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ASBESTOS EXPOSURE AND CONTROL IN HANDLING

ASBESTOS-CONTAINING PIPE INSULATION

ASBESTOS-CONTAINING CEMENTS AND GROUTS

ASBESTOS-CONTAINING BRAKE LININGS

ASBESTOS WELDING BLANKETS

By

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ASBESTOS EXPOSURE AND CONTROL

PREFACE

Asbestos is a generic term applied to a number of naturally-occurring, hydrated, fibrous mineral silicates. The most widely used asbestos in industry within the United States is chrysolite ($3MgO \cdot 2SiO_2\ 2H_2O$), a fibrous form of serpentine. Other types, all members of the amphibole group of minerals, include amosite [$(FeMg)\ SiO_3$]; crocidolite [$NaFe\ (SiO_3)_2 \cdot FeSiO_3 \cdot H_2O$]; tremolite [$Ca_2Mg_5Si_8O_{22}\ (OH)_2$]; anthophyllite [$IMgFe)_7Si_8O_{22}\ (OH)_2$]; and actinolite [$CaO \cdot 3(MgFe)O \cdot 4SiO_2$].

All of the various types of asbestos have excellent heat-resistant qualities and are non-combustible in air, which accounts for their extensive use in insulation materials around furnaces, ovens, hot pipes, etc., and in products such as brake linings, where high frictional heats are encountered. Although the asbestos in asbestos-cement board, brake linings and asbestos-containing floor tiles is firmly bonded in the matrix material, fibers can be released to the air under the influence of mechanical processes (e.g., sawing, drilling, cutting, or in the case of brake linings, blowing out abraded fibers from worn brakes prior to replacement). For the more friable insulation products such as calcium silicate or 85% magnesia block insulation and for asbestos in powder form, any type of handling will produce considerably more airborne asbestos fibers than for the firmly bonded asbestos products. Asbestos cement or grouts produce high airborne fiber level on dry mixing.

Employees who work with asbestos insulation materials, asbestos-containing grouts and cements in powder form, asbestos-cement board (Transite), asbestos welding blankets or brake linings, have significant occupational exposures to asbestos fibers. It has been demonstrated through studies of insulation workers over a 40-year period by Dr. I. Selikoff of the Mt. Sinai School of Medicine in New York that inhalation of asbestos fibers of high intensity and long duration is related to a lung condition called asbestosis and peculiar forms of cancer. The dispute over the specific level below which exposure is safe was resolved with the present OSHA asbestos standard of 5 fibers per cubic centimeter greater than 5 microns in length on an 8-hour time-weighted average basis. Allowable excursions are limited to 10 fibers per cubic centimeter greater than 5 microns in length as a ceiling limit for up to any 15 minutes in an hour, but for not more than 5 hours in any one 8-hour day. The OSHA asbestos standard, effective July 1, 1976, will lower the allowable exposure pattern to 2 fibers per cubic centimeter greater than 5 microns in length on an 8-hour time-weighted average with a ceiling limit of 10 fibers per cubic centimeter greater than 5 microns in length, for any circumstance.

Although evidence tends to show that crocidolite, for instance, is slightly more harmful than chrysotile, the evidence is not sufficient to establish separate standards for varieties of asbestos. Therefore, the OSHA standards apply to all varieties of asbestos equally, and in any form bound or loose.

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I. Introduction

Significant occupational exposure to asbestos fibers has been shown to cause lung injury and pose a threat of cancer. If any employees are exposed either incidentally, intermittently, or frequently to asbestos, adoption of a control program is required to reduce or eliminate this exposure.

The following program is designed to reduce the asbestos exposures of Weyerhaeuser employees engaged in the:

1) Handling, application or demolition of asbestos reinforced pipe insulation,
2) Mixing and application of asbestos-containing grouts and cements, or
3) Replacement of worn brake linings.

Closely patterned after a successful program developed by Mr. C. A. Mangold et al. at the Puget Sound Naval Shipyard at Bremerton, Washington, it is comprised of four sections:

A. A respirator program should be initiated immediately to substantially reduce exposure until other control methods can be implemented.

B. Work practices should be closely inspected to identify the most hazardous operations and, where necessary, alternate methods suggested. For example, the wetting of amosite materials has been shown to reduce the airborne asbestos dust production by 50-60%. Changes in work practices appear to hold the greatest promise for the reduction of airborne asbestos as an engineering control, with minimum expenditures.

C. Engineering controls, which have a far-reaching effect, but take longer to initiate; such as (1) substitution of materials, (2) new methods, and (3) techniques of ventilation control should be explored and, where practicable, implemented.

D. An educational program should be initiated to help workers understand the potential hazards and the reasons why a change in approach to control of asbestos is needed. This aspect of the asbestos control program is essential for pipe coverers, millwrights and mechanics to enable them to gain an appreciation for recommendations on protective equipment and proper work practices related to minimizing their asbestos exposures.

* * * *

The text which follows presents some of the methods employed to reduce airborne asbestos exposures. In order of their discussion, they include:

1. Respiratory protection and protective clothing.
2. Ventilation control.
3. Substitution of less hazardous materials.
4. Changes in work practices and handling methods.
5. An educational program to retrain workers to use less dusty methods.

* * * *

Ultimately, the goal of these five methods for reducing asbestos exposures is to reach an exposure level in the workplace where the potential threat to the health of Weyerhaeuser employees no longer exists. Present federal regulations enforced by OSHA dictate that such an exposure level shall be the July 1, 1976 asbestos standard of 2 fibers per cubic centimeter greater than 5 microns in length in any worker's breathing zone on an 8-hour time-weighted average basis.

II. Respiratory Protection and Protective Clothing

Respirable asbestos fibers are first introduced into the body through inhalation. The tiny fibers are then trapped by the lung, some of which are ingested. The most obvious and direct first step in protecting the health of employees is an effective respiratory protection program. It is recommended that all employees wear protective respiratory equipment at all times when the following activities are being performed:

1) The demolition, handling and application of asbestos-reinforced pipe insulation,
2) The weighing and mixing of asbestos-containing grouts and cements, and
3) The replacement of brake linings.

Where available engineering controls have been exhausted without reducing airborne asbestos to within "permissible" limits, the wearing of respiratory protective equipment becomes necessary and therefore mandatory for permanent health protection of employees. "Permissible" limits are defined by OSHA under Section 1910.93a, subsections (b)(1), (b)(2) and (b)(3) as:

1) 5 fibers per cubic centimeter greater than 5 microns in length on an 8-hour time-weighted (effective now) average.
2) 2 fibers per cubic centimeter greater than 5 microns in length on an 8-hour time-weighted average (effective July 1, 1976).
3) 10 fibers per cubic centimeter greater than 5 microns in length (allowable excursion) for up to 15 minutes in any hour, but for not more than 5 hours in any one 8-hour day (applicable now and beyond July 1, 1976).

* * * * * * * * * *

Acceptable respirators which are commercially available and approved under the Bureau of Mines approvals 21B or 21C for protection against pneumoconiosis-producing dusts (asbestos, silica, sugar cane fibers, etc.) are listed below:

1. Acme "Duo-Seal" Dust Respirator #8101-R, Dust Filter (lamb's wool) 8147 EW, Filter Holder 5021-R.
2. American Optical (AO) Protective Respirator #R-3030.
3. American Optical (AO) Protective Respirator #R-8100.
4. DeVilbiss MSD-505 Respirator.
5. Mine Safety Appliances (MSA) Dust Foe 66 Respirator.
6. Mine Safety Appliances (MSA) Dust Foe 77 Respirator.
7. Mine Safety Appliances (MSA) Custom Comfo Aerosol, Type "F" or Type "H" Filters.
8. Minnesota Mining and Manufacturing (3-M) 8710 Respirator.
9. Safeline Respirator #5311.
10. Safeline Respirator #5265, Cartridge #5901.
11. Safeline Respirator #5441, Cartridge #5905.
12. Safeline Respirator #5550, Cartridge #5950.
13. Welch Single-use Respirator, Model 7165.
14. Welch Respirator #7100.
15. Welch Respirator #7411, Cartridge #7500-1, Filter #7500-6, Louvered Cover 7500-14.
16. Welch Respirator #7511 Dual, Cartridge #7500-1, Filter #7500-6, Louvered Cover 7500-14.
17. Willson #560 Respirator, Filter #R-60.
18. Willson #1210 Respirator (Dual), Filters #R-10, Filter Retainers #R-682.

Of these 18 approved and commercially available respirators, five were selected by our tests as best, based upon good face fit, good visibility and lowest breathing resistance. They were:

2. American Optical (AO) Protective Respirator #R-3030.

5. Mine Safety Appliances (MSA) Dustfoe 66 Respirator.

8. Minnesota Mining and Manufacturing (3M) 8710 Respirator (disposable).

11. Safeline Respirator #5441, Cartridge #5905.

13. Welch Single-use Respirator, Model 7165 (disposable).

Asbestos pipe insulation demolition or rip-out, band saw cutting of asbestos pipe insulation, mixing of asbestos-containing grouts, and wiping or blowing out abraded dust from brake linings produce intermittent high airborne asbestos fiber levels and therefore create a little recognized threat because the tiny fibers are largely unseen by the naked eye. Because insult to the lungs from inhalation of asbestos fibers is at a maximum during these activities, protective dust masks must be worn during these peak dusty conditions. These intermittent peak exposures play a large role in the development and progression of asbestosis because very dusty conditions overwhelm lung clearance mechanisms. Dust remaining in the lungs subsequently increases the probability of permanent lung injury and threat of asbestos-promoted cancers.

In addition to respiratory protection, the wearing of protective clothing is recommended to prevent asbestos contamination of street clothes. This is mandatory under OSHA Section 1910.93a, subsection (d) Personal Protective Equipment, paragraph (3) special clothing when the airborne asbestos levels exceed the ceiling limit of 10 fibers/ml discussed earlier. Special clothing, other than disposable garments, requires change rooms 1910.93a (d)(4)(i), clothes lockers 1910.93a (d)(4)(ii), and laundering 1910.93a (d)(4)(iii)(a), (b), (c) and special handling procedures, labels, etc., if a third party is involved in the laundering. These are expensive and difficult to control.

A more practical and considerably less costly approach to protective clothing for the intermittent use of asbestos products can be achieved through the use of disposable, plastic-impregnated, paper coveralls with zippers, no pockets, at approximately $1.50 each. These garments can be purchased with elastic bands at the sleeve and pant cuffs, or purchased without and tape at the cuffs immediately prior to the work activity. Three suppliers of disposable uniforms, shoe covers and caps are listed below:

1. Worklon (A Division of Superior Surgical Mfg. Co., Inc.)
   63 New York Avenue
   Huntington, New York 11743
   "Disposable Apparel" of du Pont Tyvek.

2. Durafab Disposables, Inc.
   P. O. Box 658
   Cleburne, Texas 76031
   "Durafab" Disposables

3. Edmont-Wilson (Division of Becton, Dickinson and Company)
   Coshocton, Ohio 43812
   Polyolefin "Convenience Apparel"

The plastic finish on the paper or polyolefin coveralls reduces the number of fiber penetrations by attaching the fibers electrostatically and disposal of the garment aids dust control. When the coveralls are taped at the sleeve and pant cuffs (photograph #1), the worker is essentially enclosed, yet the garments are permeable to air and do not trap body moisture. Coveralls should be removed and placed in a labeled plastic bag for disposal before removal of the respirator to minimize exposure, remembering that the harmful particles are those that are unseen.

III. Ventilation Control

In accordance with the OSHA asbestos standard, Section 1910.93a, subsection (c), paragraph (2), parts (i), (ii) and (iii), engineering methods of control are to be applied to work situations generating airborne

PHOTOGRAPH 1

asbestos fibers which include, but are not limited to, isolation, enclosure, exhaust ventilation and dust collection. OSHA places considerable emphasis on exhaust ventilation for control of asbestos fibers released during:

1) demolition and application of asbestos-reinforced pipe insulation,

2) mixing of asbestos-containing cements and grouts and

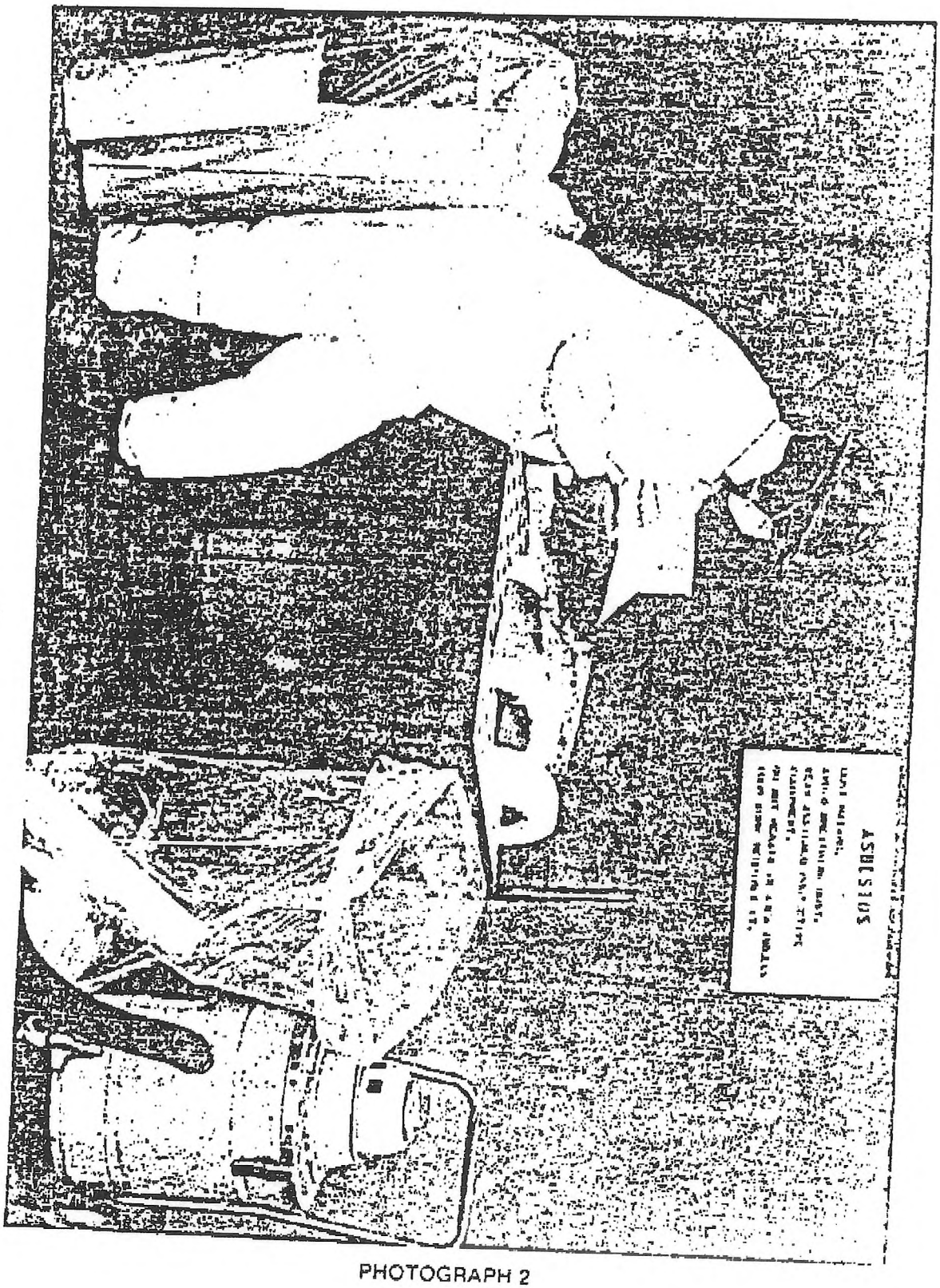
3) clean-out of abraded asbestos dust from worn brake linings

because they are known to produce high peak exposure patterns.

General ventilation requires large volumes of air to maintain dust counts at acceptable levels in areas where asbestos handling is done. Moreover, the use of general ventilation to capture fugitive asbestos fibers is costly and inefficient, considering that the exhausted air must be filtered (i.e., baghouse) to avoid contaminating other areas.

Ideally, the dust should be captured at the source of generation by local exhaust ventilation. A simple, effective, economical and satisfactory application of local exhaust ventilation principles is the portable "downdraft" table shown in Photograph #2, which is used for the capture of asbestos-reinforced pipe insulation saw cuttings. A portable industrial vacuum cleaner rated at about 200-250 cubic feet of air per minute (CFM) serves as the source of ventilation when other sources are not available. Construction details of a suitable downdraft table for the sawing of asbestos-containing pipe insulation is provided in Figure #1. Such a vacuum cleaner also serves as an excellent source of ventilation for a band saw if a collection head is installed to provide high velocity capture of asbestos dust produced at the saw.

It is recognized that such vacuum cleaners expel some fibers since collection is not much greater than 90% collection efficiency. This does not provide a significant contribution if some general exhaust ventilation exists in enclosed areas.



PHOTOGRAPH 2

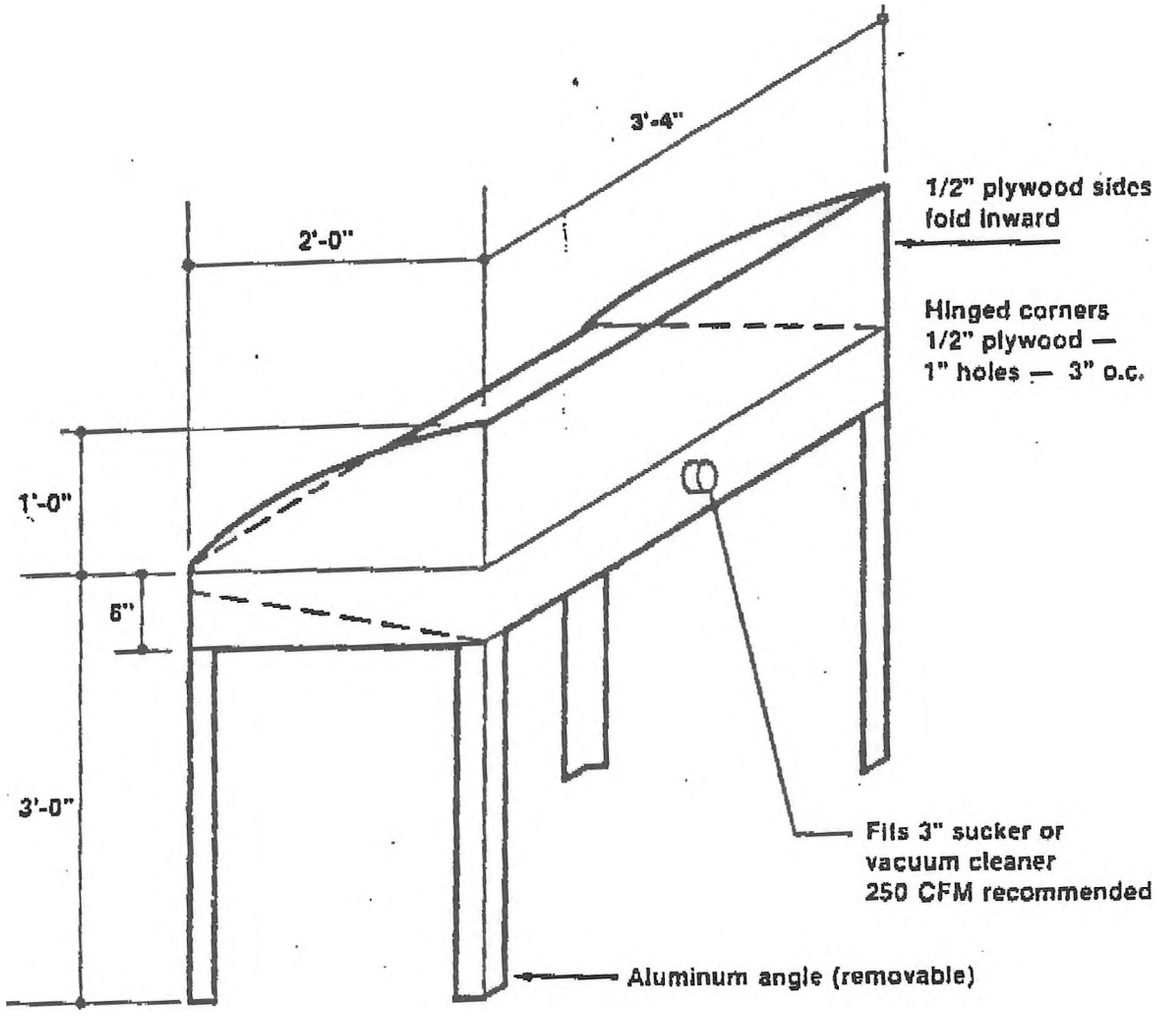


FIGURE 1

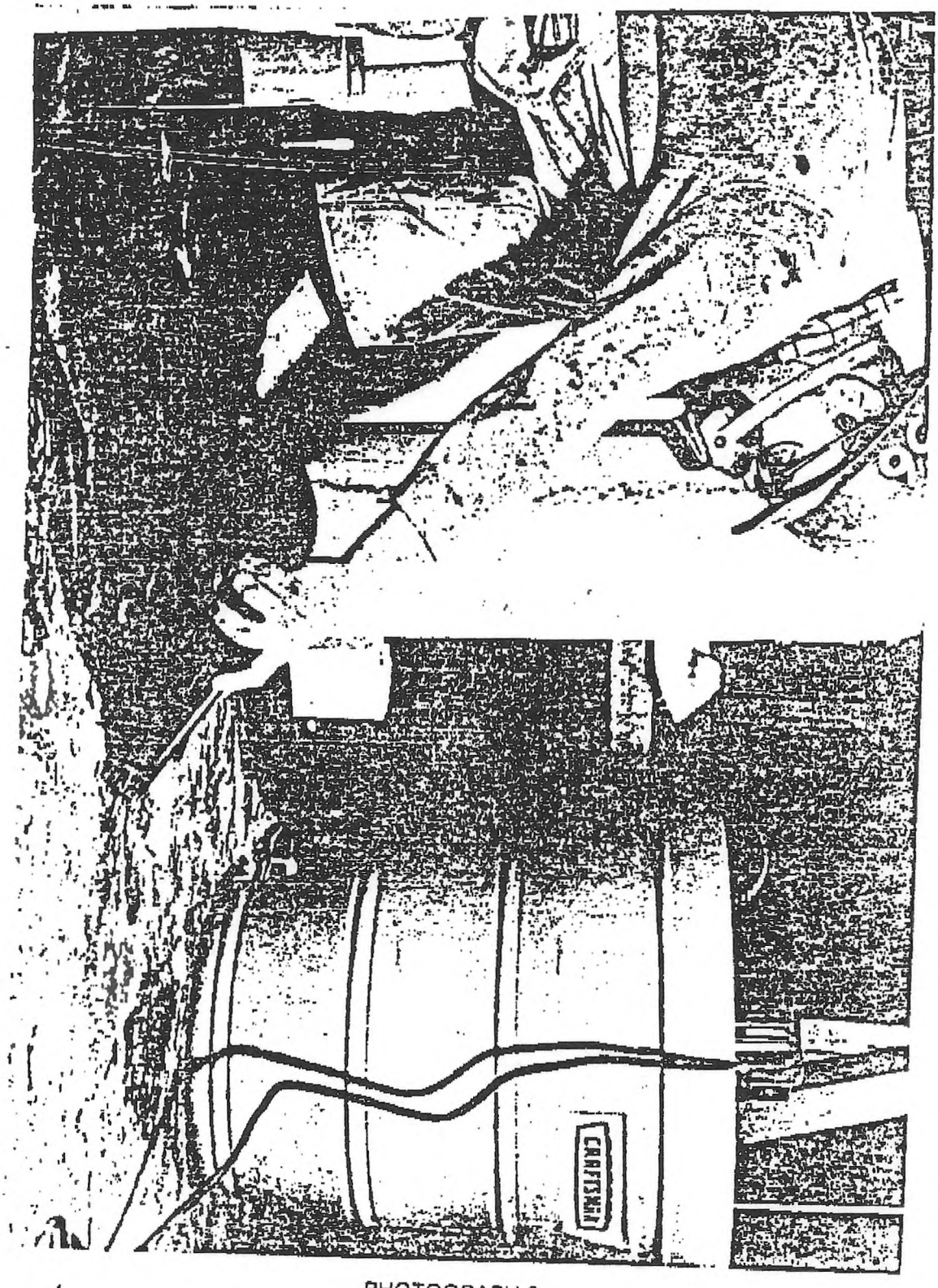
PORTABLE DOWNDRAFT CUTTING TABLE
FOR TEMPORARY LOCATIONS.

Portable industrial vacuum cleaners are recommended for area clean-up (Photograph #3) following completion of an asbestos-reinforced insulation job and/or as a source of ventilation for a small slot hood to capture asbestos fibers released during the mixing of asbestos-containing grouts and cements in a barrel or cylindrical mixing vessel. Design specifications for the slot hood, adaptable to barrel filling or mixing, are given in Figure #2. For small jobs where an asbestos-containing grout or cement must be used, the ingredients should be carefully weighed out into a plastic bag, the proper amount of water added and the mixing accomplished by kneading the sealed plastic bag.

During brake lining replacement in truck shops, portable industrial vacuum cleaners should be used to remove the abraded asbestos fiber dust from the linings rather than using compressed air to blow out and disperse the fibers in the shop air or wiping out the accumulated dust with a broom or rag.

IV. Substitution of Materials

Substitution of less hazardous substances for asbestos in asbestos-containing products is one of the most direct and permanent methods of reducing asbestos dust exposures. The use of fiberglass and mineral wool fibers to replace asbestos fibers in the reinforcement of calcium silicate and magnesia matrix pipe insulations is increasing rapidly to meet the demand for asbestos-free products. Two manufacturers of pipe insulation are now offering non-asbestos containing alternatives, which are:



PHOTOGRAPH 3

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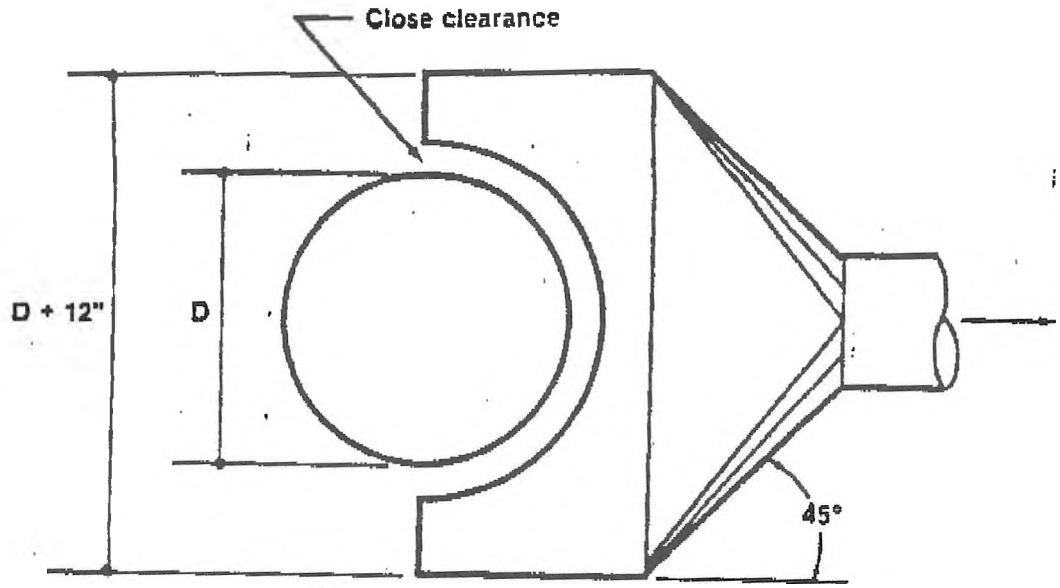

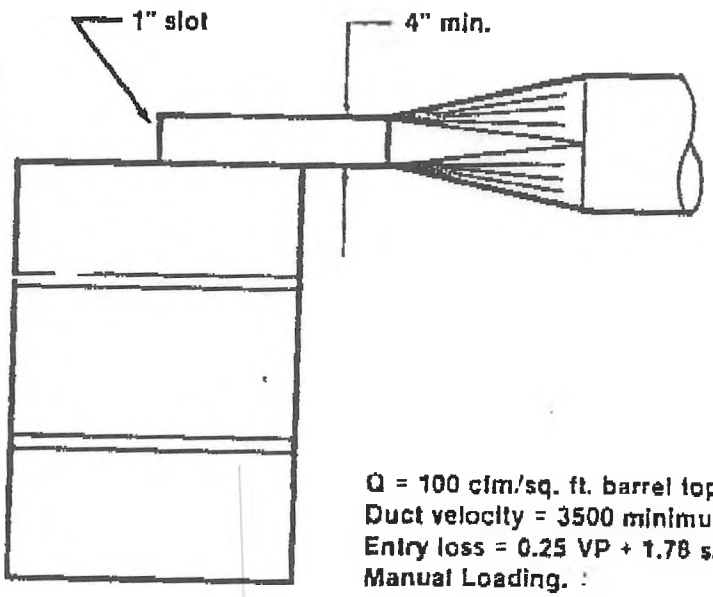

Q = 100 cfm/sq. ft. barrel top min.
Duct velocity = 3500 minimum
Entry loss = 0.25 VP + 1.78 slot VP
Manual Loading.

FIGURE 2

1. Pabco's Super Cal Temp, Type NA (No asbestos).

   Super Cal Temp, Type NA pipe insulation is a mineral wool reinforced calcium silicate with a density of 11.5-12.5 lb. per cubic foot, and a tri-dimensional linear shrink of 1% after 24 hours at 1200°F. Pabco's product is available in most of the common sizes to accommodate a wide range of pipe-insulating needs.

2. Owens-Illinois' Kaylo 10.

   More recently introduced on the market (last 6-8 months) is an asbestos-free pipe insulation, manufactured and marketed by Owens-Illinois under the trade name of Kaylo 10. Kaylo 10 is a calcium silicate material, containing a mineral wool binder, which has a tri-dimensional linear shrink of 1.4% after 24 hours at 1200°F.

Fiberglass and mineral wool dusts are not presently known to produce an adverse physiological response in the lung in the same way asbestos does. Since speculation has been raised concerning the relationship tween fiber size and the relative fibrogenic character of the inspired fibers, some caution should be used until scientists resolve the questions.

Another asbestos-free alternate for pipe insulation is Dow Chemical's "Ceramic Foam," a rigid insulation material, entirely inorganic, incombustible and resistant to chemical attack. It possesses a density of 8 lbs. per cubic foot, is impervious to moisture and is suitable for use in applications involving cryogenic temperatures upwards to 1400°F.

For insulation applications requiring the use of asbestos-containing cements or grouts, Ryder Industries - Dallas, Texas, has developed an asbestos-free high temperature bonding cement listed under the product name of One-Coat cement. The material is suitable for all jobs which formerly required chrysotile or tremolite asbestos-containing grouts and/or cements.

Throughout Weyerhaeuser operations, woven asbestos welding blankets or asbestos cloth finds wide use. These blankets or cloths have traditionally provided protection to machinery and facilities during welding activities from direct oxy-acetylene flame contact or falling molten slag. In placing the asbestos cloth into position over a machine or in shaking off the solidified slag after a welding job, a welder and other employees become exposed to considerable airborne asbestos fibers. A search for a satisfactory substitute to date has not been too successful. A potential substitute material being tested is a fiberglass fabric trade-named Alpha Maratex. The 1925/1983 number designation for this fabric represents a particular product which was designed to replace asbestos cloth.

V. Work Practices and Handling Methods

A major portion of the asbestos fibers released to the work room air during handling of asbestos-containing products could be minimized or eliminated through changes in work practices and/or improvements in handling methods. Workers often apply materials in a manner that leads to high concentrations of dust in the breathing zone regardless of ventilation

supplied, location, or packaging. For example, one worker may carefully pre-wet the materials while another will not, yet pre-wetting is known to reduce airborne asbestos production from 50 to 60%. Such changes in work practices will largely depend on the identification of dusty processes and the development of new work methods. As outlined under VI on Educational Program (next section), education and training will permit employees to accept a realistic role in their own health protection.

Work practice changes and/or improvements in handling methods can be divided into several categories, each containing methods that do not require large expenditures, extensive engineering controls, or spacial ventilation techniques.

A. Demolition or "Rip-out" or Pipe Insulation

1. For major "rip-out" or demolition jobs on asbestos-reinforced pipe insulation, an attempt should be made to isolate the area from the other areas of the mill or plant with curtains, portable partitions, etc., to prevent spreading of dust to adjacent work areas.
2. Because demolition of pipe insulation produces high asbestos dust concentrations, all maintenance personnel should wear an approved respirator and protective clothing while performing this work activity.
3. All insulation scheduled for removal should be wet down thoroughly prior to demolition. This may not be practical around electrical connections or auxiliary heating wiring.
4. Materials should be sawed into sections for removal instead of ripping with a bar or a claw hammer. Less rubble and less dust is produced by this manner of removal. A plaster of paris cast-cutter, such as used in the medical profession, produces excellent results with little attendant dust.

5. Plastic drop cloths should be suspended or spread beneath work areas to catch falling scraps and debris that produce dust (Photograph 04).

6. Asbestos scrap should be placed in plastic bags while still wet.

7. Where feasible, exhaust ventilation should be provided at the source of the rip-out.

8. Areas involved in demolition must be posted as to the hazard to discourage unprotected employees from passing through the area.

B. Installation or Re-application of Pipe Insulation

1. All maintenance personnel involved in the installation of asbestos-reinforced pipe insulation should wear an approved respirator and protective clothing while performing this work activity.

2. Since unpacking, handling and applying asbestos materials contributes significantly to overall exposures, pre-wetting, pre-packaging and careful handling is advised to reduce breathing zone exposure.

3. Even if hand sawing or cutting is performed under ventilated conditions (i.e., portable downdraft table), not all the dust generated by these practices is captured. Respiratory protective equipment should be worn by exposed individuals, because hand sawing or breaking produces excessively high dust levels in the immediate area.

4. In inaccessible areas, asbestos-reinforced pipe insulation scrap should be placed in a plastic bag as it is produced.

5. Plastic drop cloths should be suspended or spread beneath work areas to catch falling scraps and debris that produces dust.

6. Areas involved in the application of pipe insulation must be posted as to the hazard to discourage unprotected employees from passing through the area.

7. All asbestos-reinforced pipe insulation should be stored in labeled plastic bags to minimize contamination of storage areas.

8. Asbestos-free substitutes should be used in place of asbestos-reinforced pipe insulation whenever possible.

C. Application of Cements and Grouts

1. Whenever possible and assuming that the cements do not harden rapidly, mixing of asbestos-containing grouts and cements should be done remotely under ventilated mixing conditions and then delivered to the work site. For small batches, mixing in a sealed plastic bag by kneading the ingredients has been shown to be very satisfactory.

2. Bags of cement (containing asbestos) should be emptied into the mixing vessel without shaking to reduce dusts.

3. When the bag is emptied, the material should be dropped the shortest distance to avoid dispersion of asbestos dust.

4. Empty bags are to be placed in labeled containers, i.e., plastic bags, wet down, then removed from the area for ultimate burial.

5. Employees working with asbestos cements or grouts should wear approved U. S. Bureau of Mines respirators and protective clothing.

6. Surface scraped clear of old asbestos cement should be pre-wet. Wetting the tools also aids in dust reduction.

7. The use of asbestos-free cements, such as Ryder One-Coat is encouraged to eliminate asbestos dust exposures.

8. Bags of dry asbestos-containing cements and grouts, especially opened bags, should be placed in labeled plastic bags to minimize contamination of storage areas.

D. Replacement of Brake Linings

1. Vacuuming with an industrial vacuum cleaner is advised for removal of abraded asbestos fibers from worn brakes. Compressed air blow-out and/or rag wipe-out are procedures specifically not recommended.

2. A protective respirator should be worn during brake lining changes to minimize the asbestos fibers inhaled by the mechanic during this activity. Environmental monitoring at a later date may show that the mechanic's

exposure is such that a respirator may not be required, as defined under OSHA's "permissible" limits for asbestos exposure.

3. Worn brakes should be vacuumed off thoroughly and disposed of by conventional means.

E. Housekeeping for Shops and Work Sites

1. Periodic cleaning of work area, especially at the end of each shift, contributes greatly to dust reduction. The longer asbestos-containing materials remain in an area, the more widespread they become, producing considerable airborne dust.

2. Foot traffic produces considerable dust from fallen asbestos scrap, shavings, or debris. The simple procedure of placing cutting or work stations away from general foot traffic significantly reduces dust.

3. Surplus materials should be picked up and placed in plastic bags.

4. Industrial vacuum cleaners are excellent to remove settled asbestos dust and other material around cutting benches. They provide some ventilation when attached to ventilated cutting tables when other sources of ventilation are not available.

5. The use of brooms, fox-tail brushes or rags is discouraged for cleanup of asbestos dust, because of the high dust levels produced. Compressed air blowing off of uniforms or machinery should be expressly forbidden. Such fine dust once redispersed remains suspended in air for many hours.

6. Scrap materials should be placed in disposable plastic bags (Photograph #5). At the end of the shift the bags are taped shut, labeled as to the hazard contained therein, and removed from the work location as refuse.

7. Large pieces of scrap should be placed in containers and wet down thoroughly to reduce dust.

F. Prohibited Practices

Because the following practices produce high asbestos dust levels, they should be prohibited to reduce employee exposure to peak concentrations, which increases the threat of asbestosis and cancer.

1. Do not clean up fallen asbestos debris with brooms or brushes.
2. Do not shake coveralls or drop cloths.
3. Do not remove respirators before removing asbestos dust laden clothing.
4. Do not clean dusty clothes or machinery with a compressed air gun.
5. Do not vent asbestos dust picked up by ventilation into adjoining work areas.
6. Do not wear respirators covered with asbestos dust.
7. Do not wear street clothes to handle asbestos materials or under known dusty conditions.
8. Do not use asbestos for welders' pads.
9. Do not mix asbestos-containing grouts and/or cements in open containers without local exhaust ventilation.

PHOTOGRAPH 5

10. Do not use compressed air guns or rags for removing abraded brake lining dust in worn brakes.

11. Do not allow uncontrolled cutting, ripping, sawing, or breaking of asbestos-reinforced insulations in small enclosed spaces.

VI. Educational Program

In concert with an asbestos dust control program, a sustained, detailed educational program appears essential. A survey of workers exposed to asbestos at one of our locations revealed they did not fully understand the hazards of asbestos, nor had they received formal training explaining the medical program, environmental controls and preferred work practices. Subsequent lectures, followed by question and answer sessions, were given to gain their acceptance of our proposed abatement program, allay their fears, and carefully explain proposed changes in work practices, and the effects of breathing asbestos dust. Although some skeptics questioned the value of the proposed changes and resented the inconvenience of wearing respirators and protective clothing, overall the lectures were very well received. Results were excellent; most of the employees began applying the changes in work methods that significantly reduced exposures.

Follow-up lectures by the plant nurse and area superintendents explained the medical aspects, tests, the meaning of chest X-rays and pulmonary function testing, and methods of environmental testing. The scientific reasoning for control rules, or equipment use, was carefully explained to ensure intelligent application. The attitude of the employees has changed to one of interest and cooperation as a tangible result of the lectures. No adverse reaction or worker-employer difficulties developed

as a result of the presentation of all the facts regarding the health and environment of the employees.

A written employee orientation concerning asbestos, the employee's responsibilities under the OSHA asbestos standard and the employer's responsibilities under the standard has been written and will be circulated to affected employees for a permanent reference document. In addition, an educational program has been initiated with the union at this particular location to convince asbestos workers not to smoke. The risk of lung cancer among asbestos workers who smoke is nearly 4:1 compared to workers who do not smoke.

VII. Procedural Violations of the Asbestos Standard

Because violations of the OSHA asbestos standard, Section 1910.93a, both environmental and procedural, are potentially serious violations by definition, it is necessary to become familiar with the procedural violations of the standard so that they can be avoided by early correction. They may be stated thusly:

Regulation	Description (as a violation)
1910.93a (c)(1)(iii)	Failure to provide local exhaust ventilation on particular tools which may release asbestos fibers in excess of the prescribed exposure limits, such as, but not limited to, saws, scorers, abrasive wheels, drills, sanders and routers.
1910.93a (c)(2)(i)	Failure to utilize wet methods in handling, mixing, application of removal of cutting or scoring asbestos materials where practicable or feasible.

Regulation	Description (as a violation)
1910.93a (c)(2)(ii)	Failure to provide means to wet, enclose or ventilate asbestos material wherever removal from bags, cartons or other containers is conducted.
1910.93a (c)(2)(iii)	Failure to provide respiratory equipment and special clothing in accordance with paragraph (d)(2)(iii) and paragraph (d)(3), respectively, of this section for employees engaged in spraying of asbestos or demolition of pipes, structures or equipment covered or insulated with asbestos, etc.
1910.93a (d)(1)	Failure to achieve compliance with exposure limits prescribed earlier by the use of appropriate respirators or shift rotation of employees.
1910.93a (d)(2)(i-iv)	Failure to establish a respirator program and/or failure to provide respirators specified under this section depending upon the concentrations to which the employees are exposed.
1910.93a (d)(2)(iv)(d)	Failure to provide another employment position for employees who, through a medical examination, have been determined to be unable to function normally wearing a respirator.
1910.93a (d)(3)	Failure to provide special clothing for employees exposed to airborne concentrations of asbestos fibers in excess of the ceiling limit of 10 fibers per cubic centimeter greater than 5 microns in length. For asbestos-reinforced pipe insulation, any visible dust constitutes conditions in excess of the ceiling limit.

Regulation	Description (as a violation)
1910.93a (d)(4)(i)	Failure to provide change rooms for employees working regularly in a place of employment who are exposed to airborne concentrations of asbestos fibers greater than the prescribed limits.
1910.93a (d)(4)(ii)	Failure to provide two separate lockers for each employee in order to prevent cross-contamination.
1910.93a (d)(4)(iii)(a)	Failure to launder contaminated clothing.
1910.93a (d)(4)(iii)(b)	Failure to inform third party independent laundry (if used) of the asbestos hazard so that laundry employees do not become exposed.
1910.93a (d)(4)(iii)(c)	Failure to transport asbestos contaminated clothing in sealed impermeable bags and labeled properly.
1910.93a (f)(1),(2),(3)	Failure to conduct initial monitoring within six (6) months of June 7, 1972 on personal, or environmental monitoring of asbestos product processing thereafter. Merely not having a record of such testing on hand when an OSHA enforcement officer conducts an inspection represents a violation (serious) of subsection (f), paragraphs (1)-(3).
1910.93a (g)(1)(i)	Failure to post caution signs where asbestos products are used and/or stored.
1910.93a (g)(2)(i)	Failure to label raw materials, scrap, waste and debris containing asbestos fibers.

Regulation	Description (as a violation)
1910.93a (h)(1)	Failure to provide external surfaces clean of accumulations of asbestos fibers that may cause excessive airborne concentrations.
1910.93a (h)(2)	Failure to contain asbestos waste, scrap and debris in sealed impermeable bags for transportation or disposal.
1910.93a (i)(1)	Failure to maintain personal and environmental monitoring records on employees for at least three years.
1910.93a (j)(1)	Failure to provide preplacement, annual, or termination medical examinations to employees engaged in the handling of asbestos materials.

VIII. Medical Surveillance of Employees Exposed to Asbestos

Medical examinations must be performed on all employees occupationally exposed to any airborne concentration of asbestos fibers in excess of the federal standard.

A. Frequency

1. Preplacement: An examination must be performed within 30 calendar days of the first employment in an asbestos exposure occupation.
2. Examinations must be performed at least on an annual basis after the initial examination for as long as the employee is working in an asbestos exposure occupation.
3. Termination: An examination must be performed within 30 calendar days before or after termination of employment in an asbestos exposure occupation.
4. If adequate records show that an employee has been appropriately examined in accordance with the requirement within the past 12 months, no additional medical examination will be required.

B. Scope

The medical examination must be under the direction and control of the responsible physician and will consist of a full physical examination and routine laboratory studies. The following must be included:

1. Chest X-ray (posterior-anterior, 14x17 inches). This X-ray must be interpreted by a Board Certified Radiologist.
2. Pulmonary function studies. These will include a forced vital capacity (FVC) and a one-second forced expiratory volume (FEV_1).

3. A history to elicit symptomatology of respiratory disease. This history must be considered an important part of the examination. Abnormal chest X-rays and altered pulmonary function may result from other diseases and exposures to pollutants other than asbestos. It is important to document other exposures. A cigarette smoking history should be recorded. Excessive smoking may lead to altered pulmonary function or progress to pulmonary emphysema, as well as representing a risk factor in the development of bronchogenic carcinoma.

C. Medical Records

1. Complete and accurate records of all medical examinations must be maintained for each employee.

2. These records must be kept for a period of at least 20 years.

3. The records must be available on request, for inspection and copying to:

   a. the Assistant Secretary of Labor for Occupational Safety and Health,

   b. the Director of NIOSH,

   c. authorized physicians and medical consultants of either OSHA or NIOSH,

   d. the personal physician of any employee, or former employee, upon the latter's written request and authorization.

IX. Recommended Checklists and Handling Procedures

A. Asbestos Control Program Checklist

The broad requirements of any asbestos control program should include:

First: Initiate a respirator program immediately to reduce exposure until other control measures can be developed.

Second: Identify obvious dusty operations, or potential sources of asbestos dust.

Third: Develop capabilities for both personnel and environmental monitoring. Otherwise, the exact exposures or dust level ranges are unknown.

Fourth: Examine work practices to identify those causing dust production and eliminate, modify, or explore alternate ways.

Fifth: Initiate engineering controls that will have a sustained effect, such as substitution of materials, new methods, ventilation control, isolation, enclosure and dust collection.

Sixth: An educational program is necessary to explain program directives, changes of work practices, techniques, and medical requirements.

Seventh: Medical programs are now required. Each asbestos worker must be medically and environmentally monitored. Recordkeeping and availability of the records to both the worker, his physician and to OSHA or NIOSH are embodied in the requirement.

B. Recommended Handling Procedures for Asbestos-Reinforced Pipe Insulation

1. All maintenance people should wear suitable respirators and protective clothing while removing, replacing or installing any asbestos insulation, particularly asbestos-reinforced calcium silicate or magnesia pipe insulation.
2. Insulation should be wet down before "rip-out" or demolition.
3. The work area should be covered with a tarp or plastic drop cloth to catch scrap insulation as it is being stripped off.
4. Where practicable, plastic sheets should be hung around the work area to partially enclose the work area and minimize contamination of adjacent areas.
5. All loose and scrap insulation will be shoveled up while still wet and placed in plastic bags. The bags of wetted scrap insulation should be appropriately labeled and placed in a non-combustible refuse box for ultimate burial.
6. For applying new or demolition of old asbestos insulation, the work areas should be posted, according to 1910.93a (g), (1)(i) and (ii). This posting should also include storage areas.
7. Where wet-down of insulation prior to rip-out is not feasible because of electrical considerations or potential damage to water-sensitive machinery, a portable local exhaust ventilation system should be improvised (using an industrial vacuum cleaner) to capture asbestos fibers at the point of generation.

8. Substitution of either Pabco Super Cal Temp, Type NA or Owens-Illinois' Kaylo 10 is encouraged to ultimately phase out the use of asbestos insulation.

9. Sawing, cutting or drilling of asbestos-reinforced pipe insulation should be performed on a downdraft table supplied with an industrial vacuum cleaner for a ventilation source.

10. At the end of each work shift, employees should discard their disposal clothing in a labeled plastic bag for disposal prior to removing their respirator.

11. Where asbestos-free substitute materials have been used in a mill or plant, that section of the new insulation should be labeled as <u>non-asbestos</u> (sprayed on in red or black letters) so that the progress of substitution may be followed. Also, future work on such insulation would not require the precautions listed above for asbestos work and labeling, as described above, would provide a convenient identification of the less hazardous material.

12. All cleanup of dry insulation and dusts following a job should be done with an industrial vacuum cleaner and disposed of in labeled plastic bags.

C. Recommended Handling Procedures for Asbestos-Containing Cements and Grouts

1. All maintenance people or masons involved in the chip-out or drilling of old asbestos-containing cements or grouts and in the weighing, mixing, application and cleanup of new asbestos-containing cements or grouts should wear suitable respirators and protective clothing.

2. Mixing large amounts of asbestos cements or grouts in open tubs or wheelbarrows is discouraged owing to the high concentrations of fibers released.

   A. Large amounts of asbestos cements or grouts should be mixed in a barrel supplied with a slot hood local ventilation system (slot hood connected to an industrial vacuum cleaner).

   B. Small amounts of asbestos cements should be mixed in a sealed plastic bag by kneading the cement/water mixture.

3. Empty bags or sacks containing asbestos cements or grouts should be wet down and placed in a plastic bag, labeled, and disposed of by burial.

4. The use of asbestos-free substitutes such as Ryder One-Coat is encouraged to minimize employee asbestos exposures.

5. Cleanup of application areas and especially mixing areas should be accomplished with an industrial vacuum cleaner. Sweeping is expressly forbidden.

6. As in the case of asbestos-reinforced pipe insulation activities, disposable uniforms should be discarded into plastic bags at the end of each work shift prior to removal of respirator.

7. Mixing areas and storage areas should be posted according to OSHA Section 1910.93a (g)(1)(i) and (ii).

8. Plastic drop cloths should be placed beneath each work area to facilitate clean-up.

9. Surplus or scrap asbestos-containing cements or grouts should be placed in labeled plastic bags for ultimate disposal by burial.

10. Vacuum cleaner bags containing asbestos fibers should be placed in labeled plastic bags and disposed of by burial.

D. Recommended Practice for Replacing Brake Linings

1. Mechanics replacing brake linings on any enclosed brake drum, brake shoe vehicle brake system should wear an approved respirator during these activities.
2. An industrial vacuum cleaner should be used to remove abraded dust from worn brake linings prior to installation of new brake shoes. Use of compressed air guns or rags to remove the abraded asbestos-containing dust is expressly forbidden.
3. Once discarded brake shoes have been adequately freed of dust through vacuuming, disposal can be accomplished by conventional means since the remaining fibers are tightly bonded in the matrix.
4. Vacuum cleaner bags containing asbestos fibers should be placed in labeled plastic bags and disposed of by burial.

E. Recommendations for Transite and Asbestos Welding Blankets

1. Employees involved in the sawing, drilling or scoring of asbestos-cement board (transite) should be protected with an approved respirator during these work activities.

2. Saws or drills used in the machining of transite should be equipped with local exhaust ventilation to prevent contamination of work room air. This can be accomplished economically through the use of an industrial vacuum cleaner connected to a narrow capture head which presents a high velocity, low volume capture of asbestos fibers released during sawing or drilling at the point of generation.

3. Use of asbestos welding blankets is discouraged in lieu of potential acceptable substitutes such as Alpha Maratex, etc.

4. If the substitutes for the asbestos welding blankets prove acceptable, the asbestos-containing cloths should be placed in labeled plastic bags for ultimate burial.

X. References

1. Criteria for a recommanded standard - "Occupational Exposure to Asbestos" - U.S. Dept. of Health, Education and Welfare. National Institute for Occupational Safety and Health Criteria Document.
2. Federal Register Volume 37, No. 110 (June 7, 1972), Part 1900 - Occupational Safety and Health Standards, "Standard for Exposure to Asbestos Dust."
3. General Electric. "Environmental Health Management Manual" Section 9 on Dust and Dust Diseases, Subsection 9.1 Asbestos, pp. 7-9.
4. Hallen, W. L. "Asbestos Insulation," a memo to pulp safety coordinators. May 3, 1973.
5. "Industrial Ventilation," a manual by the Committee on Industrial Ventilation - American Conference of Governmental Industrial Hygienists.
6. Mangold, C. A., Beckett, R. R. and Bessmer, D. J. "Asbestos Exposure and Control at Puget Sound Naval Shipyard," Puget Sound Naval Shipyard at Bremerton, Washington (March, 1970).
7. Richman, Howard. "Safety-Asbestos Dust Control," Longview Fibre Company internal document offered to the Pacific Coast Association of Pulp and Paper Manufacturers on June 18-19, 1973.
8. Walters, Cal. "OSHA Rules for Handling Asbestos on Weyco Pulp Plant Site," a memo written on May 1, 1973.
9. Walters, Cal. "Asbestos Exposure and Control" - to be used at Weyco Pulp Division, Longview; a memo written on May 3, 1973.