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Biochemical Research Department
THE DOW CHEMICAL COMPANY



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MAY 27 1955 D.D.L.

Noted E. E. D.
JUN 20 1955

SUBJECT: RESULTS OF AIR ANALYSIS MADE
WHILE MIXING ASBESTOS -
VINYL FLOOR TILE

File: T2.1-1-32 A)
Chg. 1219
Rec'd 10-23-54
Fin'd 5-5-55
Work S. R. Johann
Rep't S. R. Johann

Signed S. R. Johann

Checked H. R. Hoyle

Date 5-6-55

Date 5-26-55

510030577

TO:

Ray McDonald, 433 Bldg.
Ralph Hand, 433 Bldg.
S. M. MacCutcheon, 401 Bldg.
H. H. Gay, M.D., 607 Bldg.

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CONCLUSIONS AND RECOMMENDATIONS

Air analysis showed that the presence of air borne materials near the operators was of sufficient concentration to create a health hazard for repeated eight hour exposure. The present equipment should be equipped with local exhaust ventilation if it is planned to operate continuously on this material.

Sufficient quantities of lead were found in the air samples in two of the operations, such that blood lead analyses were thought necessary. The results of the blood lead analyses showed the men had not been exposed for long enough periods of time to result in excessive exposure to lead.

PRESENTATION OF DATA

During the processing of experimental formulations of asbestos vinyl tile, it was believed a health hazard existed due to the dustiness of the dry ingredients used. The Industrial Hygiene Laboratory was asked to investigate this hazard.

The 23rd of December 1954, samples were taken of the air while the men were operating the different pieces of mixing equipment on the 3rd floor of 433 building.

The amount of dry material found in the air during the different mixing operations was such that if these operations were run on a continuous basis a health hazard would exist. Any further large scale work should be done with improved ventilation. This ventilation should include exhaust ventilation hoods over each piece of equipment and the dry mixing with the electric mixer in the laboratory should be done in an approved hood.

The majority of dry materials in the air was assumed to be asbestos fibers and calcium carbonate. No specific tests were made at the time of sampling to determine the amount of each present. The two materials are reported as inert. Any future work with this or similar material should be checked for the amount of asbestos in the air. An excess, that is more than 5 million particles per cubic foot of air, is a health hazard for repeated eight hour exposures.

Owing to the presence of lead-organic compounds in the dry mixtures, it was deemed necessary to have blood lead analyses made on the men concerned. The examinations showed the blood lead level was low. The men have not suffered any ill effects because they have operated the equipment for short periods of time only. Continuous eight hour operation would constitute a health hazard. This information is shown in Table I.

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The amount of material found in the air as solid inert material, assumed to be calcium carbonate and asbestos, is shown in Table II, along with the samples that were analyzed for metals.

TABLE I

Blood lead content of men working with asbestos - vinyl tile

<u>Name</u>	<u>Clock No.</u>	<u>Mg. Pb per 100 cc Blood</u>
		0.024
		0.024
		0.016
		0.08

Samples drawn, 3-7-55

Recorded, 4-4-55

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TABLE II

Sample No.	Location of Sample	Analysis	Concentration Mg/m ³
1	Man was mixing a batch of vinyl-asbestos tile on a differential speed 2 roll mill. Sample taken about 2 feet above the hot rolls (285°F. & 235°F.) Odor of coconut oil present. Asbestos fibers could be seen in the air for a few minutes.	Pb cd Inert	3.47 <.66 102.00
2	Same operation as Sample #1, a different formulation used. No odor of coconut oil. Fumes or steam could be seen rising from the rolls.	dd Inert	<.66 93.00
3	Breathing zone sample of the operator while he was running a third batch of material on the same machine as in Samples 1 & 2. Man stated the odor was strong and disagreeable.	Ba cd Inert	4.00 <.66 16.00
4	Same as sample #3 but included cleaning the rolls after the run. Different formulation than in Sample #3.	Pb Ba Cd Inert	.98 4.90 <.445 Nil
5	Blanding dry ingredients in a Baker-Perkins mixer. CaCO ₃ being added to dry vinyl plus stabilizer. No asbestos fibers added at this stage. Material became plastic after mixing.	Inert	50.00
6	Same mixing operation as above but as the asbestos fiber is added. The material already in the mixer was soft. This and sample #5 are done about 20 runs per day when doing this particular experiment about 10 min. per run.	Inert	0.00
7	Breathing zone of the operator on the Bandbury Mill, as he added the dry filler material (asbestos & CaCO ₃) to the molten mixture of vinyl. Dry filler material was visible in the air for several minutes but was dissipated by the room ventilation, operation takes about 3 min.	Inert	66.00

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<u>Sample No.</u>	<u>Location of Sample</u>	<u>Analysis</u>	<u>Concentrat: Mg/m³</u>
8	Sample taken in the lab while the operator was mixing dry ingredients in a "Kitchen-aid" electric mixer. This is done about 10 times a day.	Inert	24.20
	Industrial Hygiene Standards for repeated eight hour exposures.	Pb Ba Cd Inert	0.15 0.50 0.10 15.00

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glf

P.T.S. 433 Bldg.
Rd. and 8636
will plan on tests 15-17

← Tribosol 90.1% pt 0
monohydrous Tribosol
lead sulfates

Plumb-O-Sil A 60.61% pt 0
Copperisulphate, pb orthosilicate
+ silica gel.

Plumb-O-Sil B 49.50% pt 0

Plumb-O-Sil C 75.98% pt 0

← Normosol - 76.9% pt 0
normal lead salicylate
soluble glycerol & glycol ethers

Dyethol - 81.9% pt 0
Dibasic lead phthalate

D.S.-207 59.9% pt 0
Dibasic pb stearate

← Tribosol-E 69% pt 0
Basic pb silicate sulfates

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Duphon 90.2% PbO
Dibasic lead phosphite

All above available in common
secret

Ferro Stabilizers

No

120 $\leftarrow$ Barium Ricinoleate

200 $\leftarrow$ Cadmium 2-Ethylhexoate

311 Cadmium Naphthoate
2-Ethylhexoate

321 Cadmium Ricinoleate

341 Sodium organo-phosphate

351 A Calcium Ricinoleate

360 Zinc 2-Ethylhexoate

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AVOID VERBAL ORDERS

MR. _____ DATE _____

mg Pt / 100 cc Hb.

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Sample drawn 3-7-55 & recd
4-4-55

.07 mg / 100 cc allowable.

SIGNED _____

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DOW 01525

INDUSTRIAL HYGIENE SAMPLE RECORD

SAMPLING METHOD <i>Widger Sampling</i>		SAMPLE RATE <i>3L/min.</i>	PROBLEM <i>72.1-1-32</i>	BLDG. <i>433</i>	DATE <i>12-23-54</i>
TRAPPING MEDIUM <i>H₂O</i>		ROTAMETER OR ORIFICE NO. <i>Pump # 9</i>		PROCESS <i>Vinyl tile fabrication</i>	
ROTAMETER SETTING <i>3L</i>	OUTSIDE TEMP. <i>25</i>	WIND TEMP. <i>75</i>		ARTERIAL <i>4 formulation</i>	
VENTILATION <i>No special ventilation. The room has a machine light roof & some heating & ventilation</i>					
SAMPLE	BOTTLE	DESCRIPTION	TIME		CONCENTRATION
			START	STOP	
<i>#1</i>	<i>1</i>	<i>man was wiping a batch of vinyl tile on a differential speed 2 roll mill. Taken about 2 feet above the hot rollers (285°F & 235°F) odor of coconut oil present asbestos fibers could be seen in the air for a few minutes.</i>	<i>5 min</i>	<i>at 11:00 AM</i>	<i>Pt. 397 mg/m³ cd. 6.66 " about 102 "</i>
<i>2</i>	<i>2</i>	<i>same operation as #1 but no odor of coconut oil seen or steam could be seen rising from the rollers. Different formulation than #1.</i>	<i>5 min</i>		<i>cd. 6.66 mg/m³ about 93 mg/m³</i>
<i>3</i>	<i>3</i>	<i>B.Z. sample while operator was running a 3rd batch on same same machine. Stated odors were strong & disagreeable.</i>	<i>5 min</i>		<i>Pt. 9 mg/m³ cd. 6.66 " about 16 "</i>
<i>4</i>	<i>4</i>	<i>same as #3 but included cleaning the rollers off after the run.</i>	<i>7.5 min</i>		<i>Pt. 9.8 mg/m³ cd. 9.95 " about nil</i>

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DOW 01526

INDUSTRIAL HYGIENE SAMPLE RECORD

SAMPLING METHOD <i>Millipore filter</i>	SAMPLE RATE <i>3 l/min</i>	PROBLEM <i>T21-1-32</i>	B.L.C. <i>933</i>	DATE <i>12-23-59</i>
TRAPPING MEDIUM	ROTAMETER OR ORIFICE NO. <i>Pump No 4</i>		PROCESS <i>Thermal tile mifing</i>	
ROTAMETER SETTING	OUTSIDE TEMP.	INSIDE TEMP.	MATERIAL <i>substrate + others</i>	

VENTILATION:
no special hood or fans.

SAMPLE	PORT	DESCRIPTION	TIME		CONCENTRATION
			START	STOP	
#5	1	3 l/min Blowing ingredient in a Baker - Perkins mixer no substrate but some CaCO_3	8 min		50 mg/m ³
#6	2	3 l/min same material above but as the substrate was added to the plastered material mixed in sample #5 phase. Normal operation 20 runs/day.			0.0 mg/m ³
7	3	Banbury Mill. 3 l/min B.P. operator as he added the dry filler material (substrate, + CaCO_3) to the wetter mix material was visible in the air but was soon dispersed by the room ventilation	3 min		66 mg/m ³
8	4	Ch. Lat while mifing dry ingredient in a Kitchell mixer (2 l/min) mixer was noticable dust (done 10 times a day average)	2.75 min		24.2 mg/m ³

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S. P. Johnson
12-28-59

CALCULATIONS RECORD

PROBLEM T21-1-32	DATE 3/1/min.	MATERIAL Ba, Cd, chert	BUILDING 733	DATE 3-1-55
ANAL. WT.		CONVERSION HALOGEN TO TOTAL		
ppm/mg/l		PROCESS <i>Vinyl tile formation</i>		
EXPLANATION OF CALCULATIONS				

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SAMPLE	TIME	S. VOL.	ANALYSIS	Mg./l.	CONC.
1	5 min	15.l	Pb	.00347	397mg/m ³
			Ba	nil	nil
			Cd	<.00066	6.66mg/m ³
			chert	.102	102mg/m ³
2	5	15.l	Pb	nil	nil
			Ba	nil	nil
			Cd	<.00066	6.66mg/m ³
			chert	.093	93mg/m ³
3	5	15.l	Pb	nil	nil
			Ba	.004	4mg/m ³
			Cd	<.00066	6.66mg/m ³
			chert	.016	16mg/m ³
4	7.5	22.5l	Pb	.00098	98mg/m ³
			Ba	.0049	49mg/m ³
			Cd	<.000445	4.45mg/m ³
			chert	nil	nil
allowable concentration			Pb		.15mg/m ³
8 hr exposure 5 days a week			Ba		.5mg/m ³
			Cd		.1mg/m ³
			inert		15mg/m ³

DOW 01528

TO: S. Johann

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

MAIN LABORATORY

REPORT SHEET

DATE February 23, 1955

CHARGE 1219-26

MAIN LAB. NUMBER SSR 208-446

YOUR NUMBER 1-5

DESCRIPTION Atmosphere when making vinyl tile

ANALYSES OR TEST:

Sample	P.P.M. per Sample			
	Pb	Ba	Cd	Inert
1	5.2	nil	< 1.0	154
2	nil	nil	< 1.0	140
3	nil	.6	< 1.0	24
4	2.2	11	< 1.0	nil
5	7.4	11	< 1.0	nil

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DOW 01529

BY CDF

jh

Phone 8879

S. A. Shrader

574 Bldg.

Milipore Filter.

Sample No

1.

$$\frac{12 \text{ mg} \times 1000}{8 \times 3} = 50 \text{ mg/m}^3$$

$$2. \frac{0.0 \text{ mg} \times 1000}{3 \times 3} = 0.0 \text{ mg/m}^3$$

$$3. \frac{0.6 \text{ mg} \times 1000}{3 \times 3} = 66 \text{ mg/m}^3$$

$$4. \frac{2.2 \text{ mg} \times 1000}{2.75 \times 3} = 29.2 \text{ mg/m}^3$$

ST0030589

Roy McDonald.

Ralph McDonald

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