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December 8, 1971

D. M. ISIMINGER
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S4T - MEASUREMENT AND CONTROL OF ASBESTOS DUST EXPOSURE

Attached are comments from our plants on the proposed subject standard. As you can see, they are numerous and represent some basically different approaches from those proposed in the standard. The Textile Fibers Department has been concerned with this problem for some time now and has done a great deal of work to determine how to adequately control asbestos dust.

I am attaching a procedure developed at our Old Hickory Plant for you to use as you see fit. We certainly agree on the need for a standard such as this but, in view of the number and nature of the attached comments, we do request that their disposition be made known to this office before adoption of the standard.

MANUFACTURING DIVISIONS
J. A. Sigman
Division Engineer

Per W. D. Merriss/pas
W. D. Merriss

WDM/pas
Attach.

DUP 1153872

ASBESTOS DUST CONTROL

Old Hickory Textile Fibers
Old Hickory, Tennessee

ASBESTOS DUST CONTROL

This summary report is a compilation of work done by:

Analytical Research Laboratory
Chemical Control Laboratory
and Works Engineering Section
Old Hickory Textile Fibers
Old Hickory, Tennessee

By: R. E. Tyree, Analytical Chemist
Maintenance Engineering

DUP 1153874

DU 062102

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I. Introduction

A. Objectives

Reference: Letter J. H. Sigman-L. Cox to R. J. Blair, 8/8/68; Letter R. J. Blair to O. W. Hess, 8/16/68. (See Appendix A)

1. Study jobs where asbestos dust is present, take dust samples for analysis and determine when respiratory protection is required.

2. Provide information to the Textile Fibers Department that could be used as a guide for a uniform safety standard.

3. Recommend minimum equipment requirements for adequate dust control.

B. Promise

1. Asbestos dust control is the prevention of high concentrations of asbestos dust entering the lung of asbestos workers, insulators, and any other person exposed to, handling, or working with asbestos.

2. Asbestosis is a fibrogenic (scar producing) pneumoconiosis (dust disease of the lung) due to inhalation of asbestos fiber dust. In its more advanced stages it can impair respiratory function with production of emphysema. Total disability and death can result. Especially in smokers there is a marked increase in incidence of several varieties of cancer.

There is no known cure for asbestosis; therefore, every reasonable effort must be made from a humane standpoint to control the dust and prevent it from entering the lung.

II. Development of Old Hickory's Asbestos Dust Exposure Limits (Threshold Limit Values)

In April 1968, the Engineering Department's Construction Division established procedures for monitoring air using personnel air sampling instruments (see Appendix B). Samples were then sent to the University of Pittsburgh for microscopy analysis by qualified experts.

The Construction Division's established Threshold Limit Value (TLV) for total dust count at this time was set at 500,000 particles per cubic foot of air. This was 1/10 the TLV set for industry.

Old Hickory's Asbestos Committee has researched the subject of asbestos dust and control and has concluded from their studies:

- Asbestos dust consisted of grains and fibers[1]. The fibers are the major recognized health hazard.
- Large dust grains cannot enter the lungs but medical studies show that long fibers (as long as 200 microns[2]) do enter the lung and cause asbestosis.
- Prior to 1960, exposure measurements were based on particle counting methods which were not efficient for fiber count. Therefore, by necessity, the asbestos TLV had been set for dust concentrations which were measured primarily by grain count.
- In the late 1950's, new sample and count techniques were developed which provided much improvement in the accuracy and efficiency of counting asbestos dust grains and fibers. This method was particularly effective in the fiber sizes of most concern; i.e., 5 microns and greater.

[1] Fiber is defined as any particle having a length to diameter size ratio of 3 to 1 or greater.

[2] 1 micron = approximately .0000" inches.

- Studies since that time led the American Conference of Governmental Industrial Hygienists in 1968 to adopt, as an "intent to change[1]," a TLV of 12 fibers greater than 5 microns in length per milliliter of air (12 fibers/ml $> 5 \mu$) or 2 million particles per cubic foot of air (2 MPPCF), instead of the present TLV of 5 MPPCF (see Appendix C). The 12 fibers/ml $> 5 \mu$ TLV is based on the new membrane filter sample method; whereas, the 2 MPPCF TLV is based on the older, less effective impinger sample method.

- Both the ACGIH and the Division of Occupational Health, Department of Health, Education, and Welfare, agree the fiber count method will, in all probability, replace particulate measurement for exposure to asbestos dust and will be in the TLV "Recommended" category in 1970.

- The Construction Division's TLV and the Departmental goal of 500,000 PPCF actually applies to overall dustiness as measured by the impinger method and is not meaningful when the sample is taken by the membrane filter method. The membrane filter remains the best method of measurement to date and justifies its continued use.

Based on these findings and the fact that membrane filter sampling was being used at Old Hickory, the committee agreed to change from the Departmental TLV goal of [illegible] PPCF to 12 fibers/ml $> 5 \mu$ in length for instantaneous or short term exposure (one hour or less). A TLV of 6 fibers/ml $> 5 \mu$ in length was established for eight hour exposure. This is 1/2 the ACGIH proposed TLV.[2] We feel that our goals of 12 and 6 offer as much or more protection than the original TLV expressed in particles. Additionally, we are aligning ourselves in the direction which the asbestos industry and those in the field of study are taking. We shall continue to take additional dust samples and follow the industry studies.

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(1) [illegible] ACGIH [illegible] a "Notice [illegible] Change" category [illegible] [illegible] [illegible] in the [illegible] list.

(2) [illegible] based on an [illegible]

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In the following sample data, Old Hickory used the TLV's for long and short term exposure defined above for specifying when respiratory protection is required.

III. Sampling Procedure

Sampling at Old Hickory was done with an MSA portable pump No. 92814, with Millipore Filter Assembly No. MAWG037A0 and Aerosol Adaptor No. MX6200004. All samples were sent to:

Dr. Morton Corn
Attention: Felix Stein
Department of Occupational Health
University of Pittsburgh
Pittsburgh, Pennsylvania, 15213

Dr. Corn is a qualified expert in the field for microscopy analysis. See Appendix D for actual procedures.

IV. Sample Data

In a period, May through August, 43 samples were taken and analyzed (See Appendix E). Of the 43, 36 were jobs; 7 were sampled at vents. Fifteen of the 36 were out of limits.

Four of the 15 "out of limits" were taken while machine sawing "Unibestos." There were three short term samples and one long term.

Of the 11 remaining samples, 6 were less than one hour and 5 were greater than six hours.

Following are data of the 15 samples that exceeded TLV's.

DUST SAMPLING EXCEEDING TLV's

Instantaneous or short term (one hour or less) - 12 fibers/ML, > 5 μ length. Long term (eight hour average) - 6 fibers/ML, > 5 μ length.

Sample No.	Location and Activity	Duration of Sample	Fiber/ ML > 5 μ	Remarks
Group 1				
25	Central Shops - Sawing "Unibestos"	20 min.	477	Sawing of "Unibestos": All samples produced fiber counts greatly exceeding TLV's.
28	Central Shops - Sawing "Unibestos"	5 min.	99	
30	Central Shops - Sawing "Unibestos"	10 min.	759	
32	Reemay® Shop - Sawing "Unibestos" and "Kaylo"	1 hr. 4 min.	249	
Group 2				
24	Central Shops - Sawing	10 min.	38	Sawing of Insulation: Specific brands of insulation not known. All short term fiber counts exceed TLV by considerable amount. The long term sample =42 only slightly exceeds TLV.
4	Dacron® Shops - Sample 2 - Sawing Ruberoid-LK	15 min.	27	
5	Dacron® Shops - Sawing & Pouring Ground Asbestos	13 min.	38	
42	Dacron® Shops - Sawing "Kaylo"	7 hr. 30 min.	.8	
19	DMT Shop - Sawing	15 min.	925	
26	DMT Shop - Sawing Asbestos Cement Pipe Over Manifold	10 min.	773	
15	DMT Shop - Sawing With Vacuum On Saw	10 min.	396	

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DUST SAMPLING EXCEEDING TLV's (Cont'd)

Sample No.	Location and Activity	Duration of Sample	Fiber/ ML > 5	Remarks
Group 3				
39	Central Shops - Routine Work	7 hr.	7	Routine (Long Term): Work includes all types of jobs from sawing to cleaning. Some readings are slightly greater than two times the TLV but do not approach the levels of the short term jobs.
40	Dacron® Shops - Routine Work	6 hr. 4 min.	13	
41	Dacron® Shop - Routine Work	6 hr. 10 min.	8	
42	Power Maintenance Routine Work	6 hr. 50 min.	13	

V. Recommendations

Based on Old Hickory's study of the asbestos dust problem and analysis of the sample data, the following recommendations are made:

1. The Engineering Standards should specify the exclusion of insulation materials containing Crocidolite type asbestos.

2. Use of Unibestos be discontinued and removed from the Engineering Department Standards.

3. Samples should be taken using membrane filters (instead of impinger type samplers) at several plant locations.(1)

4. Torit Dust Collector, Series 19 (or equal) should be specified for use on all power saws used for asbestos. (Consider including in Engineering Standards.)

5. All existing vacuum systems used for asbestos dust removal should be upgraded to highest effectiveness attainable against air leakage. Special attention should be given to bandsaws. (Consider including in Engineering Standards.)

(1) Analyze data to establish relationship to the TLV. This may indicate relaxing or tightening of requirements. Routine sampling should be done so that dust level can be maintained.

6. Torit Down Draft Benches (or equal) should be specified for use in production type insulation shops where severe dusting occurs from shaping, cutting or handsawing asbestos. (OMB $1.5M-$2M). (Consider including in Engineering Standards.)

7. Approved vacuum cleaners shall be used for floors, equipment, etc., whenever practical. (Investigation is continuing to find vacuum cleaners that will entrap particle sizes 5 microns and greater efficiently.) Goal is to reduce fiber content of the exhaust air.

8. Minimum Safety Rules

   a. Mineral dust respirators approved under U. S. Bureau of Mines Schedule 21B (see Appendix F) shall be worn for the following jobs[1]:

      (1) All sawing of "Unibestos" until this product is discontinued.

      (2) Pouring of ground asbestos in all cases. Examples: filling storage bins, dumping into mix pails, etc.

      (3) Tearing off asbestos insulation from pipelines, equipment, vessels, etc.

      (4) Any operation involving cleaning or removing of asbestos dust or residue in which an approved vacuum cleaner is not used.

      (5) Cleaning vacuum systems and vacuum cleaners handling asbestos dust.

   b. An approved vacuum cleaner shall be used to remove asbestos dust when cleaning floors, equipment and parts wherever practical. Where impractical, an approved dust mask shall be worn.

   c. On power equipment provided with dust removal systems, turn systems on before working on asbestos materials. Turn systems off only after completing work.

[1] Old Hickory has chosen the MSA Dustfoe #77 (with catalog number 9[illegible] filter) approved under 21B, as a plant standard. The Insulation Industry Hygiene Research Program and Johns-Manville Research and [illegible] are developing and testing disposable masks with the cooperation of workers on the future [illegible] of asbestos. [illegible] this development.

9. Procedures

All insulation shops must be properly ventilated and saws equipped with high efficiency cyclone type or fabric filter type dust collectors. In order to assure expedient and efficient dust removal, the following shall be in effect:

a. Specific Safety Rules shall apply.

b. Equipment and shops shall be inspected once per month to assure systems are being maintained and are operating properly. (This inspection shall be on the IBM monthly reminder.) Specific items to be checked are:

(1) Dust collector fans operating.

(2) Seals around ducts are tight to assure adequate velocity and volume of air.

(3) All duct joints are tight.

(4) Dust collection containers shall have plastic bags inserted to eliminate need for shoveling, sweeping, dumping, etc. Bags should not be allowed to fill more than 1/2 to 2/3 full to allow for tying the tops of bags upon removal to prevent dusting condition.

(5) Under normal use of saws (average one hour sawing per day), the cloth exhaust filter bags should be agitated (shaken and beaten) each week and cleaned each six months.

(6) To clean exhaust filter bags, a large plastic bag should be placed over the filter bag and tied at the top. Then, with the fan off, agitate the filter bag vigorously by beating and shaking to loosen the dust particles from inside and outside the filter bag. Plastic bag must then be removed, tied and disposed of. Dust inside the filter bag will settle to the bottom. These bags can be used indefinitely by properly cleaning but it is recommended they be replaced after three years normal use.

(7) Ducts shall be checked by use of flashlight or other means to assure they are not plugged.

(8) Room exhausts and wall fans shall be checked for proper rotation of fan and to assure guards or grids are not blocked with trash.

(9) Exhausts and vents shall be checked periodically to assure they are exhausting into unoccupied areas.

c. Approved dust masks shall be used as specified in Safety Rules and inspected monthly.

d. Personnel should be thoroughly trained in how to properly fit the masks or respirators to the face as per the manufacturer's recommendations.

Responsibility - It is the responsibility of the area supervisor in whose area dust collection systems are located to see that they are inspected and recorded on IBM cards according to this procedure.

SUMMARY

Old Hickory has attempted to pool present knowledge of the asbestos dust problem with the information obtained from on-plant sampling to do the following: (1) clarify the differences between level identification - MPPCF and fibers/ML; (2) determine realistic TLV; (3) identify jobs and materials exceeding TLV; (4) reduce exposure by specifying equipment modifications or additions, changes in job procedures and use of suitable respirators where levels cannot be lowered sufficiently.

The recommendations contained in this report are based on analysis of the problems imposed on the only groups of people in the Old Hickory plant site routinely exposed to asbestos dust - the pipe insulators. Other job classes and other plant sites may have particular problems which go beyond Old Hickory's considerations

Asbestos dust hazards can obviously be greatly minimized by controlling exposure concentrations to safe levels. Old Hickory's selection of a safe level is equivalent to 20% of the present recognized industry standard. Further, it is believed that the best way to obtain this level is to control it at the source, thereby reducing the instances where respirators are needed.

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