Report of Investigation
Nuclear Division
Union Carbide Corp.
King City, California
Sept. 10-13, 1963

This was the first formal evaluation of the working environment for conditions that might be hazardous to health at the new plant and mine. It was concerned primarily with airborne dust.

Air samples were collected at both the mine and mill by a technique in which the dust was retained by impingement in liquid. Particle concentration was then determined by count using light-field microscopy and a magnification of 100 diameters. This is in accord with the standard procedures of the U. S. Public Health Service. Results are given in the accompanying table.

For safety, all particles were considered to be fibrous. While it is recognized that other materials may be present, studies of airborne material at Sterling Forrest by electron microscopy have shown that the fiber-bearing particles do not always have the familiar fiber shape, and positive distinction is possible only through elaborate and expensive techniques that are impractical for a dust control program. Further, in view of the very limited information available on the toxicity of short fiber asbestos, a conservative approach is indicated.

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Recommendations

Mine:

1. Require that caterpillar operators engaged in cleaning and scraping mine site wear respirators approved by the U. S. Bureau of Mines for toxic dusts. A relatively inexpensive respirator that resembles the non-approved mask now available, but which has been found adequate, is American Optical Co., Sure-Guard, No. R9100T.
2. The recommended maximum allowable dust concentration for long-term exposure at the mine is 5 million particles per cubic foot of air. Evaluate environment periodically to determine if exposures are controlled.

Mill:

1. The recommended maximum allowable dust concentration for mill work areas is 5 million particles (total) per cubic foot of air. Plan dust control to meet that limit.
2. Initiate a program for routine evaluation of dust concentrations at various operations at the mill site. The actual number of samples that must be collected for reliable evaluation and other details

of the program will be defined as experience is gained in developing mill operations. For the early stages of operation, sampling should be conducted at monthly intervals until a good background of information is obtained and until experience shows that a longer interval is justified.

3. Obtain laboratory equipment necessary for routine dust evaluation. A list of equipment is shown below.

a.) Microscope. Bausch and Lomb model FBR-3(No. 31200423) with mechanical stage and Abbe condenser (N.A. 1.25) This is a monocular microscope that can be readily converted to a binocular type and is supplied with 10X, 43X, and 97X achromatic objectives, and 5X and 10X Huygenian eyepieces. Cost--approximately $430. Source--laboratory supply house or directly from Bausch and Lomb.

A similar microscope of Japanese make that has been found acceptable at Grand Junction is obtainable from Unitron Instrument Co., 66 Needham Street, Newton Highlands 61, Massachusetts. The model number is MLU. It is equipped with essentially the same accessories as the B&L model (including

10X, 40X, and 100X objectives, and 5X, 10X and 15X eyepieces). In addition, it has a built-in light. Cost--approximately $270. I have asked that a catalog be sent to King City.

b.) Microscope Light (if B&L microscope is purchased). B&L Optilume for monocular microscopes. Price--approximately$8.50. Source--laboratory supply house.

c.) Whipple Micrometer Disc. For use in microscope eyepiece. Price--approximately $7.50. Source--laboratory supply houses.

d.) 6 Sedgwick-Rafter (A.P.H.A.) Counting Cells. Price--$9.00 each. Source--Laboratory supply houses.

e.) Isopropyl alchol as discussed during the visit.

4. Obtain air sampling equipment. Literature on available equipment will be forwarded as soon as received. Probable cost--$250.

Detailed Findings

Mine

No mining was being performed during this visit but operations involved with the transportation of ore to the mill and general cleaning of the mine site were in progress.

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Dust counts were not found to be excessive except on the caterpillars dressing the mine site. Concentrations alongside the operators were about twice the recommended maximum of 5 million particles per cubic foot of air and indicated a need for improved protection of personnel. It was recommended that these people be supplied with respirators approved by the U. S. Bureau of Mines.

The amount of dust found in the open cab of a pick-up truck during travel from the mine site to the public road was higher than at some points at the mine but not to a significant degree. With further improvement to the road, concentrations in moving trucks should drop.

Mill

Only the front end of the process (ore treatment up to filtration) was operated during this visit. The remainder of the process will be investigated later in the year when the installation is completed.

Dust concentrations at various points of operation are shown in the table. None exceeded 5 million particles per cubic foot of air, but it was apparent that very careful control of the dry material was necessary to prevent a significant increase in airborne particles. Thus as production

rises to mill capacity additional control measures may be indicated.

In view of the toxicity of asbestos and the low permissable air concentration, it was recommended that a program for routine periodic appraisal of the work environment be established, and that necessary equipment be obtained. While much of the program (sampling location, number of samples, and the number of investigations required per unit of time) cannot be defined until the mill is in normal operation, it was felt that initially plans should be made for monthly investigations. Information on sampling equipment needed for the program will be forwarded as soon as descriptive literature is received from the supplier.

The basic laboratory equipment for dust appraisal and its approximate cost is listed in the recommendations. The microscope selected need not be one of the makes listed but should have the same features and a complete line of available accessories. The question of imported or American-made is a matter for local decision which should consider in addition to cost the availability of parts and service. The other recommended laboratory supplies are more or less standard items in American dust control practice.

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Sampling Location and Operation	Date	MPPCF (1)	Remarks
Mine Site			
Alongside wobbler during loading trucks.	9/10/63	4.2 3.8 3.3 3.9	Variable wind direction and speed so that sampling location is upwind of dust part of time.
Riding caterpillars cleaning mine site.	9/10/63	9.6 10.9 11.3 11.8	Much large, non-respirable material noted.
Walking across ore pile	9/10/63	3.2 3.4	Light breeze (5 MPH) from west and south.
Riding pick-up with windows open on road from mine.	9/10/63	4.7 6.0	Deep dust on portions of road.
Mill Site			
Deck around Com-Bin feeder and screen 204	9/11/63	2.3 2.7	Wind from south (10-15 MPH). No ore moved from stockpile.
Same Location	9/11/63	3.1 3.7	Wind from north (10-15 MPH) and ore loaded on conveyor belt feeding Com-Bin feeder.
Walkways from screen 204 to shaking tables	9/11/63	1.7 1.9	
Deck around screen 204 and Com-Bin feeder	9/12/63	2.6 2.5	No ore moved from Stockpile. Very little wind.
Same Location	9/12/63	3.8 3.6	Ore loaded on conveyor belt feeding Com-Bin feeder.

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Mill Site (cont'd)

Walking over ore pile as pile was dressed by front loader	9/12/63	1.7	Not visibly dusty.
In front loader cab while dressing ore pile.	9/12/63	2.5	Not visibly dusty.

(1) MPPCF--Millions of particles per cubic foot of air.