Preliminary Survey

to

Determine Possible Asbestos Exposures

at

Rock Crushing Operations

IWS-32.10

THE ANACONDA COMPANY

Butte, Montana

Survey Conducted

by

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Asbestos (1332214) dust was measured at an open pit copper mine, and several underground copper mines of the Anaconda Company (SIC-3532) at Butte, Montana. Approximately 25 workers were employed in primary crushing operations where the samples were collected. Samples were collected at intervals of 5, and 90 minutes and were taken from around rock crushers, at the discharge of the crusher and next to workers at the sides of the conveyer. All of the samples were within the then existing standard of 5 fibers per cubic centimeter (fibers/cc); however, two samples exceeded the minimum standard that went into effect July 1976. The authors conclude that no asbestos fiber hazard exists.

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INTRODUCTION

The Anaconda Company has an open pit mine (Berkeley Pit No. 261), several underground mines which they work for copper, crushing and milling operations in Butte, Montana (population - 46,000). The primary purpose of this preliminary survey was to determine if workers at these operations were being exposed to asbestos dust. This survey was conducted in co-operation with the U. S. Bureau of Mines and the Anaconda Company. The decision to conduct the initial survey at the crushing operations was based on the fact that this area was judged to have the most potential with reference to any possible exposures to asbestos dust which might exist at any of the operations.

In addition, these operations met the sampling needs of the survey (i.e., easy accessibility required because of the frequent changes of membrane filters and an atmosphere conducive to sampling).

DESCRIPTION OF SITE

Over 1500 workers are employed in the various operations of this facility. However, less than 25 workers are engaged in the activities at the primary crushing operations where the samples were collected. This facility is approximately two years old and is equipped with modern process controls (including closed-circuit television sets and scanners strategically located throughout the operations) and ventilation systems.

Large trucks transport the ore from the mines to the crushing operations which are the initial steps in the process. The ore is dumped into two hoppers that feed it onto two vibrating gratings which are the feed lines to the crusher. These gratings, which act as giant sieves, permit ore fragments smaller than six inches in diameter to fall through onto a conveyer belt where it is taken for further processing at some other facility. The larger pieces (maximum size is approximately six feet in diameter) are then vibrated from the gratings to two conveyor belts (approximately thirty feet long) where the ore is fed into the crusher. About halfway down the conveyor lines several men are stationed to remove foreign materials, such as wood and scrap iron. They accomplish this manually for the small pieces and mechanically (hydraulic operated "cherry picker") for the larger ones. At the end of the conveyor the ore falls into the crusher which reduces the ore to pieces which are six inches and smaller in diameter in a matter of seconds. The crushed ore then falls onto a conveyor belt which transports it to other facilities for further crushing and processing operations.

SAMPLING PROCEDURES

Only area samples were collected for the following reasons:

1. The primary purpose was to determine if there was any asbestos in the ambient air, not to evaluate individual operations.
2. Since this was the initial survey conducted at this plant by NIOSH there was no past history on which to base the correct sampling period. Therefore, in order to be reasonably sure that a "good" sample would be collected (i.e., sufficient number of fibers with a background low enough to allow proper counting), it was necessary to collect samples from the same area for different periods of time. This necessitated changing the filters constantly, which was not amenable to "personal" samples.

Samples were collected at the following intervals: 5, 10, 15, 30, 60, and 90 minutes. Personal sampling pumps were used to collect the samples and were operated at 1.7 liters per minute (lpm). The pumps were calibrated at the site. Samples were collected at various locations around the rock crushers as shown in Figure 1, and at a lower level at the discharge of the crusher. The samples that were collected at the sides of the conveyor were immediately adjacent to the workers at those sites, and probably represent good approximations of those workers' exposure.

RESULTS

There were forty-five samples collected, the results of which are listed in Table No. 1. The results are listed as the concentration of fibers longer than 5 μm (micrometers) in length per cc (cubic centimeter) of air sampled. All counting was done optically using the membrane filter method at 400-450x magnification (4 millimeter objective) phase contrast illumination and only "asbestos fibers" were counted. A fiber is defined as a particle which has an aspect ratio (length to width) of 3:1 or greater. The differentiation between "asbestos fibers", and other fibers which met the definition of a fiber, was the result of optical identifications based on the counter's experience. If the counter was unsure of the type of particle, it was counted. This would mean that these counts would be biased on the high side as far as any possible asbestos dust concentrations are concerned.

The current standard for asbestos dust took effect upon publication in the Federal Register on June 7, 1972. In essence the standard states:

> The 8-hour time-weighted average airborne concentration of asbestos fibers to which any employee may exposed shall not exceed five fibers longer than five micrometers per cubic centimeter of air as determined by the membrane filter method at 400-450x magnification (4 millimeter objective) phase contrast illumination. No employee shall be exposed at any time to airborne concentration of asbestos fibers in excess of ten fibers, longer than five micrometers, per cubic centimeter of air.

A standard of two fibers longer than five micrometers per cubic centimeter of air is scheduled to go into effect on July 1, 1976.

None of the samples collected exceeded the existing standard of 5 fibers/cc (fibers longer than 5 micrometers per cubic centimeter of air). The highest concentrations were collected at the right side of the conveyor: 3.6 and 2.2 fibers/cc. Only one other sample exceeded 1.0 fibers/cc. The highest concentration values were those collected for short periods of time. The short sampling times were used in order to insure that some samples would not have a heavy background, which interferes with counting of the fibers. If the background gets too heavy, meaningful counting cannot be achieved.

All of the samples are well within the existing standard of 5 fibers/cc, and all but two samples (3.6 and 2.2) have values which are below the standard of 2 fibers/cc which will go into effect July, 1976.

Bulk samples from seven different levels of the mines were collected and were analyzed both optically and by electron microscope. The results indicate that there is no readily identifiable asbestos contained in them. Further tests are being run in an effort to determine what materials are present.

Since all the counts are biased on the high side because everything that had an aspect ratio of 3:1 was counted, except those that were obviously from some other source, and due to the fact that no asbestos fibers were detectable in the bulk samples, the exposure to "asbestos fibers" is not significant. At the present time, our capabilities do not include the ability to identify asbestos fibers to the exclusion of all others.

SUMMARY AND CONCLUSION

Even assuming that all fibers present (i.e., those particles which had an aspect ratio of 3:1) were asbestos fibers, minus those which obviously weren't asbestos, none of the samples had concentrations which exceeded the present standard of 5 fibers/cc. In fact, there were only two samples of all those taken (4% of total) that had values which exceeded the standard of 2 fibers/cc that will go in effect on July, 1976. Based on the results of this preliminary survey, there doesn't appear to be any significant levels of "asbestos fibers" at these operations. This is in agreement with the analysis of the parent rock, which did not reveal any asbestos.

In order to make a more complete evaluation of this environment with reference to asbestos dust exposure, it will be necessary to develop methods which will be more sensitive to asbestos identification.

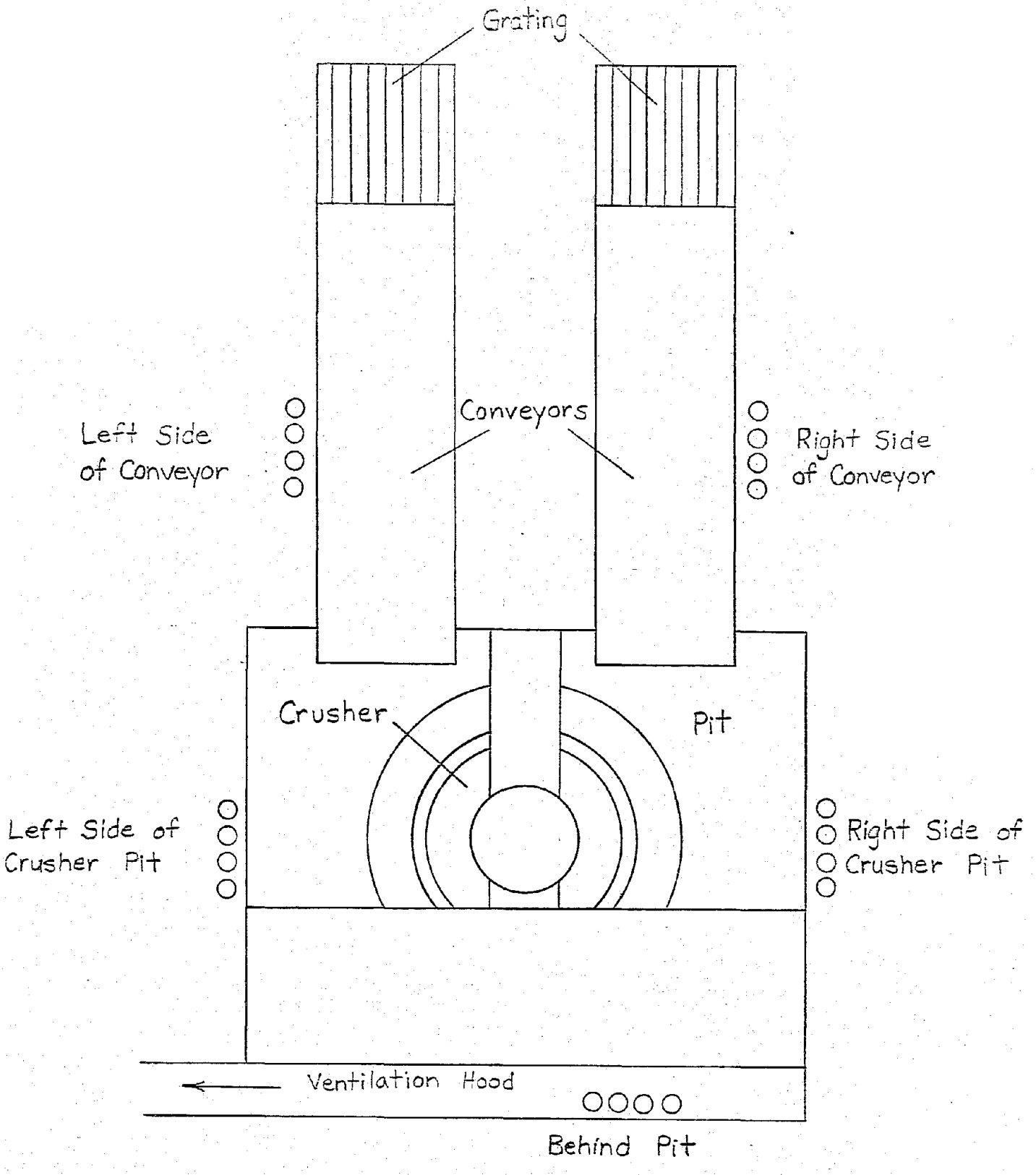

Figure 1. Sampler Locations

CONCENTRATIONS

OF

FIBERS > 5 μm IN LENGTH PER ML

AT

THE ANACONDA CO.

BERKELEY PIT 261 CRUSHING OPERATIONS

BUTTE, MONTANA

SAMPLE LOCATION	SAMPLE TIME, minutes												AVG.
	5		10		15		30		60		90		
	Sample No	*Conc.*	*Sample No*	*Conc.*	*Sample No*	*Conc.*	*Sample No*	*Conc.*	*Sample No*	*Conc.*	*Sample No*	*Conc.*	*Conc.*
Right Side of Pit	481 503	0.6 0.0	482 504	0.0 0.0	512 522	0.6 0.6	509	0.1	483	0.2	484	<0.1	0.2
Left Side of Pit			485 486 505 506	1.0 1.3 0.4 0.6	515 524	0.6 0.3	507	0.1	487	0.2	488	<0.1	0.5
Behind Pit	489 501	1.0 0.9	490 502	0.5 0.0	513 521	0.3 0.0	510	0.1	491	0.3	492	0.0	0.3
Right Side of Conveyor	493	3.6	494	2.2	514 523	0.9 0.3	511	0.0	495	0.2	496	<0.1	1.0
Left Side of Conveyor			497 498	0.0 0.4	516 525	0.3 0.3	508	0.0	499	0.1	500	0.1	0.2
Discharge of Crusher	517 518	0.8 0.0	519	0.5	520	0.6							0.5