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Biochemical Research Laboratory

The Dow Chemical Company

EXPOSURES TO ASBESTOS DUST ENCOUNTERED IN THE CHLORINE CELLS MAINTENANCE AREA, 295, 236, 137 AND 261 BUILDINGS

File: T34.21-21-3(K)
Date: 9/9/69
By: R. A. DeGesero

ST0032517

Signed Roy A. DeGesero Date September 9, 1969

Checked H Stoyle Date 9-9-69

PROBLEM

Supervision requested that the Environmental Research Laboratory survey and evaluate exposures to asbestos encountered by personnel during several operations in the Chlorine Cells area, 295, 236, 137 and 261 Buildings.

CONCLUSIONS

1. The present TLV (Threshold Limit Value) for asbestos exposure is 5 mppcf (million particles per cubic foot). By 1971, barring information to the contrary, the TLV will be lowered to 2 mppcf. The proposed TLV should be observed.

RESTRICTED: for use within The Dow Chemical Company only.

2. The northern end of 295 Building (cell repair and screen making) is an area of potential asbestos exposure. The southern end of 236 Building (chipping and cell repair area) is an area of potential asbestos exposure. Other buildings reviewed in the Chlorine Cell Complex (261, 137) lack significant potential for asbestos exposure.

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3. In 295 Building, personnel in the job classifications Cell Maintenance Man and Diaphragm Puller receive time-weighted exposures to asbestos in excess of the present and proposed TLV's for asbestos (5 mppcf and 2 mppcf, respectively). The time-weighted exposures for these job classifications are

Diaphragm Puller	--	9.4 mppcf
Cell Maintenance "weigher"	--	6.3 mppcf
Cell Maintenance "set-up men"	--	2.7 mppcf

These exposures are unacceptable and must either be reduced to within the proposed health standard of 2 mppcf by lowering concentrations of asbestos-containing dust in air, or approved respirators must be worn.

4. "Spares" in 295 Building are receiving time-weighted exposures of 1.7-9.4 mppcf, depending on whom they substitute for. The yearly average time-weighted exposure is 5.0 mppcf, assuming "Spares"

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substitute equally for the Diaphragm Pullers, Set-Up Men, Repair Men and Weighers in the course of a year's work. This exposure is unacceptable and must either be reduced to within the proposed health standard of 2 mppcf by lowering concentrations of asbestos-containing dust in the air, or approved dust respirators must be worn.

5. Personnel in 295 Building who are receiving time-weighted exposures within the proposed TLV of 2 mppcf include:

Senior Cell Shop Mechanic	--	1.1 mppcf
Journeyman Cell Mechanic	--	1.1 mppcf
Foreman, Crew Leader	--	1.1 mppcf
Cell Maintenance "repair men"	--	1.7 mppcf
Plasterer	--	1.3 mppcf

No health hazard is anticipated at these time-weighted levels of exposure to asbestos.

6. The Liquid Chlorine Operator, Assistant Operator and Hydrogen Operator in 295 Building can receive exposure to asbestos during a daily mixing operation. Based on concentrations found to be typical of mixing operations, no hazard to health from asbestos exposure is anticipated in light of the brief exposure time (at most 20 minutes per day).

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7. The following job classifications in 236 and 137 Buildings were examined for potential asbestos exposure: Plant Mechanic (295, 137 Buildings), Electrode Maker (261 Building), Resin Protector Fabricator (236 Building), Cell Welder (236 Building), Special Welder (236 Building) and Electrician (295, 137 Buildings). Asbestos exposures encountered by personnel in these classifications are small, and asbestos is not used in their work areas to any great extent. No hazard to health from asbestos exposure is anticipated for personnel in these job classifications.

RECOMMENDATIONS

1. Personnel in the Chlorine Cells area who are currently receiving time-weighted exposures to asbestos-containing dust in excess of 2.0 mppcf should be required to use approved respiratory protection until other means of lowering exposures can be found (e.g., ventilation improvement, changing work procedures, etc.), or some material can be substituted for asbestos which does not present the pulmonary hazards of asbestos.

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2. Bags and drums of asbestos should not be allowed to release asbestos fibers to the room air. If possible, asbestos should be weighed out and handled within a suitable exhaust hood. Bags and drums should be kept sealed and covered when not in use.

3. Supervision should request asbestos manufacturers use packages which do not allow leakage of asbestos. The burlap bags allow visible amounts of asbestos to escape from the bag when bags are jarred or placed near open doors, etc.

4. The practice of sitting on bags of asbestos in 295 Building should be discouraged. Fibers of asbestos were seen to leak out of the burlap bags when men sat on the bags.

5. Good housekeeping is essential in safe handling of asbestos fibers. Spills should be cleaned up at once. Vacuum cleaning is preferred to sweeping with a broom. Supervision should determine whether an industrial vacuum cleaner is feasible in 295 Building or insist that prior to broom sweeping the spills be thoroughly wetted with water to minimize dustiness.

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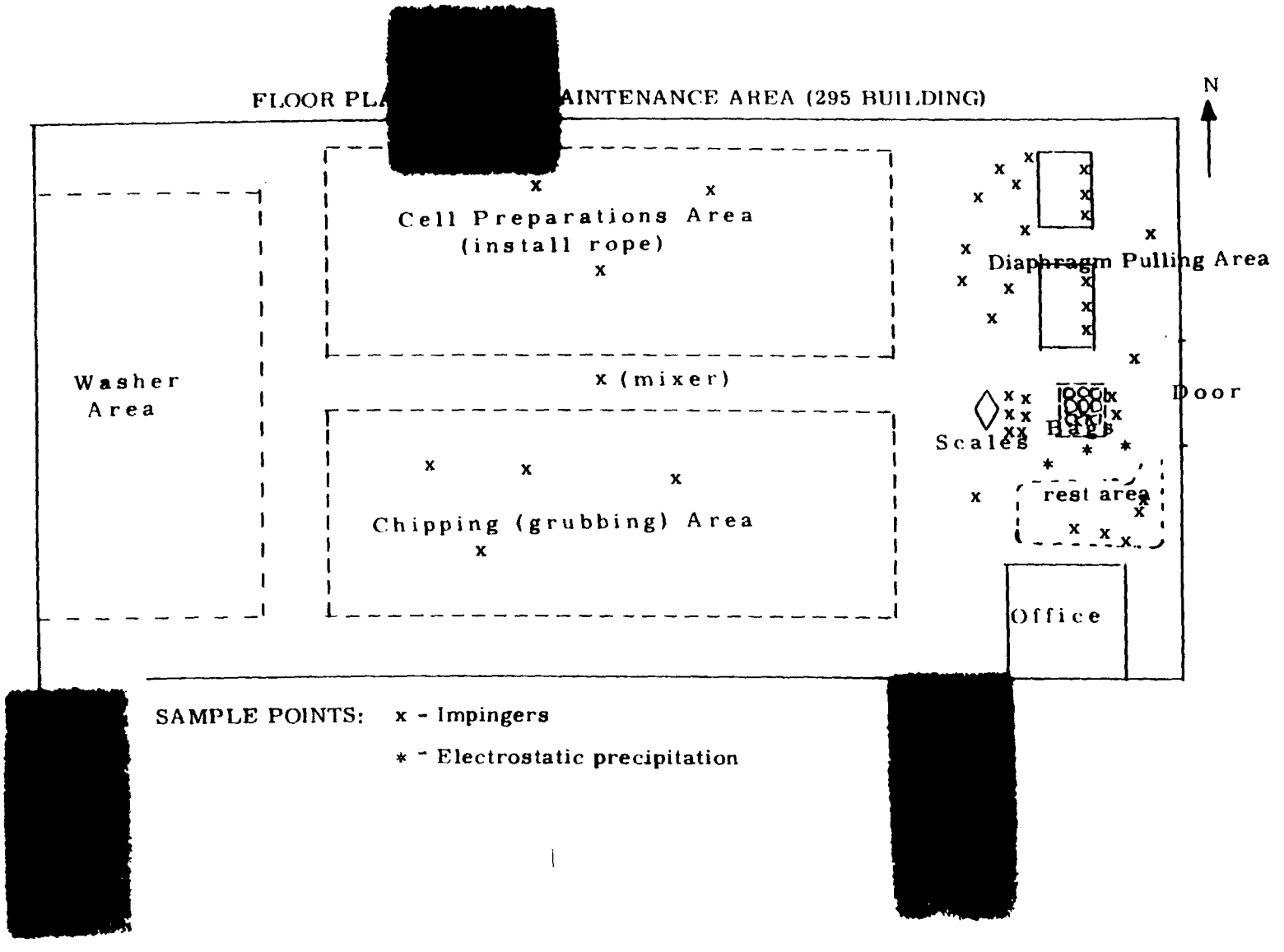
6. All personnel who have occasion to use asbestos should be informed of the hazards of the material and learn correct procedures for handling asbestos fibers so as to prevent high dust levels. An educational effort concerning use of approved* respiratory protection should be undertaken or continued, especially in areas of major exposures.

7. Any upgrading in ventilation, procedures, or handling of materials should be evaluated by the Environmental Research Laboratory to ascertain the effectiveness of such changes in terms of lowering exposures to asbestos dust.

PRESENTATION OF DATA

A total of 36 breathing zone impinger samples and 3 electrostatic precipitator samples were collected in 295 Building on May 13, May 14, May 15, and May 27, 1969. Three breathing zone impinger samples were collected in 236 Building on August 4, 1969. The enclosed Floor Plan shows sampling points in 295 Building.

*U.S. Bureau of Mines approved respiratory protection available at the Safety Department, 400 Building, include the "Dustfoe" 66 and Suregard R2090 cartridge respirators which remove the respirable range of dust. Respirators must be properly fitted.


FLOOR PL
AINTENANCE AREA (295 BUILDING)
N
Cell Preparations Area
(install rope)
x (mixer)
Washer
Area
Chipping (grubbing) Area
Diaphragm Pulling Area
Door
Scales
rest area
Office
SAMPLE POINTS: x - Impingers
* - Electrostatic precipitation

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Impinger samples have been collected and evaluated using standard light-microscopy techniques. Concentrations of asbestos-containing dust are expressed as millions of particles per cubic foot of air (mppcf). Electrostatic precipitator samples have been analyzed for concentration (mg/m^3) and crystalline composition (X-ray diffraction). Table 1 indicates that asbestos (serpentine) is the chief crystalline constituent.

Table 1. X-RAY DIFFRACTION ANALYSIS OF CRYSTALLINE MATTER IN THE BREATHING ZONE, 295 BUILDING.

Crystalline Material	Sample A	Sample B	Sample C
Serpentine (asbestos)	chief constituent	chief constituent	chief constituent
Calcite	5-15%	5-15%	10-20%
Quartz	5%	5%	5-10%
NaCl	10-15%	5-10%	10-20%
$Mg(OH)_2$	---------- possible trace in each sample ----------		

*Note that no value can be determined as to the amount of crystalline material and noncrystalline material present. The samples could, however, be as much as 50% noncrystalline.

Sample	Concentration (weight/vol of air)
A	1.0 mg/m^3
B	0.7 mg/m^3
C	0.7 mg/m^3

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Job Evaluation

An estimate of the effects on health of exposure to asbestos requires knowledge of both the concentration of dust and the length of time a man encounters such concentrations. Supervision and men define their activities by work areas to account for the eight hour day. The enclosed Industrial Hygiene Job Analysis tables list concentrations and exposure times for those job classifications which show significant potential for asbestos exposure.

The job classification Cell Maintenance Man has been subclassified into individual activities. The "weigher" in 295 Building weighs out asbestos and assists the Diaphragm Puller. "Set-up men" remove screens from the cement rabbits, transport the screens to the Diaphragm Puller, cut and install asbestos rope, mix, and plaster asbestos cement onto cells. "Repair men" may work in either 295 or 236 Buildings. Repair men's greatest exposure to asbestos is encountered during a chipping operation called "grubbing." Pneumatic chisels are used to rout dried cement, asbestos rope and putty off the cement forms, or "rabbits."

Exposures

An exposure describes the time-weighted eight hour average concentration of asbestos-containing dust encountered by personnel in

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the job classification being evaluated. Concentration and time of exposure vary independently of each other as the activity or location of work changes. Time-weighting integrates these two variables by summing the products of (concentration x time) for each change in area or activity according to the formula:

$$8 \text{ hr time-weighted exposure} = \frac{1}{480 \text{ min}} \sum_{i=0}^{n} (\text{conc. x time})_i =$$

for n different areas or activities.

The following table lists the time-weighted exposures for several job classifications in the Chlorine Cells area.

Building(s)	Job Classification	Time-Weighted Exposure to Asbestos (mppcf)
295, 236	Senior Cell Shop Mechanic	1.1
295, 236	Journeyman Cell Shop Mechanic	1.1
295	Foreman, Crew Leader	1.1
295	Plasterer	1.3
236, 295	Cell Maintenance "repair man"	1.7
295	Cell Maintenance "set-up man"	2.7
295	Cell Maintenance "weigher"	6.3
295	Diaphragm Puller	9.4
295	"Spares"	1.7-9.4*

*5.0 average

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Several other job classifications in the Chlorine Cells area were reviewed for potential asbestos exposure. Either there was no potential or very low potential for the job classifications mentioned below, so time-weighting was dispensed with.

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Building(s)	Job Classification
263	Resin Protector Fabricator
295, 137	Plant Mechanic
261	Electrode Maker
236	Cell Welder
236	Special Welder
295, 137	Electrician

Health Standards

A Threshold Limit Value (TLV) describes that eight hour time-weighted exposure to asbestos a man can repeatedly encounter for his entire work career with no adverse effect on health. The TLV is a time-weighted average. Exposures may exceed the TLV for brief time periods, provided such excesses are matched by periods when the exposure is correspondingly below the TLV. The present TLV for asbestos is 5.0 mppcf by impinger sampling techniques. The American Conference of Governmental Industrial Hygienists (ACGIH), which formulates the

TLV guidelines, has formally proposed that the TLV be lowered to 2.0 mppcf to provide better protection for asbestos workers. Barring evidence to the contrary, the TLV of 2.0 mppcf will go into effect in 1971.

"Spares," the Diaphragm Puller, Weigher and Set-Up Men receive time-weighted exposures in excess of the proposed TLV. A potential hazard to the health of individuals in these classifications exists. The other personnel in Chlorine Cells are exposed to less than 2 mppcf (time-weighted), and no hazard to their health is anticipated.

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DISCUSSION

Asbestos concentrations vary considerably near the tanks in 295 Building. Depending on the operation, concentrations range from 0.5-40.8 mppcf. The following table lists the operations, concentration means and concentration ranges of breathing zone impinger samples near the tanks.

Operation	No. of Samples	Dust Concentration (mppcf) Range	Mean
Sweep floors near bags	3	27.1-34.4	29.8
Swab excess wet asbestos off screens	8	0.5-30.0	16.3
Weigh out asbestos	6	4.3-40.8	15.1
Slurry asbestos and caustic	6	4.2-34.2	13.4
"Breaks" area	7	0.5-19.8	7.3

Concentrations of dust in the breathing zone caused by broom sweeping could be lowered if spills were wetted or vacuumed instead of being swept up dry. Use of suitable ventilation near the tanks would lower concentrations of dust in the breathing zone during the swabbing off of wet slurry and during slurrying of asbestos and caustic. Suitable ventilation at the scales would help lower dust concentrations in the breathing zone during weigh out operations. The concentrations measured in the breaks area would be lowered by adherence to both of the above suggestions.

Dust levels in the breaks area averaged 7.3 mppcf. This figure includes times when work has ceased at the tanks and scales. Data suggests that dust remains airborne in the breaks area and is added to as dust from other sources in the area (bags, spills) becomes airborne when men walk across spills or sit on bags. Concentrations of dust in the breaks area would be lower if spills were promptly vacuumed up, if bags were stored in a ventilated area and/or a better package were used, and men did not sit on burlap bags of asbestos.

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INDUSTRIAL HYGIENE JOB ANALYSIS

JOB NO.	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION
Diaphragm Puller

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED
Asbestos. During dumping of 135 pound lots into cold caustic; during slurrying of asbestos and caustic; during moving screens, etc.

DESCRIPTION OF OPERATION	Time (min)		Dust Conc. (mppcf)
Dumping asbestos into caustic and mixing by hand	41.6		13.4
Manipulating coated screens and preparing coatings	218.4		16.3
Miscellaneous jobs near tanks (refill caustic, etc.)	31.2		2.6
Carry samples to lab	6.5		<1.0
Pulling series in operations areas	162.3		<1.0
Breaks (assumed taken in maintenance area usually)	20.0		7.3
time-weighted exposure = $\frac{1}{480 \text{ min}} \sum_{i=1}^{n} (\text{conc. x time})_i$ = 9.4 mppcf			

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION
Cell Maintenance Man "Weigher"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:
Asbestos dust. During weigh-out operation (16 times per day, 135 pounds of asbestos fiber per time)

DESCRIPTION OF OPERATION	Time (min)		Dust Conc. (mppcf)
Weigh out 135 pounds of asbestos into 90 and 45 pound bags	62.5		15.1
Assist Diaphragm Puller (dump bags of asbestos, pull screens)	55.2		8.0
Sweep up floor near scales	6.5		29.8
Set up pins, perform general tasks near break area, breaks	175.5		7.3
Pull series in operating area of 295 Building	180.4		<1.0

$$\text{time-weighted exposure} = \frac{1}{480\ \text{min}} \sum_{i=1}^{n} (\text{conc. x time})_i = \underline{6.3\ \text{mppcf}}$$

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION

Cell Maintenance Man "Set-Up" Man

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos. During set-up of rabbits, ropes (cut and install), mix asbestos containing cement, grub rabbits, straighten plates, install screens.

DESCRIPTION OF OPERATION	Time (min.)		Dust Conc. (mppcf)
Cut and install ropes (pure asbestos)	10		3.1
Mix cement containing asbestos	3		3.2
Move cells and screens near Diaphragm Puller	218		2.6
Grub rabbits	68		5.5
Pull series in operating area	161		<1.0
Break (assumed taken in Cell maintenance area)	20		7.3

$$\text{time-weighted exposure} = \frac{1}{480\ \text{min}} \sum_{i=1}^{n} (\text{conc. x time})_i = \underline{2.7\ \text{mppcf}}$$

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	236, 295	8/28/69

JOB CLASSIFICATION

Cell Maintenance Man "Repair Man"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos. During chipping operations.

DESCRIPTION OF OPERATION	Time (min)		Dust Conc. (mppcf)
Chip (grub) cement and asbestos off rabbits	45		5.5
Remove plates, chip out graphite, repair graphite plates	254		1.0
Break	20		7.3
Pull series in 295 Building operations area	161		1.0

$$\text{time-weighted exposure} = \frac{1}{480\ \text{min}} \sum_{i=1}^{n} (\text{conc. x time})_i = \underline{\underline{1.7\ \text{mppcf}}}$$

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION
Spare Men

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:
Asbestos. During any operations in the Cell Maintenance area; substitutes for Cell Maintenance Men (Set-Up, Weigher, Repair Men) and Diaphragm Puller as needed.

DESCRIPTION OF OPERATION	Time (min)		Dust Conc. (mppcf)
Exposed to average of all dust concentrations in 295 Building in the Cell Maintenance area as per the tables on each job classification in the text.	480		5.0*

*Time-weighted exposure is in the range of 1.7-9.4 mppcf. Assuming equal distribution of time for the job classifications, the Spare Men substitute for (e.g., Cell Maintenance Men and Diaphragm Puller), the mean time-weighted exposure is 5.0 mppcf.

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	236, 295	8/28/69

JOB CLASSIFICATION

Senior Cell Shop Mechanic and Journeyman Cell Shop Mechanic

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos. During repairs near diaphragm pulling tanks (repair pumps), some exposure possible when repairing cranes in northwest corner of 295 Building cell maintenance area.

DESCRIPTION OF OPERATION	Time (min.)		Dust Conc. (mppcf)
Maintenance work in 236 Building, north end, breaks included	360		<1.0
Maintain cranes, etc., in northwest corner of 295 Building	96		<1.0
Maintain diaphragm pulling pumps in 295 Building	24		2.6

$$\text{time-weighted exposure} = \frac{1}{480\ \text{min}} \sum_{i=1}^{n} (\text{conc. x time})_i = \underline{1.1\ \text{mppcf}}$$

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION

Foremen, Crew Leaders

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos. During overseeing of operations in cell maintenance area

DESCRIPTION OF OPERATION	Time (min.)		Dust Conc. (mppcf)
Floor walking, supervising cell maintenance	360		1.1
Office work or visiting in operations area	96		<1.0
Leave 295 Building	24		<1.0

$$\text{time-weighted exposure} = \frac{1}{480\ \text{min}} \sum_{i=1}^{n} (\text{conc. x time})_i = \underline{\underline{1.1\ \text{mppcf}}}$$

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INDUSTRIAL HYGIENE JOB ANALYSIS

[redacted]	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION

Plasterer

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED

Cement. Very seldom exposure to asbestos, occurs only if plasterer goes into cell maintenance area of 295 Building to help out cell maintenance crew.

DESCRIPTION OF OPERATION	Time (min.)		Dust Conc. (mppcf)
Working atop series, plastering with cement and sand, cleaning skids, tearing down series in operating area	420		<1.0
Run washer, opening cells, miscellany at northwest corner of 295 Building	20		<1.0
Grub rabbits	15		5.5
Pull diaphragms (very seldom done)	5		14.9
Breaks, etc., taken in operating area usually	20		<1.0

$$\text{time-weighted average} = \frac{1}{480 \text{ min}} \sum_{i=1}^{n} (\text{conc. x time})_i = 1.3 \text{ mppcf}$$

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UNIT INDEX

The time-weighted exposures encountered by the Diaphragm Puller, "Spares," Cell Maintenance "weigher" and Cell Maintenance "set-up man," all in 295 Building, are in excess of present or proposed TLV's for asbestos exposure (5.0 mppcf and 2.0 mppcf, respectively). A potential hazard to health exists at the time-weighted levels of exposure to asbestos encountered by the men in these job classifications. Recommendations to improve engineering and/or use of approved respiratory protection to lower the exposures to within the proposed TLV of 2.0 mppcf have been made. All other job classifications reviewed in 295, 236, 261 or 137 Buildings are within the proposed TLV. No foreseeable hazard to health exists at such levels of exposure to asbestos. General recommendations reflecting good practice in handling and storage of asbestos were also made.

DISTRIBUTION

N. Freeman, Industrial Hygiene, Freeport, TEXAS DIVISION 5/26/71
J. E. Snider, Chlorine Cells Department, 295 Building
F. Freudenmuth, Chlorine Cells Department, 261 Building
C. W. Kline, Chlorine Cells Department, 261 Building
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C. G. Kramer, M.D., Medical Department, 607 Building
D. B. Morse, Safety Department, 401 Building
F. Martinelli, Industrial Relations Department, 400 Building
Sarnia - Heit Murray

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ABSTRACT OF ENVIRONMENTAL EXPOSURE DATA (CHEMICAL AGENTS)

Taken From Report (Number) 34 21-21-3 Survey Date 8/28/69

Chemical Surveyed Asbestos dust Report Date: 9-9-69

K-Number Designation _____

Personnel Designation: Department Name* Chlorine Warehouse

Department Index Number* 5610

Division/Plant Location Midland Division

Process Name Wiring Operation

Type of Process: Laboratory Scale [ ] Mini Plant [ ] Semi-Plant [ ]

Full Production [ ] Other [ ] Specify _____

Location of Process (Building Numbers) 295 Bldg.

Job Classification Designation*		Estimates of Exposure Parameters			
Name	Index Number	T.W.A.	Sample Range High	Sample Range Low	Nbr. of Samples
Diaphragm Puller	775015	9.4	218.4	<1.0	6
"Spares"	660755	5.0			1
Senior Cell Shop Mechanic	590065	1.1	2.6	<1.0	3
Journeyman Cell Shop Mechanic	590065	1.1	2.6	<1.0	3
Foreman	—	1.1	1.1	<1.0	3
Cell Maintenance Man					
"Weigher		6.3	180.4	<1.0	5

Type of Sampling: Area [✓] Continuous [ ] Breathing Zone [ ]

Units of Measurement: PPM by Vol. [ ] Mg/M^3 [ ] M of Particles/cu.ft. [✓]

Other [ ] Specify _____

Did process changes occur either since the last environmental survey or within the last two years which could have significantly affected exposure levels? _____

If "Yes", please specify.

Other Stresses Present (Chemical, Physical): _____

*As shown on official Personnel Lists

6-22-71

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ABSTRACT OF ENVIRONMENTAL EXPOSURE DATA (CHEMICAL AGENTS)

Taken From Report (Number) 34-21-21-3 Survey Date 8/28/69

Chemical Surveyed Asbestos dust Report Date: 9-9-69

K-Number Designation _____

Personnel Designation: Department Name* Chlorine Warehouse

Department Index Number* 910

Division/Plant Location Midland Division

Process Name During Operation

Type of Process: Laboratory Scale ☐ Mini Plant ☐ Semi-Plant ☐

Full Production ☒ Other ☐ Specify _____

Location of Process (Building Numbers) 295

Job Classification Designation*		Estimates of Exposure Parameters			
Name	Index Number	T.W.A.	Sample Range		Nbr. of Samples
			High	Low	
Cell Maintenance "Set-up Man"		2.7	7.3	<1.0	6
Cell Maintenance "Repair Man"		1.7	7.3	1.0	4
Plasterer	725755	1.3	14.9	<1.0	5

Type of Sampling: Area ☒ Continuous ☐ Breathing Zone ☐

Units of Measurement: PPM by Vol. ☐ Mg/M^3 ☐ # of Particles/cu.ft. ☒

Other ☐ Specify _____

Did process changes occur either since the last environmental survey or within the last two years which could have significantly affected exposure levels? _____

If "Yes", please specify.

_____

_____

_____

_____

Other Stresses Present (Chemical, Physical): _____

_____

_____

_____

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*As shown on official Personnel Lists

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
34.21-21-3	Chlorine Cell Mtnce	Asbestos	295	8/11/69

JOB CLASSIFICATION: Spare men

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos - during any operations in cell Maintainance area substitutes for Cell Maintaince men (Setup, weigher, repairmen) and Diaphragm puller, as needed.

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN HOURS	CONCENTRATION
Exposured to average of all dust cones in 295 Cell Maintaince area, as per Tables on each job classification listed above.		480	5.0
t.w. exposure is in the range of 1.7 — 9.4 mppcf Assuming equal distribution of time for the job classifications the Spares substitute for (e.g., Cell Maintainance and Diaphragm Puller), the mean, t.w. exposure is 5.0 mppcf			

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Pay Decision

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INDUSTRIAL HYGIENE JOB ANALYSIS

	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Mtnce	Asbestos	295	8/11/69

JOB CLASSIFICATION: Cell Maintaince Man "Setup-men"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos: during setup of rabbits - ropes (cut and install), mix asbestos - containing cement, grub rabbits; straighten plates, install screens.

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN HOURS	CONCENTRATION
Cut and install ropes (pure asbestos)		10	3.1
Mix cement containing asbestos		3	3.2
Move cells and screens near to Diaphram Puller		218	2.6
Grub rabbits		68	5.5
Pull series in Operating area		161	<1.0
Breaks (assumed taken in Cell Maintaince area)		20	7.3

T.W. exposure $= \frac{1}{480} \sum_{i=1}^{n} (\text{conc} \times \text{time})_i$

31.0
9.6
566.8
374.0
161.0
196.0

$\frac{1288.4}{480} = 2.7$ mppcf

reproduce this on each Table

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Mtnce.	ASBESTOS	295	8/11/69

JOB CLASSIFICATION: Plasterer

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: cement; very seldom exposure to asbestos, occurs only if plasterer goes into cell maintaince area of 295 to help out Cell Maintaince Crew

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN [illegible]	CONCENTRATION
Working atop series, plastering with cement and sand, cleaning skids, tearing down series in Operating Area		420	<1.0
Run washer, opening cells, miscellany at northwest corner of 295 Bldg		20	<1.0
Grub Rabbits		15	5.5
Pull diaphrams (very seldom done)		5	14.9
Breaks, etc, taken usu. in Operating area.		20	<1.0
420.0			
20.0			
82.5			
74.5			
20.0			

$\frac{617}{480} = 1.3$

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Mtnce	Asbestos	295	8/11/69

JOB CLASSIFICATION: Foremen, Crew Leaders

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos: during overseeing of operations in cell maintainance area

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN ~~HOURS~~ min	CONCENTRATION
Floor walking - supervising cell maintainance		360	1.1
Office work, or visiting in Operations area		96	<1.0
Leave 295		24	<1.0

396
96
29

$\frac{516}{480} = 1.1$ mppcf

ST0032545

1000-130 PRINTED IN U.S.A.

INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Mtnce	Asbestos	236, 295	8/11/69

JOB CLASSIFICATION: Senior Cell Shop Mechanic (also Journeyman Cell Shop Mechanic).

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:
asbestos: during repairs near diaphram pulling tanks (repair pumps)
some exposure possible when repairing cranes in Northwest
corner of 295 Cell Maintainance area

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN HOURS	CONCENTRATION
Maintainance work in 236 Bldg, northend; breaks		~~360~~ 360	<1.0
Maintain cranes, etc, in Northwest corner of 295		96	<1.0
Maintain diaphram pulling pumps in 295 Bldg		24	2.6

TW exposure =
360
96
62

$\frac{518}{480} = 1.1$ mppcf

ST0032546

SMP-130 PRINTED IN U.S.A.

INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Mtnce.	Asbestos	295	8/11/69

JOB CLASSIFICATION ~~Cell Maintenance~~ "Diaphragm Puller"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos; during dumping of 135 lb lots into cold caustic; during slurrying of asbestos and caustic, and during moving screens, etc.

~~Dump~~. DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN HOURS	CONCENTRATION
Dumping asbestos into caustic and mixing by hand		41.6	13.4
Manipulating coated screens, and preparing coatings		218.4	16.3
Miscellaneous jobs near tanks (refill caustic, etc.)		31.2	2.6
Carry samples to lab		6.5	<1.0
Pulling series in Operations area		162.3	<1.0
Breaks (assumed taken usually in Maintaince area)		20.0	7.3
557.44			
3559.92			
81.12			
6.50			
162.30			
146.00			
$\frac{4513.28}{480}$ = 9.4 mppcf			

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROCESS	MATERIAL	BLDG.	DATE
Chlorine Cell Mtnce.	Asbestos	295	8/11/69

JOB CLASSIFICATION: Cell Maintainance Man "Weigher"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos dust during weigh out operation (16 times per day, 135 lbs of asbestos fibre per time).

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME ~~IN HOURS~~ Min	CONCENTRATION
Weigh out 135 lbs of asbestos into 90 and 45 lbs bags.		62.5	15.1
Assist Diaphrampuller (dump bags of asbestos, pull screens)		55.2	8.0
Sweep up floor near scales		6.5	29.8
Set up pins, perform general tasks near breaks area; breaks		175.5	7.3
Pull series in Operating area of 295 Bldg		180.4	<1.0

943.75
441.60
193.70
1281.15
180.40

$\frac{3040.60}{480} = \boxed{6.3}$

ST0032548

INDUSTRIAL HYGIENE JOB ANALYSIS

PROBLEM	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine Cell Maintaince	asbestos	236, 295	8/11/69

JOB CLASSIFICATION: Cell Maintaince Man "repair men"

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED: Asbestos during chipping operations

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME ~~IN~~ min	CONCENTRATION
Chip (grub) cement and asbestos off rabbits		45	5.5
remove plates, chip out graphite, repair graphite plates		254	<1.0
Breaks		20	7.3
Pull series in 295 Operations area		161	<1.0
247.5			
254.0			
146.0			
161.0			
$\frac{808.5}{480} = 1.7$			

ST0032549

INDUSTRIAL HYGIENE JOB ANALYSIS

[redacted]	PROCESS	MATERIAL	BLDG.	DATE
T34.21-21-3	Chlorine Cell Maintenance	Asbestos	295	8/28/69

JOB CLASSIFICATION
Spare Men

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:
Asbestos. During any operations in the Cell Maintenance area; substitutes for Cell Maintenance Men (Set-Up, Weigher, Repair Men) and Diaphragm Puller, as needed.

DESCRIPTION OF OPERATION	Time (min)		Asbestos Conc. (mppcf)
Exposed to average of all dust concentrations in 295 Building Cell Maintenance area as per tables on each job classification listed above.	480		5.0
time-weighted exposure is in the range of 1.7-9.4 mppcf. Assuming equal distribution of time for the job classifications, the Spare Men substitute for (e.g., Cell Maintenance and Diaphragm Puller), the mean time-weighted exposure is 5.0 mppcf.			

S10032550

[redacted] PRINTED IN U.S.A.

THE DOW CHEMICAL COMPANY

MIDLAND, Michigan
July 8, 1969

ST0032551

M. G. Ott
Corporate Medical Department
2030 ARC

Enclosed is a list of job titles of men, in the Chlorine Cells area of the Midland Division, who are being exposed to asbestos, according to Chlorine Cells supervision.

If I can be of further help to you, please contact me.

Roy A. DeGesero

R. A. DeGesero
Biochemical Research Laboratory
1701 Building
6-4759

RAD:sjl

enclosure

ST0032552

Job Title	Encounters Asbestos Exposure YES	Min. NO
1) Cell maintenance man (295) —	(x)	
2) Plasterer (295) —	[redacted] (works atop series)	
3) Diaphragm puller (295) —	(x)	(x) [redacted]
4) Series maintenance (295) —	[redacted]	(x)
5) Sr. cell shop mechanic (236)	(x)	
6) Journey cell mechanic (236)	(x)	
7) Foremen, crew leaders —	(x)	
8) Spares* (295) —	(x)	
9) Plant mechanics (~~236~~, 295, 137) . . .		x
10) Electrode maker (261)		x
11) Resin protector fabricator (236)		x
12) Cell welder (236)		[redacted]
13) Special welder (236)		x
14) Electrician (295, 137)		x
15) Liquid Chlorine Operator [redacted]	(x)	
16) Asst Operator (137 B Hg) same as liq. chlorine operator		min
17) Hydrogen Operator.		

*Not originally mentioned, but supervision says this job title is exposed to asbestos.

ENVIRONMENTAL RESEARCH SAMPLE RECORD

ST0032553

FILE NUMBER	PROCESS	BLDG. NO	DATE
	Chlorine Cell Maint / Repair	29	5.[illegible].69

MATERIAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos	Impingement	dd N_2O / E-P

EQUIPMENT NUMBER	TYPE OF EQUIPMENT	FLOW INDICATOR SETTING	SAMPLE FLOW RATE	OUTSIDE TEMP.	INSIDE TEMP
MSA (6)	Air Pump / ESP	F.I / 6.5	2 E low / 6 . Hi	—	—

REMARKS (VENTILATION, ETC.)
Door Closed - All Doors Shut & Not Moving

SAMPLE NO.	CONTAINER NO.	DESCRIPTION OF SAMPLE	TIME START	TIME INCREMENT	CONCENTRATION
1	ESP (?)	Near bags of Asbestos; 10 KV	1:47	1:50	Lost
2	Imp (A)	Slurry Asbestos + Caustic	1:50	1:53	39.2
3	Imp (E)	Sweep up Around Bags	1:54	1:58	39.9
4	Imp (C)	Weigh out Asbestos	2:14	2:18	40.8
5	ESP (2)	"	2:14	2:18	Lost
		5.14.69			
6	Imp (1)	Slurry Asbestos + Caustic	8:42	8:49	17.0
7	ESP (1)	Area near Bags / Scale	8:30	10:30	11 min
8	Imp (2)	Slurry Asbestos + Caustic	10:27	10:30	Lost
9	Imp (3)	Weigh out Asbestos	10:35	10:40	Lost
10	ESP (3)	Gen'l area near bags, Scale	10:40	1:29	0.[illegible]
11	Imp (4)	Slurry Asbestos	10:45	10:49	Lost
12	Imp (5)	Slurry Asbestos (Door open then Shut)	11:05	11:10	9.6
13	Imp (6)	Slurry Asbestos (L) Door Open	11:25	11:28	9.2
14	Imp (7)	Weigh Asbestos Door Open	11:28	11:31	6.7
15	Imp (8)	Slurry Asbestos (R) Door Open	11:43	11:46	6.9
16	ESP (5)	Fest area	1:28	2:37	[illegible]
17	Imp (9)	Mix Cement (JM 3524 Hydropel)	1:50	1:53	3.2
18	Imp (10)	Install & Cut Asbestos Rope (one unit)	1:25	1:31	1.9
		5.15.69			
19	Imp (11)	Chip off Putty/Rope w/ air Chisel	8:55	9:05	7.7
20	Imp (12)	" " " " " " "	9:20	9:30	5.6
21	Imp (13)	" " " " " " "	9:30	9:35	5.3

ENVIRONMENTAL RESEARCH SAMPLE RECORD

FILE NUMBER	PROCESS	BLDG. NO	DATE

MATERIAL	SAMPLING METHOD	TRAPPING MEDIUM

EQUIPMENT NUMBER	TYPE OF EQUIPMENT	FLOW INDICATOR SETTING	SAMPLE FLOW RATE	OUTSIDE TEMP. °F	INSIDE TEMP

REMARKS (VENTILATION, ETC.)
Material JM #1000 3/4" Rope

ST0032554

SAMPLE NO.	CONTAINER NO.	DESCRIPTION OF SAMPLE	TIME START	TIME INCREMENT	CONCENTRATION
22	Imp 14	Weigh Asbestos w/ door open	10:48	10:51	8.1
		" " " " open	10:45	10:48	8.9
1	Imp 16	Weigh asbestos; Door Shut	11:05	11:08	10.6
25	Imp 17	Open	[illegible]	[illegible]	4.3
26	Imp 18	" " " Shut	1:42	1:45	20.1
27	Imp 19	Cut & hang up rope	1:15	1:14	6.1
28	Imp 20	Place rope onto cement rabbit	1:26	1:27	1.2
[illegible]	Imp 21	Grub rabbit (wet)	1:20	1:21	2.8
30	Imp 22	during screen prep & clamp set	<5.5		>30!
31	Imp 23	area near tank after wet [illegible]	<5.5		>30!
33	Imp 24	Area near tank during wet ops	<5.0		0.5
34	Imp 25	Area near tank during wet ops/[illegible]	[illegible]		1.3
35	Imp 26	Area at bags - [illegible] (Source)	[illegible]		19.8
36	Imp 27	area at bags	3.0		<0.5
37	Imp 28	Rest area	5.0		1.6
38	Imp 29	rest area	3.0		7.4
		5.27.69 - door closed			
39	Imp 30	Non-dust jobs on tanks (all but dump/slurry)	1:10	1:21	0.9
40	Imp 31	" " " " " " " "	1:12	1:21	7.8
41	Imp 32	" " " " " " " " "	1:15	1:21	>30!
42	Imp 33	" " " " " " " " "	1:25	1:33	>30!
43	Imp 34	back grd - in rest area; smoker	1:27	1:33	1.2
44	Imp 35	" " " " " non-smoker (d.wind)	1:28	1:33	4.6
45	Imp 36	" " " " "	1:35	1:45	16.2

ENVIRONMENTAL RESEARCH SAMPLE RECORD

FILE NUMBER	PROCESS	BLDG NO	DATE

MATERIAL	SAMPLING METHOD	TRAPPING MEDIUM

EQUIPMENT NUMBER	TYPE OF EQUIPMENT	FLOW INDICATOR SETTING	SAMPLE FLOW RATE	OUTSIDE TEMP °F	INSIDE TEMP °F

REMARKS (VENTILATION, ETC.)

SAMPLE NO.	CONTAINER NO.	DESCRIPTION OF SAMPLE	TIME START	TIME INCREMENT	CONCENTRATION
46	Imp 37	Sweep Up - on man	1:45	1:51	27.1
47	Imp 38	background - during sweep up	1:46	1:52	27.8

ST0032555

FORM 6-[illegible] PRINTED IN U.S.A. [illegible]

① Dust [illegible] cts [illegible]

Degrees
5 [illegible]

ST0032556

pi (A)

69/165/112/92/134 602

322/435/460/800/423 2140

274.2

− 20.0

254. cts/qf

$$\frac{254 \times 4 \times 1000 \times 10}{2.8 \times 3 \times 0.0351} = \frac{254 \times 4 \times 1000 \times 10 \times 10^{-6}}{0.099 \times 3}$$

$$= \frac{254}{3}\ 0.404 \text{ mppcf}$$

$$= \boxed{34.2 \text{ mppcf}}$$

Spl (B)

590/500/470/650/550 2760

178/147/163/147/165 850

361.0

− 20.0

341.0

$$\frac{341}{4} \times 0.404 = \boxed{34.4 \text{ mppcf}}$$

(2)

Deg: 0
5/6.09

ST0032557

Spl (C)

845/675/875/675/680
105/120/95/100/78

3750
488
423.8
-20
~~404~~ 101 × 0.404 = $\boxed{40.8}$
~~4~~

Spl D
294/253/260/253/276
325/340/445/335/350

1344
1795
314.9
-20
294 × 0.404 = $\boxed{17.0}$
7

~~Spl (D)~~
~~112/144/153/148/132~~
~~119/141/165/145/132~~

629
202
1391
-20
~~119.0~~ × 0.409 = $\boxed{9.6}$
~~5~~

81

Degas
5.1

ST00032558

Spl (7)

58/58/77/56/76 — 322

75/77/69/62/86 — 369

691

49 / 3 × 0.404 = **6.7 mppcf**

Spl (6)

68/42/50/44/32 — 236

56/58/55/67/58 — 299

510

31 / 3 × 4.09 × 10⁻¹ = **4.2 mppcf**

Spl (8)

70/100/75/89/93 — 427

87/92/76/100/98 — 453

880

45.0 / 4 × .404 = **6.9 mppcf**

Spl (9)

37/40/44/38/48 — 207

52/101/67/54/50 — 234

441

20.0 / 24 × 0.404 = **3.2 mppcf**

(9)

4

Spl (10)

53/50/62/63/83 311

100/36/88/80/69 373

68.4

- 20.0

$\frac{48}{10} \times 0.404 = \boxed{1.9 \text{ mppcf}}$

Spl (11)

212/164/203/147/121 847

191/254/269/290/250 1254

210.1

- 20

$\frac{190.0}{10} \times 0.404 = \boxed{7.7 \text{ mppcf}}$

Spl (12)

420/235/245/97/83 1080

122/111/106/113/111 553

163.3

- 20

$\frac{143}{10} \times 0.404 = \boxed{5.6 \text{ mppcf}}$

Spl (13)

65/70/82/66/73 356

79/102/85/105/126 497

85.3

- 78

[illegible] $\times$ [illegible] = $\boxed{5.3 \text{ mppcf}}$

ST0032559

Dorje:
5.20.69

ST0032560

Sample (14)

57/75/83/56/57 328

53/99/125/78/91 476

476
80.9
10
60/3 × 0.909 = 8.1 mppcf

-1st (15)

70/61/113/89/93 406

95/94/92/77/94 452

452
85.5
10
66/3 × 0.909 = 8.9 mppcf

Spl (16)

65/83/76/97/82 403

131/68/90/109/88 536

536
98.9
-20
79/3 × .909 = 10.6 mppcf

Spl (17) (Reloc)

14/28/26/32/28 128

24/27/18/35/19 120

120/198 = 0.7 mppcf

ST0032561

Spl 18

228/180/226/295/295 1173

125/120/80/112/118 555

173.8

20

$\frac{153}{3} \times 0.404 = \boxed{20.1 \text{ mppcf}}$

Spl 19

47/42/53/60/58 260

47/44/54/46/45 236

49.6

20

$\frac{30}{2} \times .404 = \boxed{6.1 \text{ mppcf}}$

Spl 20

19/31/27/22/15 114

19/22/26/20/33 120

234

20.0

$\frac{3.0}{1} \cdot 0.404 = \boxed{1.2 \text{ mppcf}}$

Spl 21

30/32/24/29/36 157

23/19/24/27/26 119

$\frac{119}{270} = \frac{7.0}{1} \times .404 = \boxed{2.8 \text{ mppcf}}$

(p7)

Count (redone) # 17

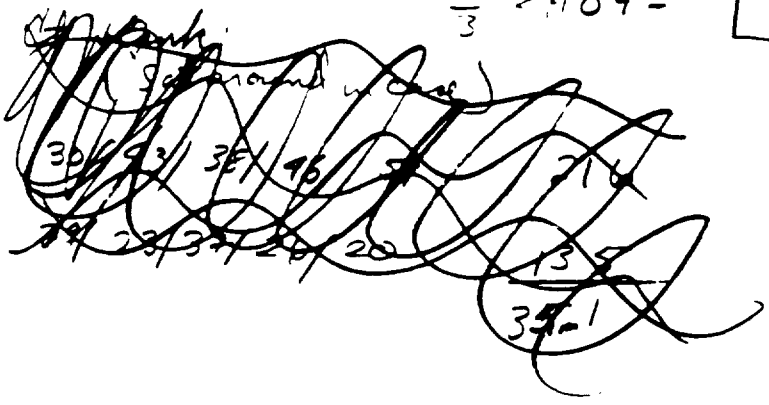
41/57/54/54/51 257

60/57/54/47/47 265

522

$\frac{34}{3} \times 409 =$ $\boxed{9.3 \text{ mppcf}}$

~~(Set around in case)~~



~~30/43/38/46/ 216~~

~~39/23/37/26/20 135~~

~~35.1~~

et

41/12/18/39/12 12[illegible]

19/20/14/16/14 78

20.0

∴ backgrd = 20

ST0032562

Bckgnd = 50.0

Spl 24

64/51/65/81/78 339

35/40/47/52/51 225

56.4

50.0

$\frac{6.4}{5} \times 0.404 = 0.5$

Spl 25

69/68/79/63/65 344

67/53/41/55/73 319

66.3

50.0

$\frac{16.3}{5} \times 0.404 = 1.32$

Spl 26

220/230/235/221/270 1176

300/275/245/265/200 1285

241.1

50.0

$\frac{196.1}{4} \times 0.404 = 19.8$

27

~~21/32/26/23/42 144~~

F. 2669 ~~41~~/43/49/62/49 248

~~38~~ 53/42/37/51 220

ST0032563

backgrd.

27/46/32/26/48 179

56/69/50/80/66 [illegible]

[illegible]

ST0032564

ST0032565

Spl 30

31/ 35/ 33/ 33/ 39

49/ 42/ 69/ 65/ 52

166
272
43.8
-20.0
23.8 / 11 × 0.409 = 0.9 mppl

Spl 31

212/ 250/ 255/ 265/ 245

111/ 147/ 185/ 135/ 150

1227
718
194.5
20.0
179.5 / 9.0 × 0.409 = 7.8 mppl

~~Spl 32~~

~~41/ 37/ 42/ 38/ 50 20.8~~

Spl 34

30/ 31/ 29/ 37/ 30

40/ 40/ 42/ 30/ 37

163
218
38.1
-20.0
11 / 6 × 0.409 = 1.2

ST0032566

Spl (38)

530/535/510/[illegible]/435 = 2305

424/385/420/395/340 1964

4329

20.0

412.9 × 0.404 = 27.8 mppcf

Spl 29

46/39/51/45/56 237

31/29/36/32/[illegible] 10[illegible]

4[illegible]

[illegible] × 0.404 = 1.6 mppcf

Spl (30)

65/85/[illegible]/71/97 413

71/57/76/73/61 33[illegible]

75.1

10.0

55.1 × 0.404 = 1.9 mppcf

3

ST0032567

ENVIRONMENTAL RESEARCH SAMPLE RECORD

FILE NUMBER	PROCESS	BLDG. NO.	DATE
		236	6.23.69

MATERIAL	SAMPLING METHOD	TRAPPING MEDIUM
		d.d. H_2O

EQUIPMENT NUMBER	TYPE OF EQUIPMENT	FLOW INDICATOR SETTING	SAMPLE FLOW RATE	OUTSIDE TEMP. °F	INSIDE TEMP. °F

REMARKS (VENTILATION, ETC.)
Very dusty backgrd from air hammers

SAMPLE NO.	CONTAINER NO.	DESCRIPTION OF SAMPLE	TIME START	TIME INCREMENT	CONCENTRATION
A	C	Grub rabbits - damp (somewhat)	7.0		
B	B	" " dry, visibly dustier than A	6.0		
C	a	on me as walk between A & B DUD	—		
D	D	Grub dry rabbits (	4.0		
E	E	" " "	4.0		
F	F	" " "	6.0		
G	G	" " "	3.0		
H	H	Bckgrd during cement) drilling	3.0		
I	I	" " " "	1.0		
J	J	" " Break; no drilling	3.0		
K	K	" " " " "			
(asbestos)		3 hrs/day - grubbing - ; (2 or 3 men chisel)			
		2 hrs/day - clean grooves on rabbits			
		1.25 hrs/day - scrap grooves			
		1.75 - miscellany, breaks; 8.4.69			
	1	Grub dry rabbit	5.0	2.[illegible]	
	~~2~~	~~" dry "~~	~~5.0~~	dud	
	3	" " "	5.0	9.0	
	~~4~~	~~blank~~	~~5.0~~		
	~~5~~		~~5.0~~		

ST0032568

FORM 0-16070 PRINTED IN U.S.A. 10-62

6. 23.6[illegible]
Gr[illegible]

overloaded w/ portland cement backgrd in excess of 400 ppm

Sample D

338/ 373/ 360/ 365/ 425 : 1861

312/ 378/ 358/ 338/ 305 1691

355.2

$\frac{\quad}{40}$ × 0.404 = [mppm]

Sample E (dil 4x)

223/ 240/ 260/ 275/ 240 1238

265/ 355/ 330/ 305/ 395 1640

287.8

× 4

1151.2

× .404 = [mppm]

Sample I

ST0032569

Grul dry [illegible] - 236 [illegible]

[illegible] 8.6.6[illegible]

[illegible]

56/54/48/53/62 273

67/70/103/68/70 398

67.1

[illegible]

34.1 × 0.404 = 6.8 mpp[illegible]

5.0

ST0032570

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]/141/150/166/166 715

161/150/153/170/101 735

145.0

33.0

112.0 × 0.404 = 9.0

5

	34.4	40.8		1.9
	27.1			6.1
	27.8			1.2
	29.8			3.1
13.4		15.1		

ST0032571

7.7		
5.6		
	>30	
	>30	
9.0		
5.5		7.3

16.3

all these not >30 (2.6 apart)

Cell Maintenance

1 hr -	weigh bags	160 min
1-2 hrs -	out of asbestos	60
1 hr -	help on tanks	90
1-1½ hrs -	pins (clamps)	90
1.5 hrs -	clean up around & stock mg	400 ← [illegible]
8.0 hrs		[illegible] ← [illegible]
		480

ST0032572

Screen Makers

20
8
160
2
320 min to pull screen

160 min.

max caution - 5 min

10 min - to [illegible]

150 min in area [illegible]

total of ~~470 min~~/[illegible]

Cell Maintainance (2) - prep & dissemble old cells

assemble new cells:

(1) put screen into cell
(2) asbestos rope; putty; (rope & cement) (before screen)
(3)

Pull screens (20 - 25 min)

Diaphram Pullers
Cell Maintainance

(1) load rinsed screen onto tanks.
(2) hook up suction line
(3) install pressure gauge
(4) shoot slurry into vat
(5) sink screen into asbestos
(6) pull off, sink again for 1 min
(7) pull off, stick out screen
(8) set clamps
(9) [illegible]
(10) [illegible] off [illegible], screen way up
(11) set guide rests; a chain.
(12) remove guides; run screen way up
ASBEST. (13) dump [illegible] 1 x 90 lb. bag, [illegible] 1 x 45 lbs bag of asbestos
4.2 (14) start evacuating vat, slurrying asbestos [illegible]
(15) after vat clean, pick up rinsed screen & load into tank.

16 × 3 = 48
16 × 32 × 3 = 96

50

1 × 2 × 3 × 4 × 5 × 6 × 7 × 8 × 9 × 10 × 11 × 12 × 13 × 14 × 15 × 16

3.3 × 15 = 165 + 33 = 495

16 ⟌ 3.00

25 × 16 = 150 + 25 = 400

16 × 4 = 64 + 336

16 × 21 = 16 + 32 = 336

ST0032573

Foremen - floor work 75%
- Office 25%
- 234 (237) etc. 10%

75% in Floor
20% on Operations
5% out of 295

Spares - (2)/day work in 295; ~~gmb - etc, any job.~~

ST0032574

ST0032575

U Van Summern -261 65573

pH control -

mix 1 bag/drum Liquid Chlorine Operator

this (15-25 % spent in diaphram area).

Sr Cell Shop Mech. - 10 hrs/wk in 295 repair vac pumps,
Journeyman Cell Shop Mech - diaphrams pulling equipment, almost all by [illegible]
30 hrs/wk in 236 (near floor for Cell Mtnce

---

plasterer (295) works a top series, plasters
tops on w/. cement & sand.
very little Asbestos Exposure.
Clean skids, tear down sacks
(out of 295 Cell mtnce 75% of
time),
25% of time in cell maintce.
open up, run, washer, etc., set
diaphrams (3 or 4 days in ½ year)

Series Maintnce. - work on floor at any job. (not once in 3 mos)

SAMPLE RECORD

DOW

CPRL REPORT 202360

ATTENTION:

SEND REPORT TO	DEPARTMENT	BUILDING	DOOR
De Gesero	Biochem Res	1701	
EXTRA COPIES TO			

ACCOUNT NUMBER	LEDGER	ACCOUNT	SUFFIX	PROBLEM INDEX	DEPT.	PROBLEM	DATE SUBMITTED	DATE NEEDED
	8213	011211	0216				5.15.69	ASAP

SAMPLE DESCRIPTION (identification number; name or structural formula; method of preparation)

TUBES 1, 4, 5

ST00032576

INFORMATION WANTED Identify & Quantify (% total crystalline)

Clay/Crystalline Phase

☑ RETURN SAMPLE BLDG. 1701 DOOR

☑ CALL RESULTS PHONE 6 9759

METHODS PREFERRED (SEE "MODERN METHODS OF RESEARCH AND ANALYSIS"): X-ray DIFF

PRECAUTIONS

☐ VERY TOXIC ☐ EXPLOSIVE ☐ LACRYMATOR ☐ NORMALLY NOT HAZARDOUS ☐ _____

☐ FLAMMABLE ☐ LOW BOILING ☐ SKIN IRRITANT ☐ PROPERTIES UNKNOWN _____

RESULTS

	-1	-4	-5	
SERPENTINE	c.c.	c.c.	c.c.	Chief constituent
CALCITE	5-15%	5-15%	10-20%	
QUARTZ	~5.%	<5.%	5-10%	
NaCl	10-15%	5-10%	10-20%	
$Mg(OH)_2$	POSSIBLE TRACE IN EACH SAMPLE.			

NOTE: NO VALUE CAN BE DETERMINED AS TO THE AMOUNT OF CRYSTALLINE MATERIAL AND NONCRYSTALLINE MATERIAL PRESENT. THE SAMPLES COULD, HOWEVER, BE AS MUCH AS 50% NONCRYSTALLINE.

ANALYST L. R RUNBERG DATE 5-22-69

FORM C-1670 PRINTED IN U.S.A. R1-68

CHEMICAL PHYSICS RESEARCH LABORATORY BUILDING 1603 DOOR 4
THE DOW CHEMICAL COMPANY - MIDLAND, MICHIGAN 48640

Asbestos in Cl Cells
ESP tubes 5 14.69
Degiorgio

m^3	ESP#	Tare Wt		mg (Δ)g	mg/m³
(22.1)	1	48.1573	48.1814	0.0241	1.1
	2	~~50.0653~~	~~50.0618~~	[illegible]	
	3	~~48.6814~~	~~48.6481~~	[illegible]	
	4	47.2833	47.3050	[illegible]	0.7
	5	48.2047	48.2133	[illegible]	0.7
	6	48.367[illegible]			

airflow ≈ 6.5 cfm = 184.08 l/min

ST0032577

Use this form for historical data only.

Industrial Hygiene Chemical Exposure Data Entry Log
Field Survey TWA Exposure And Excursion Exposure Data

Report no. 34.21-21-3/5608 Date 0869

Building no. 295 Index no. _____

Units of Data X Respirator Worn? _____

Master no. _____

ST0032578

Job Classification	Job No.	Chemical Name: asbestos DR# 270713 TWA/Exc.	Chemical Name: _____ DR# _____ TWA/Exc.
diaphragm puller	775015	9.4/16.3	/
cell maintenance man	758025	6.3/29.8	/
cell maint. man	758025	2.7/5.5	/
cell maint. man	758025	1.7/7.3	/
Spare men	660755	0/5	/
Senior cell shop mechanic	590064	1.1/2.6	/
journeyman cell shop mechanic	590055	1.1/2.6	/
foreman, crew leader	065755	1.1/1.1	/
plasterers	725755	1.3/14.9	/
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Use this form for historical data only.

Industrial Hygiene Chemical Exposure Data Entry Log
Field Survey TWA Exposure And Excursion Exposure Data

Report no. 34.21-21-3/5608 Date 0869

Building no. 236 Index no. _____

Units of Data X Respirator Worn? _____

Master no. _____

Job Classification	Job No.	Chemical Name: asbestos DR# 270713 TWA/Exc.	Chemical Name: _____ DR# _____ TWA/Exc.
cell maint. man.	758025	1.7/5.1	/
Senior cell shop mechan.	590064	1.1/2.6	/
journeyman	590055	1.1/2.6	/
		/	/
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ST0032579