

20125 AND REGULATIONS

air, as determined by the method prescribed in paragraph (c) of this section.

(d) *Methods of compliance*—(1) *Engineering measures*. (i) Engineering controls, such as, but not limited to, isolation enclosures, exhaust ventilation, and dust collection, shall be used to maintain the exposure levels prescribed in paragraph (a) 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: Government 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 current file in connection therewith. The address of the American National Standards Institute is given in § 1910.109.

(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, grinders, 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, loaded, applied, removed, cut, sawed, 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 conditions of the process would be diminished thereby.

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

(iii) *Smearing, denotation, or removal*. Employees engaged in the smearing of asbestos, the removal or denotation of pipe, substation, or equipment covered or insulated with asbestos, and in the removal or denotation of asbestos insulation or coverings shall be provided with respiratory protection in accordance with paragraph (iii)(ii) of this section and with special clothing in accordance with paragraph (iii)(i) of this section.

(4) *Particular protective equipment*—(i) *Compliance with the exposure limits*. (a) Compliance with paragraph (b) of this section may not be achieved by the use of respirators or by built-in exhaust or filtration devices.

(b) During the time when the duty of the employee is to remove or denotate asbestos, the employee shall wear the special clothing required by paragraph (iii)(i) of this section.

§ 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, 1973*. The 4-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, 1973*. The 3-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) *Control concentrations*. 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

2) Personal monitoring—(a) Personal and/or collective form without indicating time of the employees. In measuring level of the microwave energy involved in an area, after leaving 5 points may be taken for the detection of the 1-hour or 2-hour average extreme temperature variations and other concentrations of heat or stress.

Special clothing: The employer shall provide, and ensure the use of, special clothing, such as coveralls or similar whole body clothing, lead coverings, gloves and foot coverings for any employee exposed to airborne concentrations of asbestos fibers, when exceed the ceiling level prescribed in paragraph (b) of this section.

4) Change rooms: (a) At any fixed place of employment exposed to airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph b) of this section, the employer shall provide change rooms for employees working regularly at the place.

2. Classified locations: The employer shall provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the one over another and which are in your process.

(U) "Inventory" (1) Inventory of
 weapons confiscated clothing used by
 drug lords to protect the interests of sur-
 viving relatives, children, friends of the en-
 deavored family, and others in the area (2)
 of this section.

(7) Any employer who gives satisfaction to another person for furnishing or failing to furnish information to that person in violation of the requirements of all of this subchapter shall be effectively prevented from the receipt of airborne asbestos fibers in excess of the exposure limits prescribed in paragraph (a) of this section.

c) Contaminated clothing shall be transported in sealed impermeable bags, or other closed, impermeable containers, and labeled in accordance with paragraph 41 of this section.

g) Method of measurement. All determinations of airborne concentrations of asbestos fibers shall be made by the membrane filter method at (0.04 ± 0.01) x magnification (4 millimeter objectives) with phase contrast illumination.

of sampling frequency and pattern. After the initial determinations required of paragraph 1, of this paragraph, sampling shall be of such frequency and pattern as to represent with reasonable certainty the levels of exposure of employees. It is recommended the sampling be done at intervals greater than 4 months for employees whose exposure to asbestos may reasonably be expected to exceed the limits prescribed by paragraph 1, of this section.

3. **Environmental Monitoring**—If samples will be collected from areas of a work environment which are representative of the airborne concentrations of asbestos fibers which may reach the breathing zone of employees, samples shall be collected on a membrane filter of 0.9 micrometer porosity mounted in an open-face filter holder. Samples shall be taken for the determination of the 15-hour time-weighted average airborne concentrations and of the ceiling concentrations of asbestos fibers.

3) Comparing frequency and patterns. After the initial determinations required by the first three steps, the investigator determines which of the two frequency distributions is to represent the "real" situation. The choice is based on the level of structure of the comparison. In no case shall sampling be a factor. For example, if a sampling of 1000 is taken from a population of 100,000, the investigator is not permitted to expand the structure of the sample, but is permitted to add structure.

(3) Employees observation or monitoring. Affected employees, or their representatives shall be given a reasonable opportunity to observe any monitoring required by this paragraph and shall have access to the records thereof.

c) Caution signs and labels. (1) Caution signs, (2) Posting. Caution signs shall be provided and displayed at each location where airborne concentrations of substances there may be in excess of the exposure limits prescribed in paragraph 3) of this section. Signs shall be posted at such a distance from such a location so that an employee may read the signs and take necessary protective steps before entering the area marked by the signs. Signs shall be posted at all approaches to areas containing excessive concentrations of airborne substances.

(c) WGS specifications. The warning label required by this section shall conform to the requirements set forth in the official format prescribed at 49 CFR 101.14(c), and to any variation. The labels shall also include the following information: (1) the date of the test; (2) the name and title of the person who performed the test; (3) the name of the laboratory; and (4) the signature of the person who performed the test.

Labels	Notations
Asbestos.....	1" Sans Serif, 10 points or 12 points
Dust Hazard.....	1/2" Sans Serif, 10 points or 12 points
Avoid Breathing Dust.....	1/2" Gothic, 10 points or 12 points
Wear Approved Protective Equipment.....	1/2" Gothic, 10 points or 12 points
Do Not Remain in Area Unless Your Work Requires It.....	1/2" Gothic, 10 points or 12 points
Breathing Asbestos Dust May Be Hazardous to Your Health.....	10 points Gothic, 10 points or 12 points

Spacing between lines shall be at least equal to the height of the upper of any two lines.

2) Caution labels—(1) Labeling. Caution labels shall be affixed to all raw materials, mixtures, scrap, waste, debris, and other products containing asbestos fibers, or to their containers, except that no label is required where asbestos fibers have been modified by a bonding agent, coating, binder, or other material so that during any reasonably foreseeable use, handling, storage, disposal, processing, or transportation, no airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section will be released.

(2) Label specifications. The caution labels required by subdivision (1) of this paragraph shall be printed in letters of uniform size and contrast so as to be readily visible and legible. The label shall state:

CAUTION
Contains Asbestos Fibers
Avoid Creating Dust
Breathing Asbestos Dust May Cause Serious Bodily Harm

(3) Housekeeping—(1) Cleaning. All external surfaces in any place of employment shall be maintained free of accumulations of asbestos fibers if, with their dispersion, there would be an excessive concentration.

(2) Waste disposal. Asbestos waste, scrap, debris, bags, containers, equipment, and asbestos-contaminated clothing, consigned for disposal, which may produce, in any reasonably foreseeable use, handling, storage, processing, disposal, or transportation airborne concentrations of asbestos fibers in excess of the exposure limits prescribed in paragraph (b) of this section shall be collected and disposed of in sealed impermeable bags, or other closed, impermeable containers.

(3) Recordkeeping—(1) Exposure records. Every employer shall maintain records of any personal or environmental monitoring required by this section. Records shall be maintained for a period of at least 3 years and shall be made available upon request to the Assistant Secretary of Labor for Occupational Safety and Health, the Director of the National 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 subdivision (1) of this

paragraph, which includes the employee's own exposure to asbestos fibers.

(3) Employed 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 1 day of the finding. The employee shall also be timely notified of the corrective action being taken.

(4) Medical examinations—(1) General. The employer shall provide or make available at his own medical examinations and ensure exposure to asbestos required by this paragraph.

(2) Employment. 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 symptoms, history of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(3) Annual examinations. On or before January 31, 1973, and at least annually thereafter, every employer shall provide or make available to each of his employees a medical examination to elicit any symptoms or signs 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 symptoms, history of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(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 symptoms, history of respiratory disease, and pulmonary function tests to include forced vital capacity (FVC) and forced expiratory volume at 1 second (FEV₁).

(5) Recent examinations. No medical examination is required of any employee, if accurate records show that the employee has been examined in accordance with this paragraph within the past 12 months.

(6) Medical records—(1) Maintenance. Each year of employment examined pursuant to this paragraph shall cause to be maintained during 30 years, provided that if an employee has been examined within 30 years, the records shall be maintained by employers for at least 30 years.

(2) Access. The contents of the records shall be made available to the employee and former employee upon request.

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.

able during the past several years support our current recommendations. The rationale for these revised recommendations was developed jointly by our staffs as part of a draft preamble to a proposed lead standard. Should there be a need to revise and reissue the lead criteria document, we would be glad to do so within a reasonable period of time.

General Policy

GAO WILL DETERMINE MOST EFFECTIVE USE OF CANCER RESEARCH RESULTS FOR AGENCIES

A study to determine how research results on the carcinogenicity of materials can be handled most effectively to meet the needs of regulatory agencies is being conducted by the General Accounting Office.

Research sponsorship and the government's coordinating activities for the screening of potential cancer-causing substances is carried out at the National Cancer Institute of the National Institutes of Health, but research is performed at many locations as implications for industrial, environmental, and other exposures are all different.

The study by GAO was initiated internally, that is, not at the specific request of Congress. Its purpose is to examine the problems in developing and recommending standards for screening possible carcinogens, and its scope includes costs, scheduling, and interagency information flow. A GAO spokesman said that in addition to the National Cancer Institute, research agencies surveyed included the National Institute for Occupational Safety and Health and the National Institute of Environmental Health Sciences. Regulatory agencies studied included the Occupational Safety and Health Administration, the Environmental Protection Agency, and the Consumer Product Safety Commission.

A draft report for agency review is in preparation, and a final report is expected to be ready in about four months, according to a GAO spokesman.

Health Hazards

NIOSH ISSUES ASBESTOS DUST ALERT FOR WORKERS EXPOSED SERVICING BRAKES

An alert concerning the potential health hazard for persons exposed to asbestos during the servicing of motor vehicle brake and clutch assemblies was issued by the National Institute for Occupational Safety and Health on August 8.

NIOSH convened a meeting of government and university scientists, industry representatives, and labor union officials to discuss the present state of knowledge with respect to this problem on June 21. Data was presented by investigators from the Mount Sinai School of Medicine in New York City indicating that workers engaged in the maintenance and repair of automobile and truck brake linings are exposed to potentially hazardous levels of airborne asbestos dust (Current Report, July 31, p. 296).

Specific brake servicing operations studied included blow-out of automobile drum brake assemblies, grinding of used truck brake linings, and bevelling of new truck brake linings. Average peak asbestos air concentrations for these three activities based on personal samples taken within 10 feet of the operator were, respectively, 10.5, 3.73, and 37.3 fibers greater than five microns in length per milliliter. An

analysis of samples of brake drum dust revealed that almost all of the asbestos fibers were found shorter than 0.4 microns in length.

Previous Studies

Previous studies of the extent of asbestos emissions from a automobile brake lining wear showed that only a very small fraction of the original asbestos content of the brake lining is found in brake drum dust. It was presumed that this is due to thermal degradation of the fibers during braking. The present findings indicate that enough asbestos is preserved to produce significant exposures during certain brake servicing procedures.

The full extent of asbestos-related disease in brake servicing personnel is not known at present because this particular occupational group has not been studied systematically up to now. However, a review of the scientific literature on the association between asbestos exposure and mesothelial tumors of the pleura and peritoneum has revealed at least four cases of these rare tumors in persons who were employed in jobs involving automobile brake servicing, the alert said.

The environmental studies of brake lining servicing together with observations of mesothelial tumors in persons so employed affirms the necessity for instituting and maintaining recommended control measures in this industry so that the health hazards of asbestos are minimized, according to the alert.

Not required,

Recommended Procedures

Following are interim procedures recommended by NIOSH to minimize exposure to asbestos dust during brake and clutch servicing:

► If possible, an area shall be designated for all brake and clutch repairs. Entrances into this area shall be posted with an asbestos exposure warning sign as follows:

Asbestos
Dust Hazard
Avoid Breathing Dust
Wear Assigned Protective Equipment
Do Not Remain in Area
Unless Your Work Requires It
Breathing Asbestos Dust May Cause
Asbestosis and Cancer

► During brake servicing, an air purifying respirator, either single use or with replaceable particulate filter(s), as approved by the Mining Enforcement and Safety Administration (formerly Bureau of Mines) or NIOSH, shall be worn during all procedures starting with the removal of the wheels and including reassembly. During manual clutch servicing, such a respirator shall be worn during removal and clearing of the clutch, pressure plate and housing assembly and during installation of the new clutch assembly.

► Dust shall first be cleaned from brake drums, brake backing plates, brake assemblies and clutch assemblies using an industrial type vacuum cleaner equipped with a high efficiency filter system (greater than 99 percent efficiency for 0.3 um diameter aerosols). After vacuum cleaning, any remaining dust shall be removed using a rag soaked in water and wrung until nearly dry. Under no circumstances shall compressed air or dry brushing be used for cleaning.

► During arcing and riveting operations, an approved respirator, as described in (2) above, shall be worn. Grinding (arc) machines shall be provided with local exhaust ventilation such that worker exposures are maintained at least below the 1976 OSHA asbestos standard (29 CFR 1910.1001). At a minimum, the dust bag of the arcing machine shall be removed and replaced with the hose of the high efficiency industrial vacuum described in (3) above.

► Industrial vacuum cleaner bags containing asbestos dust and cloths used for wiping brake and clutch assemblies shall

be sealed in plastic bags and labeled with the following warning label printed in letters of sufficient size and contrast to be readily visible and legible:

Caution
Contains Asbestos Fibers
Avoid Breathing Dust
Breathing Asbestos Dust May Cause
Asbestosis and Cancer

All asbestos waste shall be disposed of in accordance with the OSHA asbestos regulation, 29 CFR 1910.1001 (b). During removal of vacuum bags, an approved respirator, as described in (2) above, shall be worn.

► All floor cleaning in areas where brakes and clutches are repaired shall be done with the high efficiency industrial vacuum cleaner as described in (3) above. Grinding (arc) machines shall also be cleaned with such a vacuum cleaner and any remaining dust wiped with a damp cloth. An approved respirator, as described in (2) above, shall be used during this cleaning.

► Although adherence to the above procedures should minimize any contamination of work clothing, it is required that the appropriate portions of the OSHA regulations on asbestos (29 CFR 1910.1001 (d) (3) and (4)) concerning special clothing, change rooms, etc. be followed.

Note: Strict adherence to the above procedures should minimize exposures to mechanics during brake and clutch servicing. These are interim recommendations and are subject to revision pending results of ongoing NIOSH research.

Health Hazards

NIOSH RECEIVES REPORT ON EFFECTS OF OCCUPATIONAL EXPOSURE TO LEAD

A biomedical standard for blood lead (PbB) of .07 milligrams of lead per 100 milliliters of blood for workers was recommended in a report submitted to the National Institute for Occupational Safety and Health.

The report, entitled "Behavioral Effects on Occupational Exposure to Lead" was prepared under contract to NIOSH by John D. Repko, Ben B. Morgan, Jr., and John Nicholson of the Performance Research Laboratory, University of Louisville, Louisville, Ky.

Five measures of body burden and 80 behavioral measures of task performance were obtained from 316 experimental and 112 control subjects. The experimental subjects were volunteers from among workers exposed to inorganic lead at their jobs in three storage battery manufacturing companies. The controls were volunteers from five firms involved in various types of light manufacturing.

The data obtained from the subjects indicate that PbB is not a sensitive measure of changes in functional performance capacity. Aminolevulinic acid dehydrase in the blood (blood ALA-D) was found to be the most sensitive predictor of task performance.

Recommendation Rationale

Because most industrial hygienists and government regulatory agencies employ PbB as an index of the extent of exposure, the report said, any specified changes in biomedical monitoring criteria must include this specific measure.

Once the recommended level of PbB is exceeded, the report stated that the worker should be examined to determine:

- The occurrence of deterioration in medical status.
- The occurrence of deterioration in functional capacity.
- The specific level of ALA-D.

If any of these additional examinations are positive, the worker should be removed from his current level of exposure, the report said.

Other Recommendations

Other recommendations made in the report are as follows:

► Based on the behavioral data and the relationship between PbB and ALA-D, a biomedical standard of 21 units of ALA-D was recommended.

► Functional measures should be utilized in routine health-monitoring programs.

► Industrial tests developed for monitoring programs should meet certain criteria such as validity, sensitivity, engineering feasibility, reliability, and flexibility.

Sensory-perceptual Functions

According to the report, loss of hearing, as evidenced by an increase in auditory threshold, was correlated significantly with decreases in ALA-D. In addition, initial increases in hearing level were evidenced at PbB levels between .07 and .079 milligrams of lead per 100 milliliters for all frequencies tested.

There also was a significant correlation between decreases in the audible duration of a tone and increases in PbB, which provided "some suggestive evidence of auditory pathology."

In the past, where auditory dysfunctions were attributed to lead intoxication, the actual effects were unclear. The results of this study confirm that hearing losses may occur at all frequency ranges, particularly at high levels of body burden of lead.

The report stated that not only do increases in threshold hearing levels (between 1,000 and 8,000 Hz) bear a relationship to decreases in ALA-D, but hearing levels at 500 and 1,000 Hz correlated positively with urine lead (PbU) and at 4,000 and 8,000 Hz hearing levels correlated positively with PbB.

Changes in watchkeeping, vigilance, and attentive as well as visual functions were not indicated by the data.

Biomedical Measures

The study data suggest that PbB is "neither reliably stable nor sufficiently related to the effect of exposure to provide a sensitive measure of changes in functional capacity."

Blood ALA-D was found to be the strongest clinical measure of changes in the functional capacities assessed. The usefulness of ALA-D is based on two facts:

► ALA-D is a quantitative measure of the effect of lead on body biochemistry.

► Inhibited ALA-D activity is detectable in the absence of urinary responses and at extremely low concentrations of PbB.

Intellectual Functions

The report noted that significant differences in intellectual functions between study groups or between PbB were not found in the experiment.

However, the report added, this should not be taken to mean that all intellectual functions are unaltered in exposure to lead. Additional research in this area is needed, the report said.

New research should concentrate on the ability of "lead subjects" to learn new skills or to improve performance through practice and to the performance of intellectual functions "under stressful conditions," according to the report.

Neuromuscular Functions

According to the report, the strongest relationships between body burden of lead and functional capacity occurred with neuromuscular function tests.

On the basis of correlations between performances and decreases in ALA-D, the data showed a decrease in func-