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MEMORANDUM

To: Jill
From: Chris
Subject: NSC Doc.
Date: 9/10/01

I remember from something I did for you a while back that Larry Rogers worked for Weyerhaeuser in the 70's, though I don't remember when, exactly. Thought you might find this article interesting.

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PROCEEDINGS



AGENDA

SEMINAR — FRIDAY, DECEMBER 6, 1974 AIRTEL

8:30 a.m. - 8:55 a.m.
Registration

8:55 a.m. - 9:00 a.m.
Introduction Larry Penkava

9:00 a.m. - 10:15 a.m.
Asbestos & Wood Dust Joe Wendlick

10:15 a.m. - 10:30 a.m.
Coffee

10:30 a.m. - 11:15 a.m.
Wood Preservatives, Solvents &
Flammables Al Riegert

11:15 a.m. - 12:00 Noon
Carbon Monoxide Peter Breysse

12:00 Noon - 1:30 p.m.
Lunch

1:30 p.m. - 2:00 p.m.
Formaldehyde &
Caustics Art Schoenborn

2:00 p.m. - 2:30 p.m.
Respirators & Protective
Equipment Walter E. Ruch

2:30 p.m. - 3:00 p.m.
Instrumentation &
Controls Donald Quilici

3:00 p.m.
Adjourn

ASBESTOS AND WOOD DUST

by

Joseph D. Wendlick
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PART I

ASBESTOS

What is asbestos?

Asbestos is a member of a group of some 80 naturally-occurring inorganic fibers, which is principally characterized by two broad mineral groups, the serpentines and the amphiboles. Only one significant species of asbestos originates in the serpentine mineral group: chrysotile (a magnesium silicate occurring as long, white flexible, tubular fibers), the chief asbestos of commerce, mined principally in Canada, Italy, Rhodesia, and South Africa, as well as the U.S.S.R. Commercial deposits of asbestos also occur in the U.S. in the states of Vermont, Arizona, and California. Amphiboles (iron silicates), on the other hand, include a number of asbestos species: amosite, crocidolite, anthophyllite, actinolite and tremolite which are mined in South Africa, Australia, Bolivia and Finland.

What are the standards?

Prior to the Williams-Steiger Occupational Safety and Health Act of 1970, standards on asbestos were primarily directed at minimizing workers' exposure to within limits thought to cause the debilitating disease, asbestosis. Consider, for example, the level adopted under the Walsh-Healey Public Contracts Act in 1969, which set the acceptable limit at 12 fibers/cubic centimeter. This asbestos standard was in force until December 7, 1971, when OSHA published an emergency temporary standard concerning exposure to asbestos fibers which lowered the acceptable airborne concentrations in the workplace to:

5 fibers/cc greater than 5 microns in length for an
8-hour time-weighted average (TWA)

and

10 fibers/cc greater than 5 microns in length for a
ceiling concentration,

effective July 7, 1972. NIOSH further recommended that the 5-fiber TWA and 10-fiber ceiling concentrations be permitted only for 2 years; thereafter, TWA concentrations should be not more than 2 fibers/cc, with no change in the ceiling concentration. OSHA adopted this recommendation in the interest of the health of employees so exposed, such that after July 1, 1976, the acceptable airborne concentrations in the workplace will be:

2 fibers/cc greater than 5 microns in length for an
8-hour time-weighted average (TWA)

and

10 fibers/cc greater than 5 microns in length for a ceiling concentration.

A specification on fiber size was included in the asbestos standards (greater than 5 microns in length) to denote those fibers possessing the greatest fibrogenic and carcinogenic potential. Fibers less than 5 microns in length, according to British studies, do not exhibit near the hazardous properties that mark their "greater than 5 micron" counterparts; hence the inclusion of a specific fiber size consideration.

What are the hazards?

The concern which precipitated the writing, adoption and eventual promulgation, by OSHA, of the emergency temporary asbestos standard and later the permanent asbestos standard, CFR 1910.93a, was the evidence from several investigators (notably Dr. Irving Selikoff of the Mt. Sinai School of Medicine, N.Y.) which indicated a causal relationship between exposure to asbestos and the development of certain types of cancers after a latent (asymptomatic) period of 20-40 years.

Medical science has long been cognizant that exposure to airborne asbestos fibers of high enough intensity and long enough duration will lead to a diffuse inorganic dust pneumoconiosis known as asbestosis. Asbestosis is an exposure-related disease which is characterized by interstitial calcification and scarification, obliterating lung spaces and replacing functional lung tissue with non-functional collagen. It first manifests itself with either dyspnea (shortness of breath) or an irritating dry cough, often over a period of many years. Progressively, as the condition advances, the worker will become increasingly shorter of breath (possibly cyanotic) with death occurring from respiratory failure or heart failure.

The more recent revelation, however, that asbestos exposures also increase the risk of: 1) gastric neoplasia (esophagus, stomach and small intestine cancers), 2) bronchial carcinoma (principally among smokers) and finally 3) a rare malignancy, mesothelioma of the pleura or peritoneum, has generated the most consternation. Because the attack rate of neoplasia among asbestos workers who smoke is 10-12 times higher than workers who smoke but are not exposed to asbestos or who are exposed to asbestos but do not smoke, there would appear to be a synergistic cocarcinogenic effect involved in the development of bronchial carcinoma. It was with regard for the carcinogenic effects of asbestos that the standard was lowered.

What products contain asbestos?

Long recognized as a substance possessing desirable fire-resistant characteristics, asbestos fibers have found use in a tremendously broad and diversified array of products. Some, but not all, of the product categories in which asbestos is used are given below:

Asbestos-containing blown insulation

Asbestos-reinforced magnesia or calcium silicate steam pipe covering and block insulation

Brake shoes

Asbestos-containing grouts and cements

Clutch linings of cars

Asbestos-cement products/board

Transite pipe

Asbestos-reinforced floor tiles

Asbestos cloth, blankets, clothing, gloves

Asbestos rope

Gasketing

Asbestos-containing taping for sheet rock joint work

Fibrous talcs

Filtering medium for wine, gin, etc.

Filtering medium for sulfate precipitates (Gooch crucibles)
in analytical laboratories

What substitute materials are available and can be used?

Because of the recognized hazards of working with asbestos-containing materials, especially friable asbestos-containing products, many asbestos-free (but not fiber-free) products have been developed to lessen the asbestos hazard to workers and the general public. Mineral wool fiber or fiberglass fiber-reinforced magnesia and calcium silicate pipe coverings and block insulations are now available throughout the United States in all the shapes and sizes formerly available in asbestos-containing insulative materials. By example (not to be construed as product endorsement), the following asbestos-free insulations are on the market:

Pabco Super Cal Temp Type NA

Johns-Manville Thermobestos (Asbestos-free)

Kaylo-10 (Asbestos-free)

Asbestos has been replaced in grouts and cements also, an example of which is Ryder One-Coat asbestos-free grouting. For products with asbestos bound tightly in a rigid, non-friable matrix such as with brake shoes, clutch linings, asbestos-cement board, most gasketing and asbestos-containing floor tiles, only a mechanical process such as cutting, sawing, drilling or sanding would represent potentially hazardous work exposures. All other handling activities could be performed with relative impunity.

Asbestos has been phased out of laboratory gravimetric analysis schemes in favor of turbidimetry, etc. and is no longer employed as a filtering

medium for wine and gin (in this country). Non-fibrous talcs (no tremolite asbestos) are available to replace the more potentially hazardous fibrous variety. Asbestos cloth, blankets, clothing and gloves are now surface-treated by the manufacturer to minimize release of asbestos fibers to the work place atmosphere.

It may well prove to be a false sense of security to assume that mineral wool, fiberglass or ceramic wool are "safe" vis-a-vis asbestos. As our technology improves in the development of better and better synthetic inorganic fibers and fibers approximating the size and chemical composition of naturally-occurring asbestos fibers are produced, these also may possess fibrogenic and even carcinogenic potential. We would be well advised to exercise the same precautions in handling these products reinforced with mineral wool or fiberglass as in the case of asbestos.

How are levels of exposure determined?

The accepted technique for evaluating or ascertaining level of exposure is to collect all of the fibers in a known amount of air by passing that air through a filter and then subsequently, by microscopic counting methods, determining the numbers of actual fibers collected in the known air volume. Such a sample must, perforce, be collected in the employee's breathing zone in order that the fiber concentration can be related to the individual. Once a determination has been made on the level of asbestos to which an employee is exposed, qualification for a medical surveillance program can also be evaluated.

According to the OSHA Sampling Method for Asbestos, the samples must be collected across the face of a Millipore Type AA cellulose acetate filter at a sampling rate of 2 liters/minute. Duration of the sample will depend upon the relative concentrations of asbestos and extraneous matrix material in the air at the time of sampling. Attempting to conform rigidly to OSHA's recommended sampling time of 15 minutes minimum duration (in order to determine violations of the ceiling exposure limit) may result in the loss of an important sample because the microscopist simply cannot get a reliable count on the heavily built-up fiber sample on the filter face. Sampling in high visible dust areas should always be started at 2-4 minutes, then 5-7 minutes, 8-12 minutes and finally 15 minutes to minimize loss of samples, particularly if the sampling site is several hundred miles from the counting lab, or more importantly, if the samples taken are representative of an event not likely to be repeated on a planned schedule.

Any industrial hygienists, environmentalists or analysts who are responsible for the calibration of the personnel sampling pumps, collecting the samples in the workplace and counting the fibers collected on the sampling filters should be aware of and take steps to minimize the errors which can occur at various stages of sampling and analysis, i.e. -

- 1) Altitude corrections - a pump calibrated at sea level and used at 1,000 feet above sea level may be off in the actual volume by 3 per cent.

- 2) Cassette orientation - a sampling cassette resting against a worker's uniform or clothing at the lapel will have a different fiber distribution across the fiber face than one located in the breathing zone but away from the uniform.
- 3) Ester mixture - the ester mixture used to dissolve away the filter in the counting procedure should be of a consistent concentration and saturated with filter so as to minimize errors in masking fibers with a liquid of similar refractive index.
- 4) Counting - counts run on wedges cut from the same filter may vary by as much as $\pm 30-40$ per cent.
- 5) Microscope - although many microscopes can meet the requirement of phase contrast illumination at 400-450X magnification, microscope resolution varies considerable from brand to brand.
- 6) Eye - problems of resolution are not just limited to the microscope, the eyes of different "counters" can also vary. To minimize this error, the same individual(s) should always make the counts.

All of these errors can total (by compounding) $\pm 40-50$ per cent, which means that in order for an inspector to cite a violation of the TWA portion of the present asbestos standard and have it stand up in court, the TWA should be at least 7.0 - 7.5 fibers/cc greater than 5 microns in length. For the ceiling limit, the values would have to be 14-15 fibers/cc greater than 5 microns in length for, by definition, a 15-minute sample. Conversely, in order for an employer to demonstrate compliance with these limits, typical work place environmental levels would have to be 2.5-3.0 fibers/cc and 5.0-6.0 fibers/cc, respectively.

What are some of the asbestos control methods?

Various methods of control have been applied successfully to the handling or working with asbestos products to either minimize or eliminate worker asbestos exposure in the workplace. These include, but are not limited to:

- 1) Wet methods - wetting down asbestos-reinforced insulations prior to demolition or rip-out and, to some extent reapplication will reduce airborne asbestos levels in the breathing zone of affected workers by 80-85 per cent, according to a 1970 publication entitled "Asbestos Exposure and Control at Puget Sound Naval Shipyard" by Mangold, Beckett and Bessmer.

The new proposed regulations on Asbestos by the Environmental Protection Agency for building demolition and renovation stipulate wet-down practices as the asbestos control method of choice (the only exclusion being contractors who renovate

or demolish buildings in sub-freezing temperatures). Unfortunately, alternatives are not permitted, as the proposed regulations now read, to minimize damage to electrical equipment or to other water-sensitive equipment.

- 2) Substitution - the use of asbestos fiber substitutes (e.g. - mineral wool, ceramic wool and fiberglass), both alone, in mats or fluff, or as reinforcing fibers in friable magnesite or calcium silicate insulations. Use of non-fibrous talcs, etc. represents other materials which, in most cases, will suffice.

To reiterate, however, these synthetic inorganic fiber substitutes may have the same potential for inducing exposure-related disease as with asbestos.

- 3) Ventilation - two types of ventilation are usually available for control of occupational health hazards: a) general ventilation, and b) local exhaust ventilation. Because of the potentially grave consequences of exposure and all the unknowns as to the precise level of asbestos fibers in air which is safe to breathe without developing a mesothelioma 20-40 years later, general ventilation in the control of asbestos is not an acceptable control method (within technical reason and economical feasibility). Local exhaust ventilation, on the other hand, is an excellent control method for capturing asbestos fibers at the point of origin. For high velocity mechanical operations on asbestos-containing products (drilling, sawing and routing), the high velocity/low volume concept of dust control (as advocated by Hoffman Dust Control Systems) offers the best means, both economically and technically, for controlling the dust emissions from the power tool. In all cases where a local exhaust ventilation system is used for control of asbestos-containing dusts, a baghouse should be included in the system. Cyclones, even high efficiency cyclones in series, are not efficient enough to control the emissions to the "no visible emissions" requirement of the EPA standard.
- 4) Handling Practices - while this may seem so insignificant as not to warrant mention, employees handling asbestos-containing materials (especially dry) in a proper manner can reduce their exposures sufficiently by this route, in conjunction with other engineering controls, to comply with the OSHA standard.
- 5) Isolation - control by isolation or enclosure is another way of minimizing or eliminating employee asbestos exposures in the workplace. This method has proven effective in control of carcinogen exposures and radiation (ionizing) exposure.

References:

1. Criteria for a recommended standard - "Occupational Exposure to Asbestos" - U. S. Department 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. "Industrial Ventilation," a manual by the Committee on Industrial Ventilation - American Conference for Governmental Industrial Hygienists.
4. 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).
5. Federal Register Volume 39, No. 208 (October 25, 1974) Part II, Environmental Protection Agency (40 CFR Part 61) "Asbestos and Mercury," Proposed Amendments to National Emission Standards for Hazardous Air Pollutants.

PART II

WOOD DUST

What is wood dust?

For the purpose of this paper, wood dust will be designated as those fine particles resulting from defiberization, comminution, trituration or any mechanical cutting or abrasion process performed on wood. This dust would be generated from, but not limited to, the following processes:

Woods/Timberlands

- Cutting and bucking trees

Mechanical debarking (ring or Cambium shear debarkers)

Sawing

Wood Products

a) Sawmills and Planer mills

Sawing at head rig, pony rig, resaw, trim saw and gang saw.