PERSONAL AND CONFIDENTIAL

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TO: R. M. Vining (#1)

DATE: March 3, 1969

FROM: R. E. Schneider

SUBJECT: Insitu and Environmental Dust Control for Vermiculite Mining and Expanding Operations

cc: R. W. Sterrett (#2)
John F. Murphy (#3)
H. A. Brown (#4)
W. R. Wright (#5)
O. F. Stewart - Travelers Rest (#6)
E. D. Lovick - Libby (#7)
R. J. Kujawa - Libby (#8)
Peter Kostic (#9)
F. W. Eaton (#10)

PLAINTIFF'S EXHIBIT WRG-1307

The attached report on dust control for vermiculite mining and expanding operations authored by Messrs. F. W. Eaton, R. J. Kujawa and P. Kostic is the result of their initial studies of the dust control problems of the Zonolite operations.

The inclination of public agencies to protect the worker at any expense (usually the employer's) seems to be a firmly entrenched political phenomenon which should be of considerable concern to us. Our recent experience at Libby, viewed in light of this public policy, may well create for us a significant financial liability. We also should be concerned with the obligation to our employees; namely, permitting them to perform their services under working conditions which we have good reason to believe are hazardous.

The report recommends testing and monitoring procedures with an expenditure of some $423,000 (admittedly a guess estimate) and indicates a continuing monitoring cost of approximately $14,000 per year. I estimate the maintenance costs of the additional capital equipment at approximately 5%, or $20,200 per year.

I would suggest you read the attached copy of an article from the October 12, 1968 issue of THE NEW YORKER Magazine. This kind of publicity cannot help but engender sympathy for anyone working under conditions such as those present in our Zonolite operation. I do not believe we should ignore the possibility we may be subjected to substantial financial liability over the next few years. As we continue to gather information as to the potential hazards at Libby and elsewhere in Zonolite, we must be concerned about our moral obligation to our employees. Current evidence dictates that we must take prompt action.

It is my recommendation that authorization be granted to proceed with the program outlined in the report.

R. E. Schneider

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Attachments

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INSITU AND ENVIRONMENTAL DUST CONTROLS FOR VERMICULITE MINING AND EXPANDING OPERATIONS

By: F. W. Eaton
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INSITU AND ENVIRONMENTAL DUST CONTROLS FOR VERMICULITE MINING AND EXPANDING OPERATIONS

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I. INTRODUCTION

A. Problem

Vermiculite mined at Libby contains about 3% tremolite, a type of asbestos. Laboratory analysis of six air samples collected at the dry mill in July of last year showed tremolite content of the dust to range between 12% and 23%.

Employing the widely used impinger method of sampling and counting, the currently recognized threshold limit value (maximum allowable concentration) for asbestos is 5 million particles per cubic foot of air (5mppcf). This has been established by the American Conference of Governmental Industrial Hygienists, the recognized authority in these matters. The majority of samples at Libby, collected by Libby personnel on a monthly basis, have shown counts well in excess of the 5 million limit. The average of twenty-one air samples collected during the months of September, October and November of last year was 8.5 mppcf, with one unusual high of 22 mppcf. Of 34 samples collected by R. D. Hindmarch of Johns-Manville (JM) in the dry mill in July of last year, 11 exceeded the threshold limit. Four out of seven samples collected by J. R. Lynch of (HEW) The U. S. Department of Health, Education & Welfare, in June of 1968 showed counts well in excess of the 5 mppcf threshold.

Under a more recently developed method of sampling and counting, the membrane filter method, the recognized Threshold Limit Value (TLV) is 12 fibers longer than 5 microns per cubic centimeter. Lynch had also employed this method during his visit in June, 1968 and concluded that six of the eight samples collected in the dry mill showed counts well in excess of the limit. Lynch used the same method in February of 1967 and found that all seven samples collected showed counts far exceeding the limit. Samplings of air inside the cabs of dump trucks by Hindmarch and Lynch showed also that dust counts exceeded the established limit and that truck drivers are similarly exposed to pneumoconiosis (disease of the lungs caused by habitual inhalation of mineral or metallic particles).

B. Controls

At the present time, air is sampled on all floors of the dry mill at Libby and dust particles are counted by Libby personnel on a monthly basis; the impinger method of sampling is employed. Utilizing this method, all dust particles are counted, since it is not possible to differentiate between asbestos particles and other particles. As previously mentioned, the present threshold limit value for asbestos dust and for mixed dusts containing asbestos is 5 mppcf. This year, a tentative 2 mppcf value has been established and after two years, unless there is good reason why such value is impractical, the 2 million count will stand.

Utilizing the more recently developed membrane filter method, only asbestos fibers are counted and as previously mentioned, the threshold limit value has been established as 12 fibers longer than 5 microns per cubic centimeter.

Because our primary concern is tremolite and the membrane filter membrane enables one to identify asbestos fibers, we should change over to this method of sampling. This will involve purchase of the necessary equipment and training of one or more Libby personnel. This method requires somewhat greater skill than the impinger method. Since the same ore mined and processed at Libby is expanded at most of our vermiculite expanding plants, employees at these plants are exposed to the same toxic dust.

Little or no dust surveys have been done in the past. A program of air sampling and fiber counting at these plants is also essential. Our goal should be to reduce the asbestos fiber count to the established threshold limit value of 12 fibers greater than 5 microns per cubic centimeter and to maintain this maximum.

II. VISIT TO JOHNS-MANVILLE LOMPOC, CALIFORNIA MINE AND MILL

Through the efforts of Peter Kostic, representatives of Dewey and Almy and Zonolite were invited to visit the Johns-Manville Celite operation at Lompoc, California. The Lompoc mill closely resembles our dry mill at Libby as far as operation equipment, and dust control is concerned. In view of our concern over dust controls at the mill and expanding plants, it was felt the visit to Lompoc would aid us in formulating a program of corrective action.

The visit to JM's mine and mill was on November 19, 1968. The following people were present:

Dewey and Almy/Zonolite

R. E. Schneider	Cambridge
P. Kostic	Cambridge
F. W. Eaton	Cambridge
R. J. Kujawa	Libby

Johns-Manville

G. G. Schuknecht	Plant Manager
C. A. Carlson	Manager of Plant Engineering

A. General

As one of the leaders in industrial environmental health, JM started in the early fifties to build into its Lompoc Celite operation dust control equipment and limit values that would insure an environment that is not injurious to personnel. Over the past 15 to 20 years $3 million has been spent only on dust controls at the mine and mill. JM is of the opinion that dust controls are an integral part of the operating process, not something else or something extra. This was very evident during our tour by the lack of dust-laden air, excellent housekeeping, and good condition of all facilities.

The material mined has a silica content ranging in particle size from 1 to 25 microns. Although the California State Health Department has established a TLV of 20 mppcf, JM's TLV is 5 mppcf. Throughout the mine and mill there are 147 audit sections where air is sampled semi-annually.

B. Mine

The mine consists of 5,400 acres of which 700 acres is leased. As a strip mine operating one shift per day, they have sufficient capacity (6 million bank yards per year) to supply the mills three-shift operation. The forty-man crew, including 4 maintenance men, operate 18 dirt haulers, 2 water wagons (two-shift operation), 2 loaders, 1 shovel, and approximately 4 bulldozers. The loaders handle 1,200 yards per hour with approximately 45 second load time per hauler and the shovel rate is 350 yards per hour. Hauler capacity ranges from 28 to 44 bank yards. Ore is mined at several sites and deposited in several glory holes in one location. The glory holes are located above a 200 foot tunnel where the various ore grades are dumped into 12 cubic yard skip cars for transportation to the mill.

Dust control, safety, preventive maintenance, and efficiency get the same attention at the mine as at the mill.

1. Dust Control

Each vehicle (hauler, loaders, bulldozers) has its operating cab sealed airtight and equipped with a self-contained filter air supply unit. The air unit, approximately 2'x2'x3', is driven by a 1/8 h.p. DC motor and supplies 200 cfm of air at 1/8" H20 pressure. Air is filtered through an oil filter and cloth filter before it is discharged into the cab. On most vehicles the air unit is located in the cab, right side, but on bulldozers the unit is located on the cab roof. Maximum dust count in the cab is between 1 and 2 mppcf.

Each day primary and secondary filters are removed from each vehicle and cleaned. There is a separate filter shed where one full-time maintenance man steam cleans and resaturates oil filters and recovers the cloth filters. Two water wagons operate on the first shift and one on the second shift watering down all roadways and mining areas where there is a possibility of dust being created by moving vehicles.

The air supply units installed in the mine vehicles were designed and manufactured by JM at Lompoc at a cost of $2,000. A complete set of drawings on this air unit have been received by Peter Kostic and Ray Kujawa.

2. Preventive Maintenance

It was very obvious that preventive maintenance pays off at Lompoc since we saw no mine equipment down and only one piece of equipment down in the mill. (The piece of equipment that was down in the mill was being started up after routine maintenance. They were experiencing trouble during start-up but it was noted that all necessary crafts-mechanics, electricians, etc. were on hand.) The mine maintenance crew performs daily Preventive Maintenance (PM) lubrication and service checks as per planned PM schedules. Major overhaul and PM checks such as 500 and 1,000 hour checks are done in the main maintenance shop.

3. Safety

The last lost-time accident at the mine was June, 1948. This record should speak for itself.

4. Production Efficiency

At the mine there is group incentive on loading, hauling, and dumping. Standards are checked and revised periodically if necessary by an industrial engineer. It was quite obvious from the activity that there is excellent team work.

To minimize downtime for lunch and provide clean eating facilities, there are four lunch trailers spotted throughout the mine area.

C. Mill

1. General

Since the mill operation at Lompoc is similar to Libby and Enoree, no description of the mill facilities other than dust control will be mentioned.

As mentioned in Section B, ore is dumped from the glory holes into one of eight 12 cubic yard skip cars in the 200 foot tunnel.

While loading cars, the tunnel is sealed off on the west end by automatic operating doors. To prevent a dust condition in the tunnel where the person loading cars is stationed, air at the rate of 60,000 cfm is blown into the shaft from west to east keeping dust always away from the operator. The transfer car is sealed and air filtered with an air supply unit similar to those installed in the mine vehicles.

The total installed dust collecting capacity, not including product collection, is between 200,000 and 250,000 cfm. With the exception of exhaust from the main kiln driers, dust collection is by means of cyclones and bag houses. Exhaust from the kilns passes through various phases of mechanical collection and is discharged through abandoned glory holes at approximately 98% efficiency to the top of the mine.

JM has found that commercial enclosed bag houses are costly to maintain and are not as effective as the air reversal, open bag house. For this operation the cloth to air ratio of 1/2 cfm to 1 square foot is the most effective. Cotton bags are used for ambient temperature and orlon for higher temperatures.

Considerable design goes into each dust collection system, and through the years specific air flows and face velocities have been established for different phases of dust collection. In all cases where dust is removed from spaces such as hoods, the face velocity is 300 to 400 feet per minute. The material used to fabricate cyclones, ducts, etc. in most cases is mild steel. Where there are high temperatures and corrosive fumes involved, the equipment is brick lined. Cor-ten is used on fan housings. Other materials are under investigation but little use is made of stainless steel.

2. Vacuum System

A vacuum system with detachable hose outlets is installed throughout the mill. The total number of outlets or installed cfm is not known, but nowhere in the mill was there any accumulation of dust on the floor, equipment or structural members. Each man is responsible for keeping his area clean and this is done as part of his primary job. All cleaning is done by vacuum; the use of dust promoting brooms is discouraged.

3. Bagging Operation

Bagging is done in two areas and the number of bag packers per man varies from one to four. Dust control in each area is basically the same. The bag packers are similar to the St. Regis screw fed valve bag packer. The total air removed at the packer is 2,500 cfm with 1,000 cfm at the packer nozzle and 1,500 cfm from around bag sides. The dust is passed through cyclones and into an open bag house. One bag house supplying two packers and one bag cleaner, consisted of 56 bags, 50 feet long and approximately 8 inches OD. After the bag is packed it is placed on a conveyor and passed through an enclosure that flattens the bag and brushes all surfaces clean. In another area the bags are cleaned in a similar manner but air removal and flattening is done by loading bags on a pallet elevator. When the pallet is full the ram is raised against the overhead plate to compress loaded pallets. Average bulk density of the Lompoc product is 7 lbs. per cubic foot.

4. Bulk Loading

Box cars are bulk loaded inside a warehouse approximately 1,200 feet long. Loading and exhausting of the cars is by an installed air handling system. There are two or three bins containing sections of 3 inch supply and 6 inch exhaust hose, plus necessary adaptors that are transported by fork truck to the box car to be loaded.

The cars are completely sealed except for the doors when received. At the warehouse the sliding door is sealed with cardboard, joints taped, and a slot cut in the top to receive the exhaust hose adaptor duct. The 3 inch feed hoses are attached to each end of the car and tied into the main bulk loading pipe network. The 6 inch exhaust hose is attached to the car adaptor and the other end to the main exhaust system. This exhaust system is similar to all others in that it consists of the cyclone and bag house.

In the loading operation, product feeds by gravity into one of two 8 cubic foot (approximate) containers. When the container is full it is pressurized and conveyed to the car. Conveying air is 300 cfm.

5. Personnel Cleaning Stations

Located at strategic locations throughout the mill are seven personnel cleaning stations. These consist of a 3 foot diameter by 6 foot high booth with a grill floor. Attached to the bottom of the booth is a 1,000 cfm blower that discharges to a commercial enclosed bag dust collector. In the booth is a 1 inch hose with nozzle for either blowing or vacuuming dust from clothing.

D. Training

An interesting sideline to this tour which has a definite bearing on maintenance, dust control, efficiency, personnel relations, etc. is training. Due to the shortage of skilled operators and craftsmen, JM's Celite plant undertook a two-year project to establish a training program for their operators.

In the Maintenance Department there are five grades in each craft classification. In addition to on-the-job training, there are approximately 60 hours of classroom training from the lowest grade to the top grade. Once a person has completed the necessary time and training requirements successfully, he is regraded and paid the higher rate even though he does not perform the work in the next higher grade. Therefore, it is possible under JM's plan to receive top money but perform lesser duties.

III. PROGRAM FOR ESTABLISHING REQUIRED CHANGES

A. Monitoring

1. Personnel

Dust monitoring at Libby is done by an Engineering Department technician on a monthly basis. He should continue to do the monitoring there.

Monitoring at our expanding plants throughout the country will be conducted by Cambridge Engineering. Cambridge Engineering will also do occasional spot checking at Libby for purposes of evaluating the efficiency of the monitoring equipment and the techniques involved.

2. Type Test and Equipment

The dust at Libby and the expanding plants is a mixed dust. Utilizing the impinger method of sampling and counting, the method currently employed at Libby, all particles up to 10 microns are counted. No differentiation is made between harmful asbestos fibers and the so-called nuisance dust particles.

Since our prime concern is tremolite asbestos, we should switch over to the more recently developed filter membrane method of monitoring. It will be necessary then to provide Libby and Cambridge Engineering with the necessary sampling equipment, microscope and necessary laboratory equipment.

Supervisory personnel of JM's Environmental Control Department are soon to undergo a course of training by the U. S. Department of Health, Education and Welfare in the new sampling and counting technique. After they have completed the course they will train their own staff of industrial hygienists, hopefully after March 1, 1969. They have agreed to include our personnel in the program of training.

3. Frequency of Monitoring

Monitoring at the mine and mill should be continued on a monthly basis until such time as the threshold limit is reached.

Then, for six months, it should be done every other month. After that, if the threshold limit is maintained, monitoring should be done on a quarterly basis.

The air at all expanding plants should be sampled and evaluated as quickly as possible. At those plants where mechanical ventilation appears adequate, housekeeping is satisfactory and fiber counts are below acceptable limits, monitoring should be done on an annual basis. At those plants where these provisions are not met, monitoring should be done immediately after corrective action is undertaken, and then, after proper dust controls are established, on an annual basis.

Samplings will also have to be done after major repairs, replacements, etc. of ventilating equipment.

B. Control Measures

At this phase of the dust control study it is not possible to arrive at firm plans, recommendations, or costs for the mills and expanding plants. Detailed investigations will have to be made in each area.

1. Libby Mine

(a) Recommend increased use of the road oiling system during dry seasons to control dust on roadways. A water wagon has not been used for several years. Greater emphasis should be placed on the use of road oil of the type now used.

(b) The only other possible recommendation is to install filter units similar to JM's in each vehicle if the established TLV cannot be maintained. Filter units will probably be required on equipment since working area roads, close to shovels, cannot be oiled.

2. Libby Mill

(a) Evaluate total requirement for the mills and transfer points. Points to be covered are optimum face velocities of hoods, total CFM, hood design and dust collection equipment (cyclones, bag houses, scrubbers, etc.).

(b) Evaluate present equipment to determine its capabilities, capacities and how it can be corrected or modified to meet required results.

(c) Final recommendation and costs of new or modified equipment including necessary maintenance to meet the established dust TLV.

3. Expanding Plants

(a) Initially, design data on air flow will have to be supplied by Travelers Rest Engineering including any information on earlier furnaces if the air flow differs from the present. With this information one of the newer furnaces, such as Kearney, will be checked out using a velometer to determine actual air flows. If the "model furnace" does not operate as designed or if the design is not adequate, recommendations will be made for corrective action.

(b) With data from Engineering and the "model furnace", each expanding plant will be surveyed starting with those plants with the more serious dust problem.

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(c) Recommendations and cost estimates will be made to up-grade each plant.

(d) In those plants manufacturing Mono-Kote, Engineering will be investigating the manufacturing process and equipment, including adequate dust collection.

C. Costs

An estimate of the costs of this program may be presented as follows:

1. Monitoring Equipment and Training

a. Test Equipment for Two Stations @ $1,750 ea.		$ 3,500
b. Two Personnel Air Samplers @ $150 ea.		300
c. Training (5 people)		1,500
	TOTAL	$ 5,300

2. Monitoring

a. Mining Operations		
(1) Initial		$ 5,000
(2) Continuing @ $1,500/year		
b. Expanding Plants		
(1) Initial		$ 8,000
(2) Continuing @ $8,000/year		
	TOTAL	$ 13,000

3. Equipment Installation

a. Libby Mill		
(1) Purchase & Fabrication of Equipment		$ 75,000
(2) Installation		25,000
(3) Engineering (including travel)		15,000
	TOTAL	$115,000

b. Expanding Plants

(1)	New Ventilation Systems, 15 Furnaces @ $6,500 ea.	$ 97,500
(2)	Ventilation System Repairs, 15 Furnaces @ $2,800 ea.	42,000
(3)	Mono-Kote Manufacturing, 18 Systems @ $6,000 ea.	108,000
(4)	Engineering (including travel)	42,500
(5)	Continuing Engineering Costs $4,500/year	
	TOTAL	$290,000

Estimated Program Costs $423,300

Estimated Continuing Costs:

Monitoring $9,500/year

Engineering $4,500/year

Maintenance $20,200/year

Total Continuing Costs $ 34,200

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