~~Dick Robert~~

V, I;

United States Department of the Interior

BUREAU OF MINES
Denver Federal Center, Building 20
Denver, Colorado 80225

Health and Safety
Technical Support Center

January 28, 1972

Mr. F.H. Larrison, Resident Manager
Calidria Asbestos Plant
Union Carbide Corporation
Mining and Metals Division
Box K
King City, CA. 93930

RECEIVED
FEB 1972
UCC - CALIDRIA
KING CITY, CA.

Dear Mr. Larrison:

Enclosed is a report covering the asbestos dust (health) survey of October 4-6, 1971.

Thank you and members of your staff for cooperation during the survey.

Sincerely,

Glen W. Sutton

Glen W. Sutton
Chief, Denver Technical Support Center

cc: R.J. Kronkhyte, Maintenance Supt. and Safety Engineer

A 17952

UNITED STATES

DEPARTMENT OF THE INTERIOR

BUREAU OF MINES

HEALTH AND SAFETY TECHNICAL SUPPORT

HEALTH STUDY (ASBESTOS DUST)

CALIDRIA ASBESTOS PLANT
KING CITY OPERATION
UNION CARBIDE CORPORATION
KING CITY, MONTEREY COUNTY, CALIFORNIA

October 4-6, 1971

By

Walter Bank, Mining Engineer
Amin N. Alameddin, Mining Engineer
Kenneth L. High, Mining Engineer

Not mandatory — Recommended —
Tell state this is advisory - it's up to them to follow —

DENVER TECHNICAL SUPPORT CENTER

Mr. Glen W. Sutton
Chief

Originating Office
U. S. Bureau of Mines, Health and Safety
Technical Support Center
Denver Federal Center, Building 55
Denver, Colorado 80225

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Mine: Calidria Asbestos Plant I.D. No: 40013-00-04-027

Company: Union Carbide Corp. Underground __ Open Cut __
Mining and Metals Div.
Operated by: same as above

Survey by: Walter Bank, Amin Alameddin, and Ken High

Location: King City, Monterey County, California

Survey dates: October 4-6, 1971

DISTRIBUTION:

Company officials: F.H. Larrison, Resident Manager (3)
R.J. Kronkhyte, Maintenance Supt. and Safety Engineer

Assistant Director--Health and Safety Technical Support (2)

Assistant Director--Metal and Nonmetal Mine Health and Safety (2

Originating office: Technical Support Center, Denver, CO. (2)

State agencies: California Div. of Industrial Safety
Dept. of Industrial Relations
455 Golden Gate Ave.
San Francisco, CA. 94102
Attn: Walter Van Sandt (1), Edward Davies (1)
District Manager: Allan Look, Alameda, CA.
Subdistrict Mgr: Howard Poland, Alameda, CA.

Other: Ernie Piersol, Safety Director (2)
Mining and Metals Division
Union Carbide Corp.
P.O. Box 1049, Grand Junction, CO. 81501

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INTRODUCTION

This report is based on a study made pursuant to Section 5 of the Federal Metal and Nonmetal Mine Safety Act (80 Stat. 772, P.L. 89-577, 30 U.S.C. 721-740). The report supplements the Health and Safety Report dated September 20, 1971 prepared by J.L. Weddle of the Bureau's Alameda, California office.

GENERAL INFORMATION

The Calidria Asbestos Plant, King City operation of the Union Carbide Corporation, Mining and Metals Division, is located about 5 miles southerly from King City on Wild Horse Road about one mile from its interchange on U.S. Highway 101. The mailing address is Box K, King City, California. Mr. F.H. Larrison was Resident Manager and R.J. Kronkhyte was Maintenance Superintendent and Safety Engineer. Mr. Larrison accompanied the investigators during part of this study, and visual observations and provisional recommendations were discussed with him at the end of the sampling campaign.

Total mill employment consisted of 50 men as of October 5, 1971, the date of the survey. Production crews worked three 8-hour shifts, 5 days a week, and maintenance and distribution crews worked the day shift. There were 16 salaried employees. The mill went into production in 1963. The plant uses a wet milling process for the chrysotile asbestos and produces four types of material. The standard grade is bagged and shipped in perforated multiwall paper bags of 50 pounds (pellets), 40 pounds (open fiber) and 30 pounds (open fiber) capacity. The Super Standard is ground finer and is bagged in 30-pound bags. The High Purity asbestos, used for paper manufacture, is bagged into 50, 40, and 30-pound bags. The Resin Grade (a specialty product) is bagged in 10-pound bags provided with plastic outer sheaths. The product is transported by truck or by the Southern Pacific Railroad; however, it is never shipped in bulk. The asbestos is shipped to many points throughout the United States and overseas. Estimated production for 1971 is 20,000 tons, and the life expectancy of the operation is indefinite. The following structures are located on the property:

1. The mill, which is a metal building of 14,400 sq. feet.

2. A wooden office and laboratory building of 1,320 sq. feet.

3. A two-story metal warehouse-office-shop building of 2,400 sq. feet.

A 17955

4. A metal, open-sided product storage shed of 10,960 sq. feet.

5. A rubberized-cloth inflatable building of 6,426 square feet.

An ore stockpile, estimated to contain about 35,000 tons, was located across the roadway. Ore was delivered to the stockpile by a 25-ton capacity truck and trailer, dumped on top the stockpile, and pushed by a bulldozer to blend the ore and to provide a more level surface or roadway for the ore truck. A front-end loader with a 2 1/2-yard capacity bucket trammed ore from the stockpile to the loading point which leads to the COM bin - the start of the ore processing.

A tailings pile, estimated at 15,000 tons, was immediately adjacent to the ore stockpile. Product recovery was 50 percent; the 50 percent wet tailings was stacked by means of an inclined belt conveyor. When the waste pile becomes too large and overflows onto the roadway, the waste pile is cut down to size and the waste is hauled to a nearby ravine by a means of self-loading paddle wheel scraper.

While the dust survey was in process, M. Walter A. Van Sandt, Industrial Hygiene Engineer and Mr. Ed Davies, Safety Engineer of the California Department of Industrial Relations visited the operation, discussed our sampling techniques, collected several samples for record purposes, and furnished the writers with information on this and other asbestos plants.

DESCRIPTION OF STUDY

Asbestos airborne dust is the overriding health hazard in a plant of this character. Airborne asbestos dust has been demonstrated to cause the pneumoconiosis called asbestosis and lung cancer.

All control measures applicable to mineral dust control can be used for airborne asbestos; however, the more hazardous nature of asbestos requires more stringent adherence to good control practices. At the Calidria mill, the following conditions and practices were noted:

1. The stockpile was kept wet most of the time. Reportedly, the ore contains 20 percent moisture.

2. Prevailing winds are from the north, and blow the stockpile-created dust away from the mill.

3. The front-end loader, normally used for tramming ore from the stockpile to the ore bin, was provided with an enclosed cab with blower attachment. The spare front-end loader (used during the survey) was not provided with an enclosed cab.

4. Offices were enclosed and isolated from dust-producing operations.

5. The asbestos processing was a wet operation.

6. Production of a pellet prior to drying decreased dust creation and dissemination in the later packaging and shipping operations.

7. Housekeeping was a continuous process. Outside areas were cleaned as needed. Wet areas in the mill were washed down at least once a shift. Dry areas were swept with a push-broom and the sweepings from the bagging and palletizing areas went back into the circuit.

8. Both the Standard and High Grade processing systems were provided with dust collectors.

9. A dust collector system was being installed in conjunction with the bagger; the incomplete system was used currently to vacuum employees clothing.

10. USBM-approved respirators were worn by (a) the dozer operator; (b) the bagger operator; (c) the palletizer operator; and (d) the front-end loader operator.

11. The assay office was air-conditioned and provided with filtered air. A fume hood was available. A vacuum cleaner was used to clean the bench and other equipment.

12. The accounting and other offices were air-conditioned and provided with filtered air. All offices were swept regularly.

13. In the electrical shop, compressed air jets were used to clean equipment. This cannot be considered a good-housekeeping practice.

14. An engineering surveillance program was maintained. A monthly sampling program was carried out by a resident laboratory technician who sampled seven locations using a Unijet pump and Millipore filters. Mr. Paul W. McDaniels, Industrial Hygiene Engineer for Union Carbide Corporation, reportedly visits the plant twice a year to check the program and to make pertinent recommendations.

15. A medical surveillance program was reported in effect. The reported program included a pre-employment physical examination followed by an examination every three years until age 40; thereafter, an annual physical examination is provided.

During the survey sampling, the weather was clear and dry with a slight wind blowing intermittently. At noon, the temperature was about 90 degrees and the humidity was about 13 percent.

The effectiveness of the control measures will be discussed later in this report.

Sixty-six samples were collected. Of these, two Nuclepore samples were submitted to Dr. Phillip DeNee, Safety Research Center, Bruceton, Pennsylvania for evaluation. Results of his work will not be included in his report. A settled dust sample and a sample of the purified product, collected from the filter press, were submitted to the Field Health Group analytical laboratory; results of these analyses are included in Appendix I. Sixty-two airborne asbestos dust samples were collected on membrane filters using pumps calibrated at the mill office to pull 1.4 liters per minute of air; these samples were counted in the Denver Field Health Group laboratory at approximately 460 magnification with phase contrast illumination according to the method established by the U.S. Public Health Service. Full-shift exposure samples were collected of three individuals who were exposed presumably to high asbestos dust concentrations; sufficient samples were collected of other representative individuals or of locations where men worked to indicate the dust exposure levels.

DISCUSSION AND RESULTS

In 1967, the published TLV 1/ was 5 mppcf (millions of particles per cubic foot of air) for asbestos-bearing dusts when collected conventionally with the impinger or midget impinger and counted conventionally with the standardized light-field counting method. The number concentration represented the visible fragments (small) of asbestos fibers plus the many associated mineral dust particles.

In 1968, the published "Notice of Intended Changes" proposed that (1) the 5 mppcf be reduced to 2 mppcf; and (2) an alternative figure of 12 fibers/ml (fibers per milliliter) greater than 5 microns in length be adopted -- this figure

1/ Threshold Limit Values for 1967, Recommended and Intended Changes; American Conference of Governmental Industrial Hygienists, 1967.

was to be based on the membrane filter method at 430X phase contrast magnification.

The above two proposed changes were retained in 1969; in 1970 the published proposed changes (1) dispensed entirely with the impinger sampling method and its number concentration figure; and (2) recommended that the alternative value be changed from 12 fibers/ml greater than 5 microns in length to 5 fibers/ml greater than 5 microns in length.

In 1971, the "Notice of Intended Changes" retained the 1970 proposal, and specified the membrane filter method at 400-450X magnification phase contrast illumination. Also, an excursion limit not to exceed 10 fibers/ml may be permitted for 15-minute periods each hour up to five times daily.

For purposes of this health study, it is believed that the 1971 proposed TLV figure and sampling method provides the best indication of the asbestos dust health hazard. This value has also been accepted by the U.S. Department of Labor and on December 7 an emergency standard of 5 fibers/ml was published in the Federal Register. Therefore, the proposed 5 fibers/ml (on a time-weighted basis) is used as the threshold limit value.

Fiber concentration and pertinent data for the individual airborne dust samples are listed in Appendix II. Fiber concentration data are summarized in Figures 1, 2, and 3.

Figure 1 summarizes the time-weighted exposures of three men. The bagger operator was exposed to eight times the TLV and had a one-hour exposure of 12 times the TLV figure. The palletizer operator, working nearby, was exposed to 6 times the TLV and also had a one-hour exposure of 12 times the TLV figure. Both men were provided with U.S. Bureau of Mines approved respirators which they wore when working in obviously dusty atmospheres.

The exhaust system at the bagging operation was inadequate to control the spillage and dust emission, and as the newly-filled perforated multi-wall bags were conveyed to the palletizer, dusty air seeped from the bag's pores and contributed to the asbestos dust load of the ambient air. When bags broke during the bagging operation, the exhaust system at floor level failed to capture the spillage; sweeping the dust spillage to the floor launder contributed to the dust load in the air. As previously mentioned, an additional dust-collecting system was in process of installation at this area.

The exhaust system at the top of the palletizer admittedly was not working properly and required repairs. When broken, bags were dropped to the floor beneath the palletizer, and subsequently the bags and asbestos were removed.

The foreman's time-weighted exposure was 7.6 fibers/ml with one sample recording a one-hour exposure of four times the TLV figure. The foreman made his rounds unaccompanied by the man collecting samples. The source of the dust contributing to the foreman's exposure is considered (provisionally) to be the general mill atmosphere.

Other workers' airborne asbestos dust exposures were obtained on a when-sampled basis. As shown in Figure 2, the exposures of the mechanic, the bagger of the resin-grade asbestos, and the filter-press operator were within acceptable limits when sampled; the exposure (arithmetic average) of the loader operator was six times the TLV figure with a one-hour exposure of eleven times the TLV figure.

A number of working areas were sampled to assist in evaluating the workers' exposures; the airborne asbestos fiber concentrations are summarized in Figure 3.

Mine yard "general atmosphere" samples collected during the greater part of the workday suggest that wind dispersal from the ore stockpile or tailings pile was not a significant factor in the workers' samples collected in the mill. But it is recognized that at times the wind direction and velocity may become significant factors in contributing to a hazardous dust environment.

Low asbestos fiber concentrations were obtained in the accounting office, the main (upper floor) office, the welding shop, and the assay office.

The roll mill area of the mill had an arithmetic average concentration of 8.0 fibers/ml. The high concentration of 17 fibers/ml of sample B-105 indicates a need for better dust control measures at this "wet" operation. The cause of this high concentration was not apparent.

The foreman's office sample results yielded an arithmetic average of 7.5 fibers/ml with a high concentration in sample B-23 of 11 fibers noted between 1:38 and 2:38 p.m. The office door opened to an area partitioned from the dusty bagging and palletizing area, so the specific cause of these concentrations was not obvious. The dust concentrations are provisionally attributed to the ambient air dust load and the dust from the workers' clothing during the time they occupied the office.

The electric shop area sample results yielded an arithmetic average of 3.2 fibers/ml. This concentration is attributed largely to sample B-103 which was collected during a period when a compressed-air jet was used for cleaning some electrical equipment.

CONCLUSIONS AND RECOMMENDATIONS

The time-weighted exposures of the bagger and palletizer operator were very high. Although considerable effort has been made to control dust in the mill, air sampling revealed that the air quality is not satisfactory and must be improved.

Engineering methods, such as, but not limited to the following recommendations, shall be used to meet the exposure limits prescribed in the standard.

1. Enclosure of operations to prevent spillage and dispersion of material shall, where feasible, be utilized. The bagger area should be enclosed, and if properly designed and operated, can protect the bagger and reduce the dust load of the ambient air. The dust control system being installed should be completed.

2. Enclosures, hoods, and other devices to contain and collect material, especially airborne dust shall be maintained under negative pressure through the use of local exhaust ventilation.

3. The air collected by the local exhaust ventilation system shall be cleaned through the use of adequate, well maintained bag collectors, or other devices equally efficient, and the filtered air shall be discharged outside the work area and not be recirculated.

4. Vacuum cleaning shall be used rather than manual sweeping or blowing with compressed air.

5. The dust collection devices and system must be maintained and utilized in a manner that will result in its operating in an effective manner. If the dust control system should fail, operations should be suspended until repairs are completed and the system is capable of maintaining dust concentrations below the standard.

6. Encapsulate the filled bags with plastic bags in the same way the resin-grade asbestos bags are handled.

To diminish the exposure of the loader operator, the following recommendations are made:

1. Keep the stockpile wet.

2. Provide an enclosed cab with filtered air on the loaders; the spare loader in use during the survey did not have such a cab.

3. Improve the housekeeping in the immediate area. For example, the concrete ramp leading to the conveyor system was hidden beneath spilled ore.

The use of respirators in the work area shall not be considered as a substitute for engineering controls and their continued use over prolonged periods shall not be permitted. However, to protect the workers prior to the application of engineering controls which result in exposures and/or concentrations below the standard, respiratory protective devices shall be provided, maintained and their use required. The respiratory protection program shall include adequate training and supervision of employees in the testing of respiratory protective devices for fit before their use. The employees shall be required to test his respiratory protective device before each use in order to insure a proper fit.

Respiratory protective devices to be used shall be limited to the following:

1. For an atmosphere containing not more than 25 fibers/ml greater than 5 microns in length over an 8-hour average or more than 50 fibers/ml over any period of 15 minutes, a reusable or single-use filter type respirator, operating with negative pressure during the inhalation phase of breathing, approved by the Bureau of Mines under Schedule 21 B shall be used.

2. For an atmosphere containing not more than 250 fibers/ml greater than 5 microns in length over an 8-hour average or more than 500 fibers/ml over any period of 15 minutes, a powered filter positive pressure respirator approved by the Bureau of Mines under Schedule 21 B shall be used.

The tailings pile, when dried, is an obvious source of airborne dust during windy conditions. Keeping the tailings pile wet continuously and removing it to a more distant location will minimize dust conditions in the mill, shop, and office areas; however, other measures must be taken to minimize its impact on the community environment.

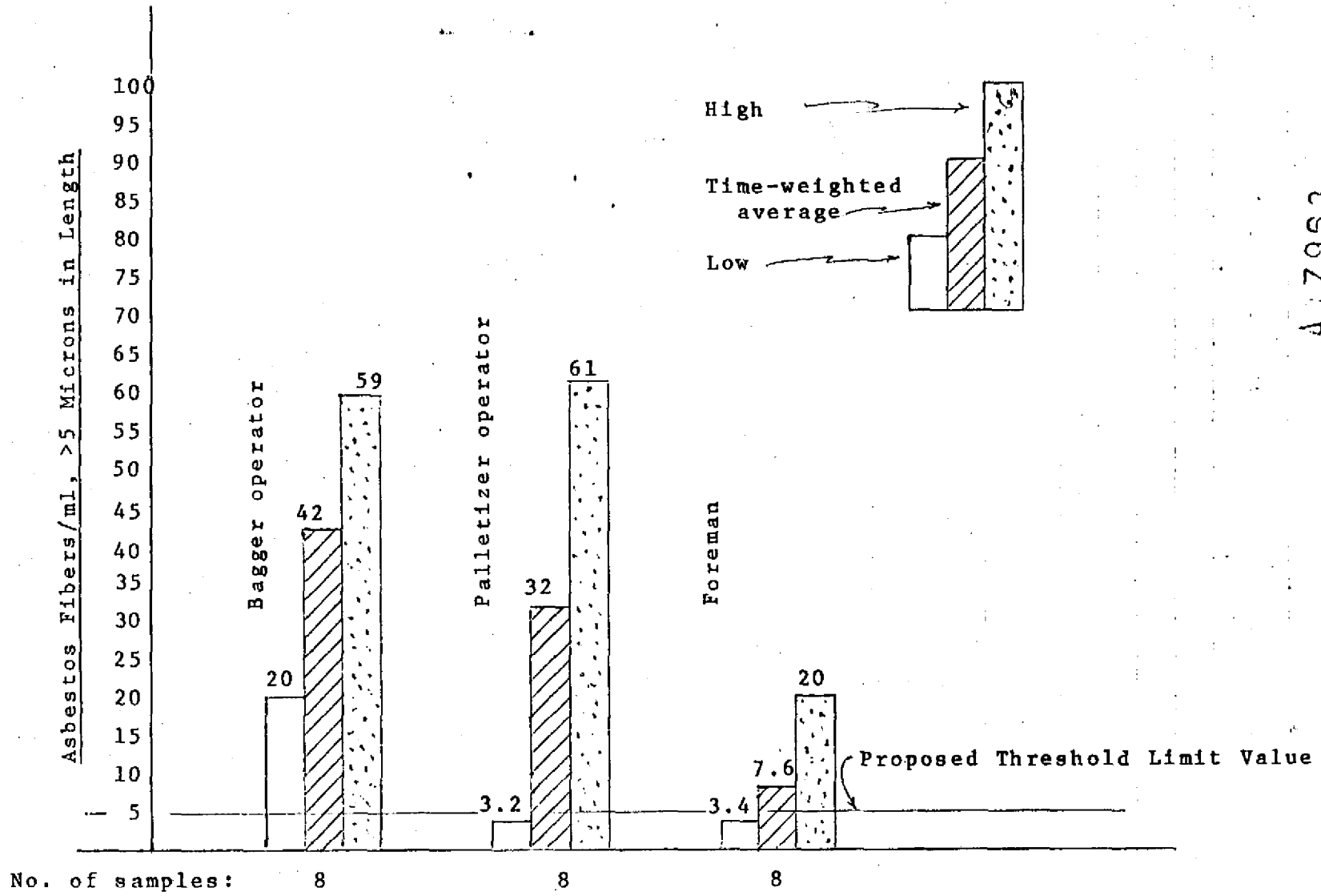

Figure 1. Asbestos Fiber Concentrations in Mill, Time-Weighted Exposures

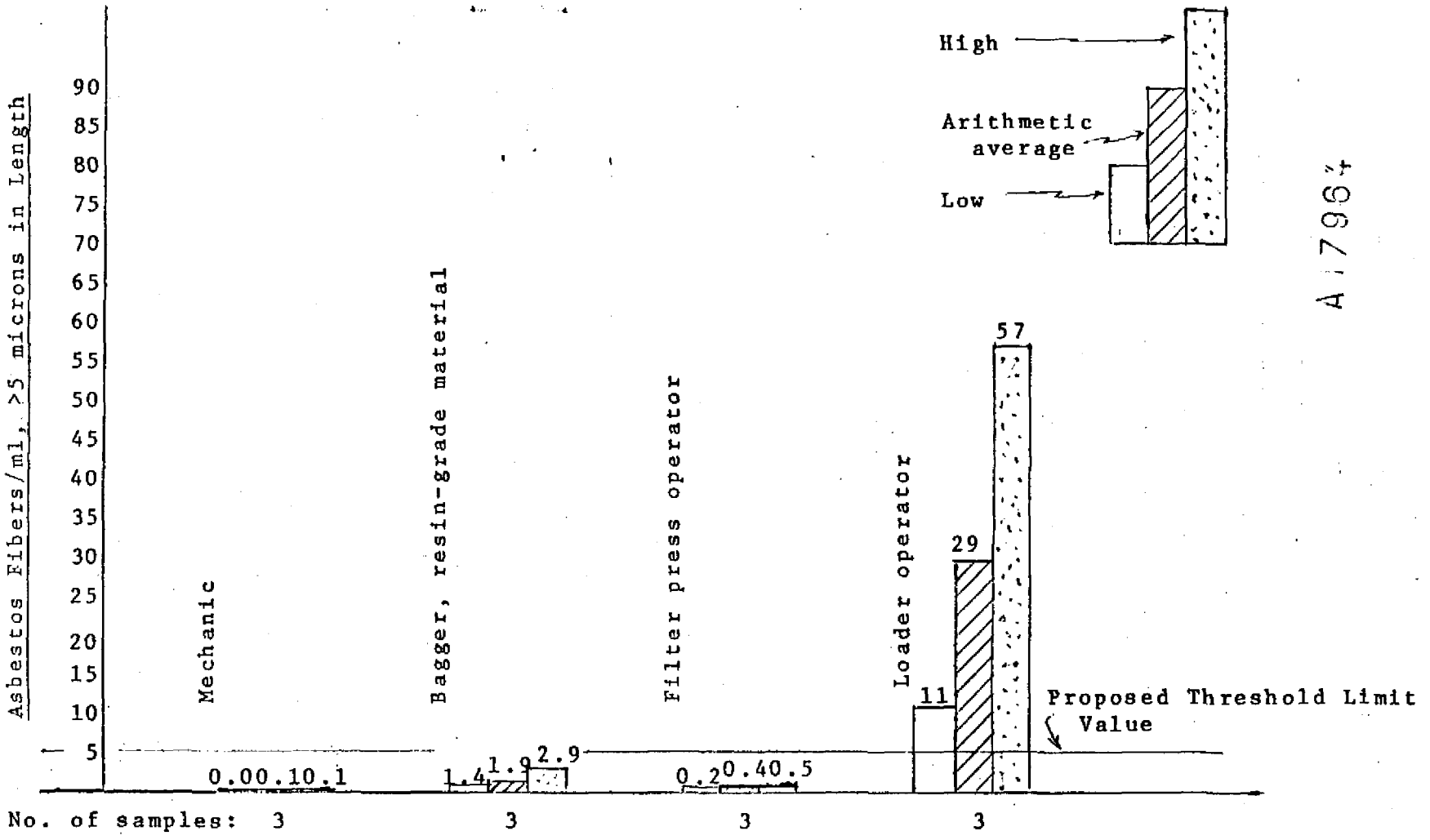

Figure 2. Asbestos Fiber Concentration Exposures in Mill -- On a When-Sampled Basis

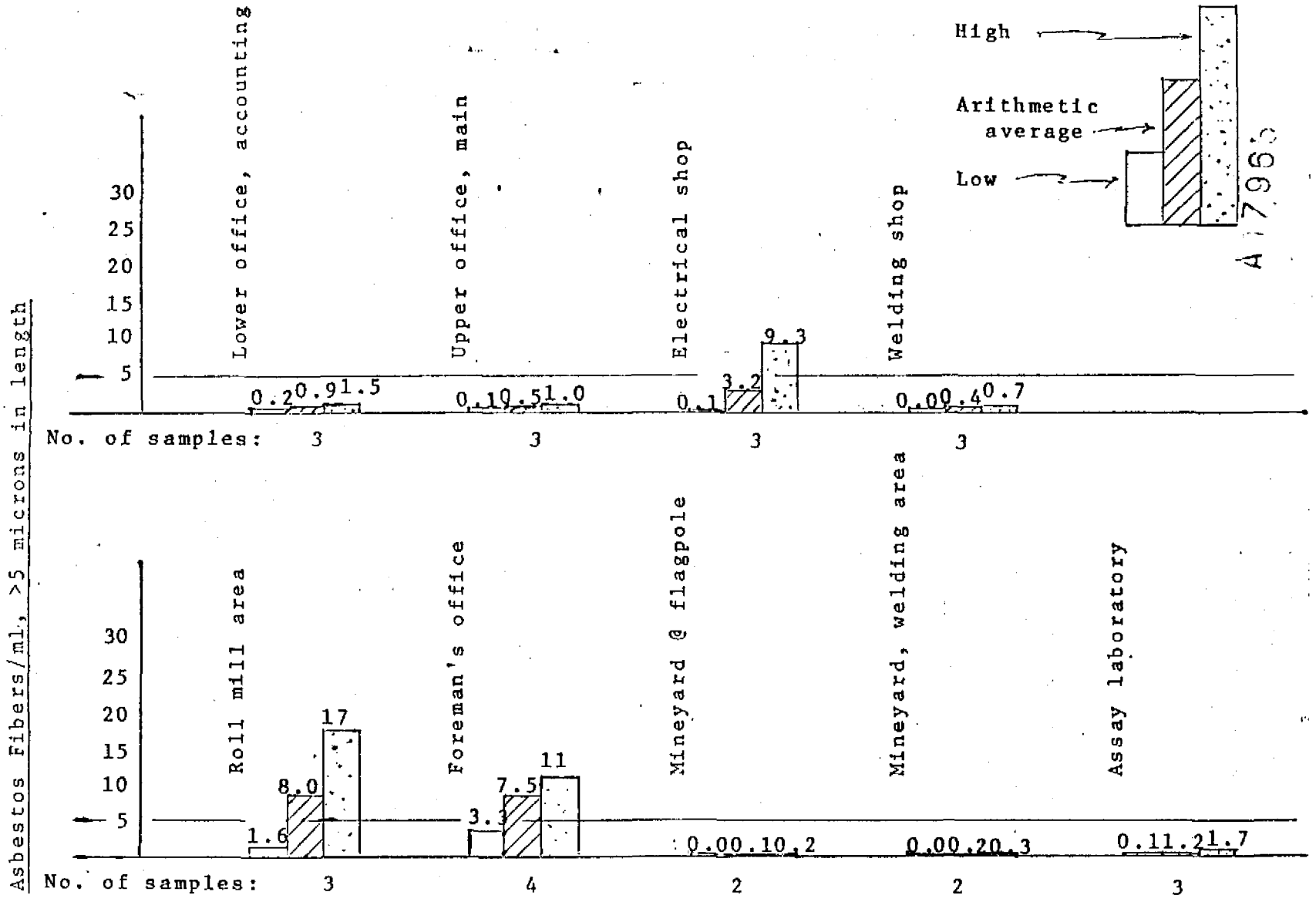

Figure 3. Asbestos Fiber Concentrations, various locations

General Atmosphere on a When-Sampled Basis

APPENDIX I

Mineral Analyses

Sample No.	Description	Percent Free Silica	Remarks
B-902	Filter-press product	0	Diffractometer scan showed broad lines identified as being from serpentine 1/
B-904	Settled dust near COM bin	4	Same

1/ Additional mineral and elemental information will be added to this report when available.

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APPENDIX II

Sample No.	Date	Sampling Time Start	Stop	Job Title or Description	Location/Operation	Fibers/ml >5 microns
B-1	10/5/71	0807	0850	Bagger operator	Mill floor, operating forklift, BZ.1/	20
B-4		0850	0944		Mill floor, weighing bagged product.	23
B-7		0945	1037		Mill floor, bagging & palletizing bags.	52
B-10		1038	1135		Same as above.	51
B-13		1135	1235		Mill floor, odd jobs.	26
B-17		1235	1336		Mill floor, bagging	53
B-21		1336	1430		Mill floor, palletizing.	59
B-24		1430	1600		Mill floor, misc. & cleanup.	43
B-2	10/5/71	0806	0850	Palletizer	Mill floor, maintenance & misc. BZ.	18
B-5		0851	0948		Mill floor, bagging.	42
B-8		0949	1041		Mill floor, operating forklift.	3.2
B-11		1044	1140		Mill floor, maintenance & misc.	26
B-14		1140	1238		Mill floor, bagging.	55
B-18		1238	1334		Mill floor, palletizing & cleanup.	48
B-22		1334	1434		Mill floor, bagging.	61
B-25		1434	1600		Mill floor, bagging & cleanup.	31

APPENDIX II

Sample No.	Date	Sampling Time Start	Sampling Time Stop	Job Title or Description	Location/Operation	Fibers/ml >5 microns
B-3	10/5/71	0813	0908	Foreman	Asbestos plant, making rounds, BZ.	9.8
B-6		0909	0949		same as above.	5.1
B-9		0949	1052		same as above.	3.5
B-12		1053	1206		same as above.	20
B-16		1206	1306		same as above.	5.3
B-20		1306	1403		same as above.	7.3
B-27		1403	1500		same as above.	3.4
B-28		1501	1601		same as above.	3.5
B-119	10/5/71	1225	1325	Mechanic	Mill, varied locations; repair work, BZ.	0.1
B-120		1330	1430		same as above.	0.0
B-121		1431	1531		same as above.	0.1
B-122	10/5/71	1243	1343	Bagger, resin grade	Mill, resin grade bagging area, misc. operations, BZ.	2.9
B-123		1345	1445		same as above.	1.4
B-124		1446	1546		same as above.	1.4
B-125	10/5/71	1302	1402	Loader operator	Outside mill, tramming ore, BZ.	11
B-126		1402	1502		same as above.	20
B-127		1502	1602		same as above.	57
B-203	10/5/71	1050	1204	Filter press operator	Mill, filter press area, op. press; BZ.	0.5
B-204		1204	1306		same as above.	0.5
B-207		1306	1452		same as above.	0.23
B-105	10/5/71	0923	1023		Mill, roll mill feed; general atmo.	17
B-111		1025	1125		same as above.	5.3
B-116		1126	1226		same as above.	1.6

APPENDIX II

Sample No.	Date	Sampling Time Start	Stop	Job Title or Description	Location/Operation	Fibers/ml >5 microns
B-15	10/5/71	1150	1236	Filter press operator	Mill, foreman's office; general atmo.	9.0
B-19		1237	1337		same as above.	6.9
B-23		1338	1438		same as above.	11
B-26		1438	1600		same as above.	3.3
B-201	10/5/71	1030	1248		Mine yard @ flag pole; general atmo.	0.00
B-205		1248	1508		same as above.	0.17
B-202	10/5/71	1040	1256		Mine yard, welding area; general atmo.	0.044
B-206		1256	1500		same as above.	0.26
B-101	10/5/71	0815	0915		Assay lab.; general atmo.	1.7
B-106		0916	1016		same as above.	1.9
B-110		1017	1117		same as above.	0.12
B-102	10/5/71	0850	0950		Lower office, accounting; general atmo.	1.1
B-107		0952	1052		same	1.5
B-112		1055	1155		same	0.2
B-103	10/5/71	0904	1004		Electrical shop; general atmo.	9.3
B-108		1005	1105		same as above.	0.29
B-114		1106	1206		same as above.	0.10
B-104	10/5/71	0913	1013		Upper office; general atmo.	0.99
B-109		1014	1114		same as above.	0.33
B-113		1115	1215		same as above.	0.10

APPENDIX II

Sample No.	Date	Sampling Time Start	Stop	Job Title or Description	Location/Operation	Fibers/ml >5 microns
B-115	10/5/71	1242	1342		Welding shop; general atmo.	0.31
B-117		1342	1442		same as above.	0.73
B-118		1442	1542		same as above.	0.00

January 18, 1972

Mr. Frank Warren
Senior Safety Engineer
State of California
Dept. of Industrial Relations
Division of Industrial Safety
2550 Mariposa St., Room 4065
Fresno, California 93721

Dear Mr. Warren:

As required in your Accident Prevention Report of 11-30-71, the bagging operator has been provided, and is required to wear, an air supplied hood unit while performing the duties of his job. The other operator, in the palletizer area, has been supplied with a 21-B rated cartridge type respirator. The two operators are rotated during the shift so that neither operator spends full time in the cartridge respirator.

Our company Industrial Hygienest, Mr. P. W. McDaniels, has checked the air supplied hood unit under operating conditions and has determined that the hood internal atmosphere is less than TLV.

Very truly yours,

Floyd H. Larrison, Jr.
Manager, King City Operations

/clg
cc: E. A. Piersall
R. J. Kronkhyte

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