JOHNS-MANVILLE
RESEARCH & ENGINEERING CENTER
P. O. BOX 159 • MANVILLE, N. J. 08835 • TELEPHONE: 722-9000 • AREA CODE 201

April 16, 1969

Mr. Peter Kostic
Safety Administrator
Dewey & Almy Chemical Division
W. R. Grace & Co.
62 Whittemore Ave.
Cambridge, Mass. 02140

Dear Pete:

Attached is a copy of the report issued by the State of California Department of Public Health concerning an industrial hygiene survey they made at the Beverly Hills High School construction site. During this survey they studied the application of your fire retardant material "Monocote" to structural "I" beams.

I would appreciate if you would call me with your comments, after you have had a chance to read this report.

Very truly yours,

Edmund M. Fenner, Director
Environmental Control

EMF/ems

Attach.

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

RONALD REAGAN, Governor

DEPARTMENT OF PUBLIC HEALTH
Bureau of Occupational Health
1449 Temple St., Suite 106
Los Angeles, California 90026

November 22, 1968

California Zonolite Company
758 Colorado Boulevard
Los Angeles, California 90041

Dear Sirs:

Enclosed is a copy of the report of our industrial hygiene study of exposures to asbestos dust at the Beverly Hills High School construction site. This study was made at the request of the California Division of Industrial Safety.

The operation studied involved the application of a cementitious fire retardant material, Monocote(R), to structural "I" beams by means of a pneumatic plaster gun assembly. Atmospheric concentrations of asbestos-containing dust were found to be low on a count basis. However, on a weight basis, exposures were found to exceed our suggested Threshold Limit Value for asbestos dust.

Therefore, because of the added carcinogenic properties of asbestos, recommendations for additional personal protection are offered in this report.

We wish to thank Messrs. Ray Rothfelder and Doyle D. Nigh for their cooperation during the conduct of this study.

Very truly yours,

Thomas H. Milby, M.D., Chief
Bureau of Occupational Health

H. P. Blejer, M.D., D.I.H.
Hector P. Blejer, M.D., D.I.H.
Medical Officer

HPB/ld
enc.

STATE OF CALIFORNIA—HEALTH AND WELFARE AGENCY

RONALD [illegible]

DEPARTMENT OF PUBLIC HEALTH

1449 Temple Street, #106
Los Angeles, California 90026

01067A/F

Report of an Industrial Hygiene Study at

Beverly Hills High School
241 South Moreno Drive
Beverly Hills, California

Study No. : S-2058
Report date: November 22, 1968

Study requested by: California Department of Industrial Relations
Division of Industrial Safety

Study conducted by: California Department of Public Health
Bureau of Occupational Health & Environmental Epidemiology
Mr. Paul E. Caplan, Industrial Hygiene Engineer

Los Angeles County Health Department
Division of Occupational Health
Mr. Mark Bent, Industrial Hygienist

and

California Department of Industrial Relations
Division of Industrial Safety
Mr. Jerome Eisen, Industrial Hygiene Engineer

in company with

CaliforniaZonolite Company
Mr. Ray Rothfelder and
Mr. Doyle D. Nigh

California Division of Industrial Safety
Mr. John A. Elliott, Safety Engineer

and

Orange County Plastering Association
Mr. Ed Rademacher

Summary

On September 12, 1968, an industrial hygiene study of exposures to asbestos dust was conducted at the building construction site of the Beverly Hills High School. The operations studied involved the application of a cementitious fire resistant material, Monocote(R), to structural beams by means of a plaster gun assembly. Relative to the pulmonary fibrosis hazard, atmospheric concentrations of asbestos-containing dust were found to be low. However, because of the added carcinogenic properties of asbestos, recommendations for additional personal protection are offered in this report.

General Operations

At this new high school building construction site, a fire-proofing material, Monocote(R), manufactured by the California Zonolite Company, was applied to structural "I" beams, as a wet slurry, by means of a pneumatic spray gun. During this application, the spray gun operator received an inhalation exposure to the cloud of dust and spray which bounced off the surface being coated. The spray contained a mixture of water, vermiculite, gypsum, and asbestos. The Monocote(R) mixture was formulated outside the building, by dumping several bags of the dry mix into the hopper of a mixer, adding water and then mixing. In turn, the resultant slurry was pumped under pressure through a hose to the point of application.

Sampling Procedures

Work atmospheric exposures to the Monocote(R) mixture were evaluated by collecting air samples simultaneously by 2 different methods: with all-glass midget impingers and with high volume filter paper samplers. The impinger samples were analyzed for dust concentration by count, using the Standard light-field technique, recommended by the American Conference of Governmental Hygienists(1) (ACGIH). High volume samples were analyzed by weight, by gravimetric techniques. All samples were taken at the operator's breathing zone during 2 different normal work procedures: indoor spray application and outdoor batch mixing.

Material samples of dry Monocote(R) mixture and wet slurry were collected directly from a bag and from the discharge of the pneumatic spray gun, respectively. These were analyzed for asbestos content by the X-ray diffraction technique in the Air and Industrial Hygiene Laboratory of the State Department of Public Health.

Analytical Results

Chemical analyses results of material samples are shown in Table I.

Study No. S-2058

TABLE I

Composition of Material Samples

No.	Location and Type of Sample	Asbestos content - %	Remarks
1	Dry mix, directly from bag of "Monocote"	11	Close to "stated" composition of California Zonolite Corp.
2	Wet slurry, directly from pneumatic spray gun	less than 1	Apparently, the presence of the asbestos is "masked" by the gypsum or vermiculite.

Results of the atmospheric samples, taken at the main construction site and at the hopper loader, are shown in Table II.

Toxicology and Hygienic Standards

Long, continued excessive inhalation and lung deposition of asbestos can result in a severe form of pneumoconiosis known as pulmonary asbestosis.[2,3,4] In it, the most marked damage is an irreversible scarring or fibrosis of the lung tissue; asbestos bodies being found there and also in the sputum. Advanced pulmonary asbestosis is a crippling and fatal disease. Relative to this dust's pneumoconiotic effects, the ACGIH has set a TLV* for asbestos of five million particles per cubic foot of air (mppcf). Recently, in addition to typical pulmonary asbestosis, it was established that bronchial carcinoma, pleural and peritoneal mesotheliomas (cancers of the lung and of the lining of the lungs and abdominal cavity, respectively) are also associated with exposures to certain kinds of asbestos dust. Even more recently, malignancies of other organs--ovaries and intestinal tract--have tentatively been similarly linked. In the 1968 "Transactions of the ACGIH"[1], attention is called to the very real probability that the TLV of 5 mppcf is inadequate to give complete working lifetime protection against all forms of asbestos-produced disease. Thus, the ACGIH now recommends a lower time-weighted

*Threshold Limit Value (TLV): As defined by the American Conference of Governmental Industrial Hygienists, the TLV refers to the time-weighted average airborne concentration of a substance, and represents conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. It should be used as a guide in the control of health hazards, and should not be regarded as a fine line between safe and dangerous concentrations.

TLV on a count basis of 2 mppcf, with a "Ceiling" TLV of 5 mppcf--the latter not to be exceeded ever for short periods of time. (Note: the exact dose-and-effect relationship relative to the cancerous effects of asbestos has not been determined yet. Currently, occupational hygienists, toxicologists and physicians continue their research to determine that relationship.)

For silica--another substance causing severe pneumoconiosis, but with no known carcinogenic effects--the ACGIH has set TLVs on a count and on a weight basis. For asbestos, however, no limit on a weight basis has been specifically suggested. Yet, such a weight-basis Hygienic Limit for asbestos is necessary due to the difficulty in identifying its fibers during microscopic counting. Asbestos fibers have unique physical and toxicological properties: they can subdivide almost ad infinitum, and, once inhaled, penetrate to the innermost pulmonary tissues and lining surfaces. As well, asbestos is fibrogenic and carcinogenic. A conservative view would be to consider asbestos at least as toxic as silica dust. Since weight-basis TLV for pure silica dust has been set at 0.3 milligram per cubic meter of air (mg/M^3), an appropriate weight-basis TLV for asbestos should--at least--also be 0.3 mg/M^3. This also takes into account the factor that any dust in which asbestos is identifiable should be considered as pure asbestos. (More than 5%).

Discussion and Recommendations

The results of air sampling in the main spray application area and the hopper loading area should be compared with the above mentioned TLVs. It will be observed that (1) by count, the average dust concentrations at both locations did not exceed the TLV of 2.0 mppcf, and that by weight, all of the dust concentrations exceeded the TLV of 0.3 mg/M^3. It appears, therefore, that exposures are sufficiently high to warrant control of the inhalation of large asbestos dust particles.

For the most effective control of this dust, respirators should be provided and worn; these respirators should be approved by the U.S. Bureau of Mines for protection against pneumoconiosis-producing dusts.

As mentioned, the exact dosage relationship between inhalation-exposure to asbestos and all forms of asbestos-produced disease is not known precisely, particularly so with respect to lung and other cancers. The conservative approach, therefore, would be to reduce all inhalation exposures to a practical minimum.

For this reason, we strongly recommend that any exposure to asbestos dust, both in hopper loading and in spray application, be minimized by the use of respirators approved by the U.S. Bureau of Mines for protection against pneumoconiosis producing dusts.

Report prepared by

Paul E. Caplan.

Paul E. Caplan
Sr. Industrial Hygiene Engineer

PEC/ld

1067F

Atmospheric Concentration of Monocote(R) Dust

Location	Operation	Atmos. Cont. mppcf(1)	Atmos. Cont. mg/M3(2)	Remarks
1.a. Inside bldg. on scaffold, 1 man	Applying Monocote by spray gun	1.0	2.8 & 6.2	OBZ(3) normal operation, nozzle at medium speed
b. Inside bldg. on scaffold, 1 man	Applying Monocote by spray gun	0.75 & 0.70	3.1 & 5.8	OBZ, normal operation, nozzle at medium speed
Av. exposure		0.8	4.5	
Peak exposure		1.0	6.2	
2. Outside bldg. by mixer hopper, 1 man	loading hopper with 4 batches of Monocote	0.7 & 1.4	1.4 & 9.9	OBZ, normal operation low wind condition
Av. exposure		1.2	5.7	
Peak exposure		1.4	9.9	
Hygienic Standards for Asbestos Dust (count basis)				
Threshold Limit Value(av.)(5)		2.0		
Threshold Limit Value (peak)(5)		5.0		
Suggested TLV (weight basis) (greater than 5% asbestos)			0.3	

(1) mppcf = million particles per cubic foot of air

(2) mg/M3 = milligram per cubic meter

(3) OBZ = Operator's breathing zone

1087E

S-2058

REFERENCES

1. Transactions of the National Conference of Governmental Industrial Hygienists, 1942.

2. Documentation of Threshold Limit Values, Rev. Edition. Committee on Threshold Limit Values, American Conference of Governmental Industrial Hygienists, 1961.

3. Hygienic Guide Series - Asbestos, American Industrial Hygiene Association.

4. Threshold Limit Values for 1968, Adopted at the 30th Annual Meeting of the American Conference of Governmental Industrial Hygienists. May 13, 1968.

5. Transactions of the 30th Annual Meeting of the American Conference of Governmental Industrial Hygienists, page 188. May 12-14, 1968.