

KELLY-MOORE PAINTS, INCORPORATED

San Carlos, California

EVALUATION OF AIRBORNE ASBESTOS

On July 7, 1972 filter paper samples were collected at selected locations in the manufacturing areas of the plant to be analyzed for airborne asbestos concentrations. The samples were analyzed using a phase contrast microscope.

The writer was accompanied by Mr. R. E. McDowell, Senior Loss Prevention Representative of our San Francisco, California office.

CONCLUSIONS

1. Our sample results indicate that airborne asbestos concentrations are well above the emergency standard of five fibers of asbestos greater than five microns in length per milliliter of air. This standard is based on an eight hour per day exposure and with the exception of the sample collected ten feet from the ready-mix operation in the general room area all samples were collected during a period when you would expect the highest concentrations. However, the ceiling value for airborne concentrations of asbestos was exceeded in most cases. It should also be pointed out that the threshold limit value for asbestos dust will be lowered to two fibers greater than five microns in length per milliliter of air by 1976.
2. There is a definite need for additional engineering controls for asbestos dust.

RECOMMENDATIONS

1. Explore the possibility of finding a suitable and less toxic substitute for asbestos in the various mixtures.
2. The exhaust ventilation hood now being used at the bag dumping station for the ready mix operation should be improved to provide an average face velocity of not less than 100 linear feet per minute.
3. Adequate local exhaust ventilation should be provided at the bag dump station for both the ceiling texture and dry topping operations.
4. All unnecessary openings in bucket elevators should be enclosed.
5. The bucket elevators should be properly exhaust ventilated.

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6. The exhaust ventilation at the bagging operation for the ceiling texture should be improved to provide a capture velocity of not less than 100 linear feet per minute at the source of airborne dust contamination. This would also apply to other bagging operations.
7. Until the asbestos concentrations are lowered to an acceptable level through engineering controls, the respiratory protection which is only worn while dumping should be worn by all employees at all times while working in this area.
8. Employees should be instructed not to "stomp" empty bags of asbestos. This practice was noted on several occasions during our visit.
9. Since normal plant traffic and work practices in this area can cause settled dust to become airborne, housekeeping will be an important part of your dust control program.
10. Consult with our medical department concerning special medical controls for employees exposed to excessive airborne asbestos concentrations.

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Industrial Hygienist
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DISCUSSION

I. THRESHOLD LIMIT VALUE AND TOXICOLOGY

While the present standard for permissible exposure to asbestos fibers in air is five fibers greater than five microns in length per milliliter of air for an eight hour work day, this value is being reduced to two fibers per milliliter for an eight hour exposure by 1976. In view of this impending change, our conclusions are based on a two fibers per milliliter standard. However due to the high toxicity of asbestos, it is suggested that all concentrations be kept as near zero as possible.

Asbestos is a generic term applying to a number of mineral silicates not combustible in air, and separable into filaments. The most widely used in industry is Chrysotile, which is a magnesium silicate derived from serpentine. Other types include Amosite which is iron magnesium silicate; Crocidolite, a sodium iron silicate; Tremolite, a calcium silicate; and Anthrophyllite, also an iron magnesium silicate. That exposure to the various forms of asbestos is associated with the development of a potentially disabling respiratory disease or pneumoconiosis in man has been demonstrated by industrial experience in the asbestos industry.

Experimentally it has been shown that very short fibers produce the same tissue reaction as an inert dust and that long fibers produce fibrous tissue reaction in the lungs, specifically the development of peribronchiolar fibrosis.

More recently, evidence indicating asbestos fibers in the development of mesothelioma, a form of cancer, has been introduced. While the emergency standard of five fibers per milliliter is at present based upon exposure to fibrosis, we should nonetheless take into account the fact that exposures to even small quantities of asbestos fibers over a short period of time may lead to the development of mesothelioma in a certain percentage of the exposed workers. For this reason, there is now proposed an emergency standard of two fibers per milliliter and it is imperative that exposures to asbestos fibers of the longer fiber variety be kept to an absolute minimum.

II. DUST CONTROL

Methods for the control of dust can be divided into three major groups according to the manner in which the control is secured. These groups are elimination of the sources of dust, prevention of the dispersion of dust at its source, and the use of individual protection.

These methods of attack differ basically. The objective of the first is to stop the production of dust entirely; in the second, to the contrary, production of dust continues but is suppressed at its source and protection is insured only as long as the control equipment continues in effective operation. The third method is not actually one of dust control, but is directed toward the individual whose protection disappears when the protective equipment is not in use.

The latter two of these controls will have the greatest application at your plant

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A. EXHAUST VENTILATION

Local exhaust ventilation is one of the most important single methods of controlling industrial atmospheric contamination. However, the system must be properly designed, balanced and maintained if it is to produce the desired results. If you decide to contract out the installation of your exhaust ventilation system you should require written performance specifications from your contractor. However, if you are planning to do any of your ventilation work yourself (including maintenance), you should obtain a copy of "Industrial Ventilation - A Manual of Recommended Practice" by writing to the following address:

American Conference of Governmental Industrial Hygienists
Committee on Industrial Ventilation
P. O. Box 453
Lansing, Michigan 48902

The price of this publication in its 12th edition is \$5.00 per copy.

Additional or improved local exhaust ventilation is needed at the following locations:

1. A small open-faced hood is now being used at the ready-mix dump station as a source of local exhaust ventilation. Our observations and sample results indicate that this hood is not doing an acceptable job of keeping airborne asbestos out of the breathing zone of the operators. It is suggested that the exhaust ventilation be improved to provide an average face velocity of not less than 100 linear feet per minute.
2. The dump stations for the dry topping and ceiling texture operations are also significant sources of airborne asbestos. The dry topping dump station has been provided with a small exhaust slot at the rear of the hopper opening. Since the dry topping operation was shut down during our survey we had to simulate the exposure by dumping only the asbestos into the hopper. Our sample results indicate that the exhaust is not providing the desired results. The dump station for the ceiling texture operation has not been provided with any exhaust ventilation at all.

It is suggested that both of the above mentioned operations be provided with adequate local exhaust ventilation. Attached to this report is a drawing which illustrates one effective method of exhaust ventilating a bin or hopper dump station. This can be adapted to your operation.

3. Bucket elevators can be a significant source of airborne contamination if they are not adequately sealed and exhaust ventilated. Consequently, it is suggested that all unnecessary openings in your bucket elevators be enclosed and that the bucket elevators be provided with adequate local exhaust ventilation. Attached to this report are drawings and specifications which illustrate one method of accomplishing this.

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4. As indicated previously, the bagger operators are exposed to excessive dust concentrations. Consequently it is suggested that local exhaust ventilation be installed that provides a capture velocity of not less than 100 linear feet per minute at the point of dust generation. Attached are drawings which illustrate methods of exhaust ventilating bagging operations.

B. SUBSTITUTION

During our visit we discussed the possibility of finding a suitable and less toxic substitute for asbestos. It was indicated that at the present time there is no known suitable substitute. However, it is suggested that you continue with your efforts to find a suitable substitute.

C. RESPIRATORY PROTECTION

Bureau of Mines-approved respiratory protection was being worn by those employees who dump ingredients into the mixers. However, this respiratory protection is removed immediately after the ingredients have been dumped. Also, none of the employees working the general working areas of the plant were wearing respiratory protection. Our sample results indicate that all employees in the department should use respiratory protection until the asbestos concentrations are reduced to acceptable levels through engineering controls.

D. WORK METHODS AND HOUSEKEEPING

Employees should be instructed to handle asbestos as they would any other highly toxic material. To exemplify this, employees were noted "stomping" empty bags of asbestos causing asbestos to bellow out of the opening. In other cases considerable buildups of settled dust were noted on equipment, structural members, etc. Normal plant traffic can cause this settled dust to become airborne. With these two points in mind, it is suggested that employees be instructed to handle asbestos as the highly toxic material that it is and the housekeeping should be improved.

E. MEDICAL CONTROLS

There are special medical controls necessary for those employees exposed to excessive asbestos in air concentrations. If you have questions concerning the medical controls necessary for asbestos exposures, it is suggested that you make arrangements to consult with our medical department.

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DATA

RESULTS OF: Asbestos in air

METHOD OF SAMPLING: Millipore filter papers

METHOD OF ANALYSIS: Phase contrast microscope

CURRENT STANDARD FOR ASBESTOS: Five fibers of asbestos greater than five microns in length per milliliter of air

PROPOSED EMERGENCY STANDARD: Two fibers of asbestos greater than five microns in length per milliliter of air

SAMPLE #	LOCATION	RESULTS (FIBERS PER MILLILITER)
43B	Operator's breathing zone (OEZ) at bag dump station for ready-mix operation	*30.0
22D	OEZ on platform where bags of raw materials are dumped into mixture for ceiling texture operation	7.1
19D	OEZ at bagging operation for ceiling texture	**THTC
85D	OEZ on platform where materials are dumped into dry topping mixture (simulated situation)	7.7
24D	Breathing zone level in general room area ten feet from ready-mix operation	6.1

*This is an approximate figure since the sample was so heavy it could not be counted accurately.

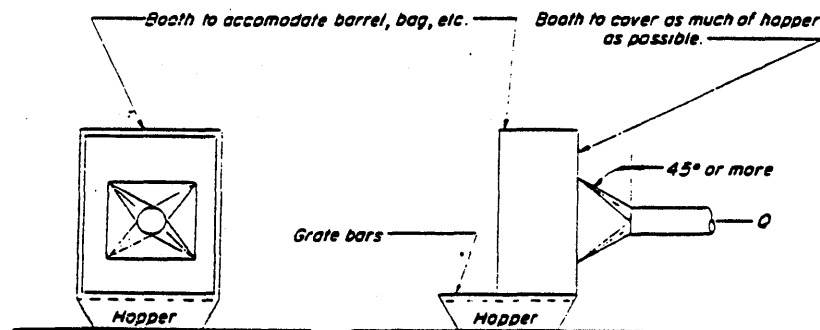
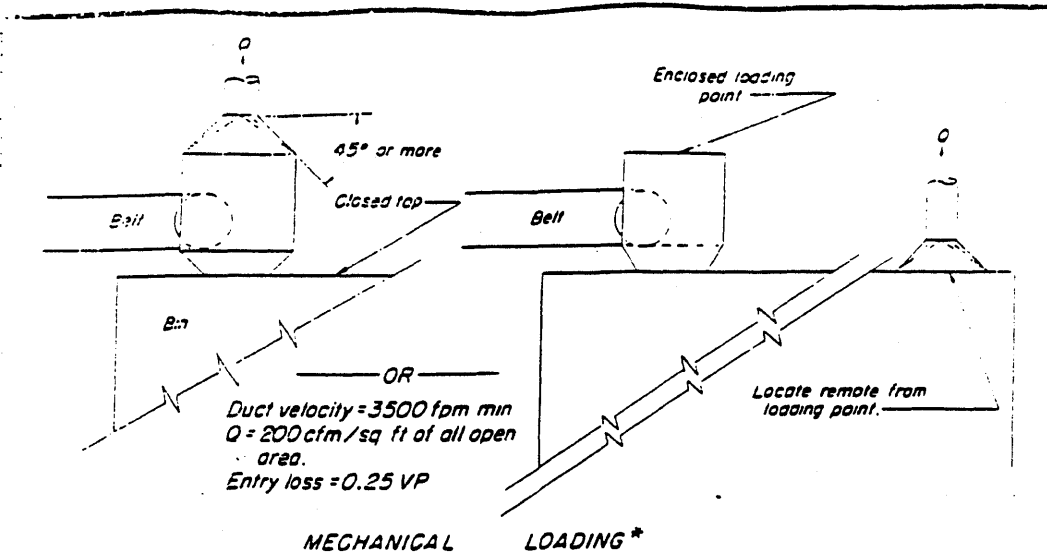
**THTC is an abbreviation for the words "Too Heavy To Count". This means that the sample had too many fibers in it to get even an approximate figure.

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SPECIFIC OPERATIONS

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*BELT SPEED	VOLUME
Less than 200 fpm -	350 cfm/ft of belt width. Not less than 150 cfm/ft of opening.
Over 200 fpm -	500 cfm/ft of belt width. Not less than 200 cfm/ft of opening.

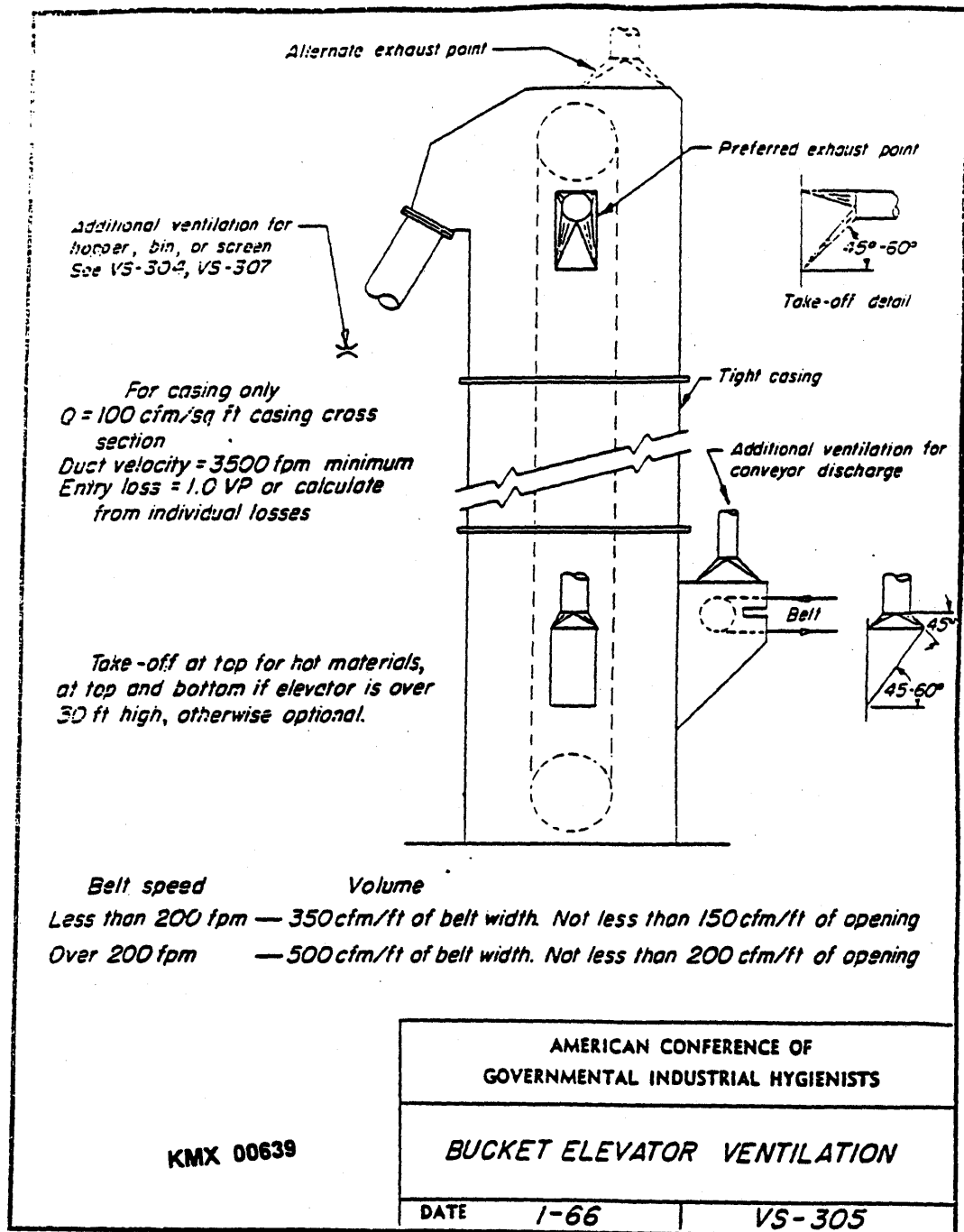
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BIN & HOPPER VENTILATION

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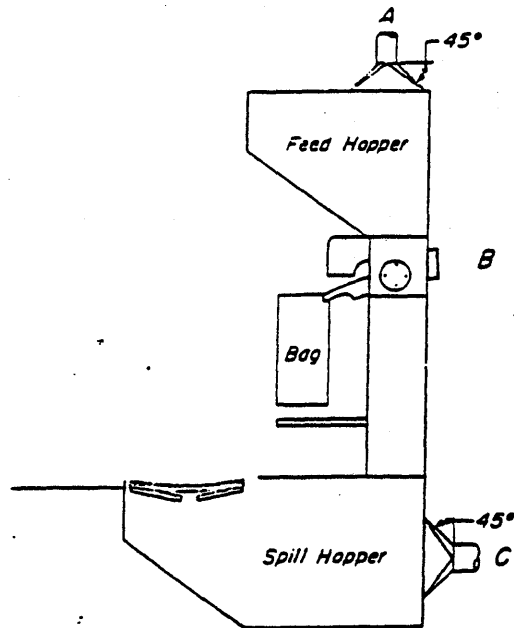
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$Q = 500 \text{ cfm/filling tube}$
 $= 500 \text{ cfm at Feed Hopper}$
 $= 950 \text{ cfm at Spill Hopper}$
 Duct velocity = 3500 fpm minimum
 Branch entry loss = 0.25 VP (A & C)
 $= 1.00 \text{ VP at open end (B)}$

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BAG TUBE PACKER

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