PLAINTIFF'S EXHIBIT
Union Carbide 93

PARTICULATE MATTER IN AIR

Dust Breathed by the Employees While Cutting and Installing "Kaylo" Insulation

Plant-wide Survey - Plant 514

Authors: H. H. Warwick
B. L. Murray

Date: September 21, 1965
Project No.: IH-1G-65

Doctor Hull, Plant Medical Director, requested a plant-wide industrial hygiene study to determine the potential exposure of insulators to asbestos fiber dust concentrations. Table I gives the results of seven separate tests, including 24 breathing zone level air samples and shows an average dust concentration of 5.2 million particles per cubic foot of air. A "threshold limit value" of 20 mppcf of air has been suggested.[1]

When three employees, or less, hand-cut and apply "Kaylo" insulation, the concentration of dust is considered safe from the health standpoint; however, with 6 men the dust count exceeds the TLV. It is at this phase of the operation that exhaust ventilation should be used. Excessive dust concentrations can be expected when the insulation is removed from piping and tanks. Again, exhaust ventilation should be used to move the dust away from the employees, if possible; otherwise, respirators are advised.

"Kaylo" insulation contains 12 to 13% asbestos and 5.6 to 7.4% crystalline-free silica.[2] This material is received in block and pipe form and the insulator measures and marks the material into appropriate sizes and cuts it with a hand saw. The insulation material is wired into position around the tank or pipe. The tasks of cutting and applying the "Kaylo" insulation are shown in Figures 1 and 2.

The air samples were collected with a midget impinger and a Uni-jet sampler, drawing 0.1 cubic foot of air per minute through impinger flasks containing 10 milliliters of distilled water. Dust counts, made by the Light Field Microscopic Counting Technique, appear in Table I.

This study has revealed that further research work is needed to:

1. Attain an established figure for the "threshold limit value".
2. Utilize exhaust ventilation to remove the dust from the work area.
3. Determine the particle size of the asbestos fiber where the dust count exceeds 5 mppcf.
4. Obtain Range Finding Tests on animals exposed to different percents of asbestos fiber.
5. Continue our plant-wide study in support of these conclusions.

1. Cook, Warren A., and Poole, Robert E., Letter dated February 12, 1962 - The University of Michigan School of Public Health.
2. Poole, R. E., Industrial Hygiene Survey - Construction Insulation Shop, Building 511-2018. Report 62-IH-1-G-1 (March 21, 1962).

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TABLE I

PARTICULATE MATTER IN AIR

Dust Breathed by Employees While Cutting and Installing "Kaylo" Insulation

Date	Sample Number	Sampling Conditions at Breathing Level	Number of Employees	Dust Count MPPCF (1)
11-16-64	1	5-min. cutting, 5-min. application inside building	2	2.1
	2	Same	2	2.6
	3	Same	2	1.7
	4	7-min. cutting, 3-min. application	2	3.0
1-19-65	5	Cutting and application during entire sampling period - inside building	6	22.5
	6	Same	6	17.0
	7	Same	6	22.5
2-16-65	8	Same	2	3.6
	9	Same	2	1.6
	10	Application of insulation - no hand saw cutting	2	0.3
	11	Same	1	0.1
3-1-65	12	Cutting and application during sampling period - outside building	2	7.6
	13	Same	2	2.4
	14	Same	2	4.0
3-22-65	15	Application of insulating - no cutting - inside building	3	1.9
	16	Same	3	13.0
	17	7-min. cutting; 3-min. application	1	7.3
5-26-65	18	Clean up of insulation from floor - sweeping and shoveling - inside bldg.	2	0.8
	19	Same	2	0.1
	20	Same	2	2.5
6-14-65	21	Cutting and application during sampling period - inside building	2	1.0
	22	Same	2	5.0
	23	Same	2	2.5
	24	Same	2	1.1

Million particles per cubic foot of air.

10-14-65

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Figure 1. Sawing block sections. Breathing zone level air sample being collected in the background.

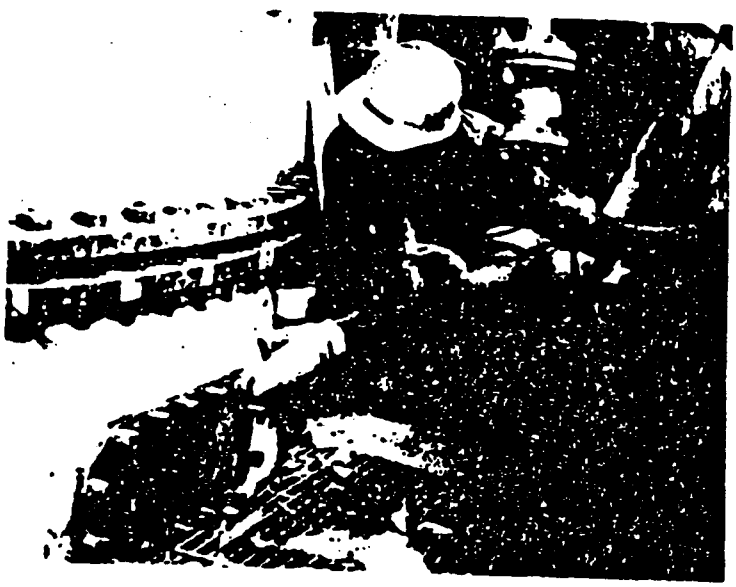


Figure 2. Applying insulation block. Breathing zone level air sample being collected in the foreground.

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Plant [illegible]

INDUSTRIAL HYGIENE EVALUATION AND SURVEY

PROJECT NO. 711

Date 9-11-66 Time [illegible] Project Asbestos Insulation Dust in Air

Department [illegible] Location [illegible] Bldg. No. 1127

Requested by ______ Reason Survey

General Conditions: Pipe insulation being cut, fitted and secured to [illegible]

Sampling Method and Equipment [illegible]

Shift: Day ___ Eve. ___ Mid ___ No. Employees ___ Sampled by [illegible] CGC

Sample Number	Zone	Sampling Time-Min.	Flow Rate (l/min)	CONCENTRATION cu ft	Cont.	mppcf	Special Conditions
1		10	2.8	1.0	<0.1	<0.25	Breathing level inside cell [illegible] (1st [illegible]) insulation being cut, fitted and secured to [illegible] cutting time approximately 2 min.
2		10	2.8	1.0	0.6	1.5	Same as for No 1, cutting time 5 min.
3		10	2.8	1.0	0.8	2.0	Same as for No 1 cutting time 8 min.
4		10	2.8	1.0	0.2	0.5	Breathing level inside cell 13 - insulation being cut, fitted and secured to [illegible] 5 ½ ft above floor level by 4 employees.

Calculation:

5		10	2.8	1.0	<0.1	<0.25	Same as for No. 4

Remarks: $\frac{\text{Net count} \times [\text{illegible}] \times 250 \times 10^3}{\text{cu ft} \times 10^6}$ = mppcf

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Sketch - See Reverse Side. Reference No. 7JND 45 Analyzed by [illegible] Date 9-22-66

[illegible initials]

Union Carbide trial exhibit Union Carbide 93: H. H. Warwick and B. L. Murray, Particulate Matter in Air: Dust Breath…
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PLANT 514

PROJECT NO. 166

INDUSTRIAL HYGIENE EVALUATION AND SURVEY

Date 4-13-66 Time 10:00 AM Project Dust in Air (Asbestos Insulation) floor (scaffold) Bldg. No. 156

Department Maintenance

Requested by Survey

General Conditions: Locker (2 workers) cutting out (scored) asbestos application

Sampling Method and Equipment: Collect in mylar bags containing 10 ml dist. water thru Millipore Jet Sampler

Shift: Day ___ Eve. ___ Mid ___ No. Employees 5 Sampled by HHW-CGC

Sample Number	Zone	Sampling Time-Min	Flow Rate L/min	CONCENTRATION Count/cu ft	Count/cc	f/cc PPCF
1		10	2.8	1.0	<0.1	<0.25
2		10	2.8	1.0	0.8	2.0
3		10	2.8	1.0	2.2	5.5

Special Conditions

Breathing level of employee as per outline of job. Another employee cutting nearby intermittently

Ditto

Ditto

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Calculation:

Net count x $\frac{1.30 \times 10^3}{.6}$ = f/cc PPCF

Remarks:

Sketch - See Reverse Side. Reference No. 6JND10 Analyzed by J. Rowe Date 4-15-66