PLAINTIFF'S EXHIBIT
DOW-106

Chlorine I

THE DOW CHEMICAL COMPANY

TEXAS DIVISION
FREEPORT TEXAS 77541

ST0014434

ENVIRONMENTAL SURVEY

Addendum "A"
File no. GP-3
Date January 17, 1972
work by O. N. Freemen
checked R.F. Glake M.D.
Date

SURVEY OF ASBESTOS USE IN CHLOR ALKALI PLANTS, SPECIFICALLY; CHLORINE I, CHLORINE 3, CHLORINE 5 AND CELL MANUFACTURING

PROBLEM

Industrial Medical Department of the Texas Division requested that the Environmental Health Group survey and evaluate exposures to asbestos encountered by personnel during several operations in the Chlor Alkali area specifically Chlorine I, Chlorine 3, Chlorine 5 and Cell Manufacturing.

CONCLUSIONS

After surveying the plants in the Chlor Alkali area that handle asbestos and calculating the Time Weighted Average (TWA), it can be concluded that the operators in these plants are exposed to asbestos concentrations well below the current TLV's.

RECOMMENDATIONS

1. From the standpoint of airborne asbestos contamination and the time weighted averages on exposure time it was concluded that we were well below the current TLV for asbestos.

After surveying the areas in the Chlor-Alkali plants that handle asbestos, it is recommended that all operators in the asbestos handling areas wear approved dust respirators as a precautionary measure from any asbestos that might contaminate the atmosphere in the future.

2. Caution and care should be exercised in the handling of asbestos in the bag to limit the asbestos coming from the bag in the emptying processes. Bags should be kept covered when not in use.

3. The practice of sitting on bags of asbestos should be prohibited.

4. Good housekeeping is extremely essential in the safe handling of asbestos fibers. Any bag breakage or spillage should be cleaned up at once. Vacuum cleaning is preferred to sweeping with a broom; however, if broom sweeping is the only way, the asbestos spill should be thoroughly soaked down with water to minimize dustiness.

5. All personnel who have occassion to use asbestos should be informed of the hazard of the material and the correct procedures for handling asbestos fibers so as to prevent high dust levels.

6. The areas handling asbestos should be checked periodically, at least once every 6 months by the department handling the asbestos, to insure correct handling procedures and to get a check on the airborne asbestos in the area.

PRESENTATION OF DATA

1. The present TLV (Threshold Limit Value) for asbestos exposure according to the Federal Register, Volume 36, Number 105, dated May 29, 1971, is five (5) fibers per milliliter greater than five (5) microns in length and this is for an eight (8) hour work day exposure.

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2. In the Chlorine I plant the job of the Class 2 Day Operator was studied in Building A-606. Thos operations job is performed usually by two (2) operators and is somewhat unusual in the respect that both operators in this classification perform the functions herein and these functions are only performed on an average of six (6) times per month. The operators were outfitted with MSA Rotameter pumps, filter holders and filters in order to ascertain dust concentrations of asbestos in their working operations. In working with asbestos these operators work 80 minutes per shift out of 480 minutes. This breaks down as follows; dumping dry asbestos into mixing dumpster requires 20 minutes per operation, concentration level measured in fibers per cc totaled 1.893.

The next job that was studied was transporting dry asbestos into the cell building which requires 10 minutes. Concentration level of asbestos measured here was 0.119. Next, mixing dry asbestos with water 5 minutes exposure time, concentration measured 0.612. Pulping cell with asbestos required 30 minutes, level of concentration measured on this job was 0.151.

The final job performed by these operators was that of unstopping feed line of pump. This requires 15 minutes and the concentration measured here was also 0.151.

The time weighted 8 hour average for these operators equaled 0.102 fibers per cc when job is being performed, dealing with asbestos fibers. These operations jobs lack significant potential in asbestos exposure, and the little asbestos measureable in the air was combated by the fact that operators on these jobs wear Dust-Foe 77 dust respirators.

According to the latest TLV quoted earlier in this report, it can be concluded here that exposure to asbestos in the operations jobs in Chlorine I, Building A-606 is well below the TLV.

3. In the B-622 Building at Chlorine 3, the operator that handles asbestos performs two functions in the same job, in that he dumps asbestos into the slurry tank and pulls diaphragms. The time spent in this operation totaled 420 minutes; however, this is a two man job and this time is divided by 2, indicative of one man exposure time to ascertain the TWA. The time weighted average per man in handling asbestos over an 8 hour period at Chlorine 3 was 0.263 fibers per cc, again well below the current TLV.

4. The handling of asbestos in the A-1322 building of the 1300 block at Plant A in Chlorine 5 entailed looking at several jobs. The first of which was the Towmotor Operator at Chlorine 5. This operator transports asbestos from the Hot House to the drawing vat and then moves the dumpsters of empty sacks from the vat area to outside the building. Time for these three operations performed by the Towmotor Operator totaled 38 minutes per 8 hour shift. The time weighted average exposure for an 8 hour period totaled .007 fibers per cc, below the TLV that is currently in effect.

The next job that was studied, dealing with asbestos in Chlorine 5, was that of the Cell Maintenance Operator who works in the diaphragm drawing process. This operator performs three main functions in relationship to asbestos handling and these are (1) breaking asbestos bags and dumping them into the drawing vat, (2) the diaphragm drawing operation itself, (3) epoxying heads, that is mixing asbestos with epoxy. The time weighted 8 hour average on this job totaled 0.1198 fibers per cc. Present TLV for asbestos exposure is 12 fibers per cc greater than 5 microns in length; therefore, it is concluded that the fiber count reported here is considerably less than the TLV.

5. In surveying the handling of asbestos in the Cell Manufacturing Area at A-1022, we found that three (3) operators performed the various functions on an alternating basis. The jobs that the operator in Cell Manufacturing does, relating to asbestos handling, involves dumping asbestos from the bags into the slurry tank, analyzing

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the slurry tank solution which is asbestos and caustic, the slurry tank operation itself which is dipping the cathode, and raking the cathode. The TWA on an 8 hour work day exposure period in Cell Manufacturing amounted to 0.314 fibers per cc of asbestos.

A total of 62 samples were taken in the Chlor-Alkali plants over a period of 15 months, from March of '70 to June of '71. MSA Rotameter pumps with filter holders and AAWG 04700, AA 0.8 micron white grid, 47 mm Millipore filters were used in the sampling. The microscopy group of central lab did the particle count.

Counting Procedure: Microscopy Lab B-1218

Incoming Millipore filters were sectioned out in four grid square sections and immersed in a 10% solution of millipor filter in a one to one mixture of dimethylphthalate and diethyloxalate on a slide and covered with a cover slip. When the filter section becomes clear it is placed on a microscope (40x objective and 12.5x eye piece or a total of 500x field magnification). Eye piece is equipped with a micrometer of 100 divisions, each division is equal to 2.5 microns.

Counting is done by making x number of passes across grid square until an average of approximately 300 particles and fibers are counted. Only fibers greater than 2.5 micron fibers and 5-10 microns and fibers greater than 10 microns are counted.

Particle or fiber number is ascertained by multiplying the number counted by $\frac{12}{X}$ and this gives you the number per squares and this figure is multiplied by the number of squares on filter.

Ref: Millipore ADM-30, 1964 adition.

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Table 1. Class II Day Operator Exposures to Asbestos Fibers, Chlorine I, A-606 Building

	Dry Asbestos	
	Time Min.	Avg. Conc. (fibers/cc)
Dumping asbestos into mixing dumpster	20.0	1.893
Transporting asbestos into cell building	10.0	0.119
Mixing asbestos with H_2O	5.0	0.612
Pulping cell with asbestos	30.0	0.151
Unstopping feed line of pump	15.0	0.151

Time-weighted Average Exposure (fibers/cc) -----0.102^f/cc

Threshold Limit Value* (fibers/cc) 5.0

*TLV (Threshold Limit Value) is the time-weighted average concentration to which most people can be exposed daily without adverse effect.

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Table 2. Operator Exposures to Asbestos Fibers, Chlorine III, A-622 Building
(Dumps asbestos & pulls diaphragms)

	Dry Asbestos	
	Time Min.	Avg. Conc. (fibers/cc)
Dumping asbestos & pulling cells (diaphragms) in slurry tank & proceeding through complete drawing cycle.	**420	0.263
Lunch, coffee & smoke breaks	60	

** This is a two man job and the figure for time is derived by dividing total two man time by 2.

Time-weighted Average Exposure (fibers/cc)-------0.263 f/cc

Threshold Limit Value *(fibers/cc) 5.0

*TLV (Threshold Limit Value) is the time-weighted average concentration to which most people can be exposed daily without adverse effect.

Table 3. Cell Maint. Operator (Diaphragm drawing) Exposures to Asbestos Fibers, Chlorine V, A-1322 Building.

	Dry Asbestos	
	Time Min.	Avg. Conc. (fibers/cc)
Breaking bags and dumping into drawing vat	12.0	0.80
Diaphragm drawing operation	324.0	0.147
Epoxying heads (Asbestos mixed w/epoxy)	10.0	0.031
Time-weighted Average Exposure (fibers/cc)-------0.1198 f/cc		
Threshold Limit Value*(fibers/cc)		5.0

* TLV (Threshold Limit Value) is the time-weighted average concentration to which most people can be exposed daily without adverse effect.

Table 3A. Towmotor Operator Exposures to Asbestos Fibers, Chlorine V, A-1322 Building

	Dry Asbestos	
	Time Min.	Avg. Conc. (fibers/cc)
Transports Asbestos from delivery point to hot house	30.00	0.084
Transports Asbestos from Hot House to drawing vat	5.00	0.084
Moving dumpsters of empty sacks from vat area to outside building	3.00	0.119

Time-weighted average Exposure (fibers/cc)--------.007 f/cc

Threshold Limit Value* (fibers/cc) 5.0

*TLV (Threshold Limit Value) is the time-weighted average concentration to which most people can be exposed daily without adverse effect.

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Table 4. Operator Exposures to Asbestos Fibers, Cell Mfg., A-1022 Building

	Dry Asbestos	
	Time Min.	Avg. Conc. (Fibers/cc)
* Dumping asbestos from bags into slurry tank	75	1.125
Analyzing slurry tank solution (asbestos & caustic)	75	0.677
Slurry tank operation (dipping cathode)	75	.145
Raking cathodes	100	.048
Breaks, Lunch, misc. duties & change time	155	

* Three operators perform these functions on an alternating basis.

Time-weighted Average Exposure (fibers/cc)----------0.314 f/cc

** Threshold Limit Value (fibers/cc) 5.0

TWA: $E = \frac{CaTa + CbTb + CcTc-------TaTn}{480}$

** TLV (Threshold Limit Value is the time-weighted average concentration to which most people can be exposed daily without adverse effect.

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INDUSTRIAL HYGIENE JOB ANALYSIS

	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine I	Asbestos	A-606	8-3-71

JOB CLASSIFICATION
Class II Day Operator (*Both operators in this class perform following functions. These functions (are performed on an average of 6 times per month)

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:
Asbestos, water, pumps, hoses & towmotors in building

*(These operators perform whatever operating conditions require in addition to time spent as listed below).

(Freemen)

DESCRIPTION OF OPERATION	FREQUENCY	TOT. TIME IN HOURS	CONCENTRATION f/cc
Dumping dry asbestos into mixing dumpster		20.0	1.893
Transporting dry asbestos into cell building		10.0	0.119
Mixing dry asbestos with H_2O		5.0	0.612
Pulping cell with asbestos		30.0	0.151
Unstopping feed line of pump		15.0	0.151
TOTAL		80.0	
		480.0	

Time weighted 8 hour average = 0.102 f/cc when job is performed

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DOW **ENVIRONMENTAL SURVEY SAMPLE RECORD** DATE: 1/__/__

BUILDING NO.	PROCESS	SUPERVISOR
A-666	Chlorine & "Dry Pulping" of Chlorine Cells	

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos	47 mm .3µ MEMBRANE FILTERS 160 FACTOR	Membrane filter.

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
MSA Monitaire	10				

REMARKS: Using GAF 1#H asbestos from 50 lb (?) burlap bags. Hand drops asbestos in plug hole. washes with water. Drops another handful Visable dust coming from funnel. About ⅓-½ bag hand fed into hole. then plugged hole back up. 1 holes pulped with the first bag. 1/__/66

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
34		blank						
35	#1 Pump	On pulping operator (Johnson). Flow indicator set on 10, PULPED 6 HOLES USING 1.5 BAGS OF ASBESTOS. KNEELING ON TOP OF SERIES TO HAND TRANSFER ASBESTOS INTO FUNNEL.	1:01	1:31	30/60 hr			~~1.64~~ 1.16
36	#2 pump	On Jack Barton, standing within 3' from the operation. Flow indicator set on 10	1:01	1:31	30/60 hr			0.064

Contd from above:

dust and Fumes visible in sunlight rising to roof monitors. Cells located in middle of Bldg. Series 16, There was about a 10 minute delay while the operator got another bag of asbestos and then he began the dry pulping operation again. Pulped two more holes. SLIGHT AIR MOVEMENT.

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INDUSTRIAL HYGIENE JOB ANALYSIS

	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine III	Asbestos	B-622	10-27-71

JOB CLASSIFICATION

Operator (Dumps asbestos & pulls diaphragms)

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos - electric hand hoist for cell handling - misc. valves for filling and emptying slurry tank and associated mixing of asbestos and caustic.

DESCRIPTION OF OPERATION	FREQUENCY	TOTAL TIME IN HOURS	CONCENTRATION
Dumping asbestos and pulling cells (diaphragms) in slurry tank and proceeding through complete drawing cycle.		420	0.263
Lunch, coffee & smoke breaks		60	
* This is a two man job and the figure for time is derived by dividing total two man time by 2			
Time weighted 8 hour average per man = 0.263 f/cc			

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ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE 6-28-71

BUILDING NO.	PROCESS	SUPERVISOR
B-622	DIAPHRAGM DRAWING - CELL MTC PROCEDURE	FREEMEN

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
ASBESTOS	Rotometer Pump	Milepore filter w/grid

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
Rotometer Pump	13		ESE	18 mph	85

REMARKS

CHL #3

8/

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Contr
60	Pump #1 10	Breathing zone of operator dumping asbestos for drawing diaphragms (>2.5 μ 774) (5-10 μ 72) (>10 μ 84)	4:13 PM	4:25 PM	12 min			0.
61	Pump #2	~~General area 16-18' from storm tank~~ Paper Tape stuck to filter, INVALID	~~4:14 PM~~	~~4:30 PM~~				5.
62	Pump #3 10	Breathing zone of operator during dumping ~~[illegible]~~ of asbestos. (>2.5 μ 996) (5-10 μ 78) (>10 μ 108)	4:13 PM	4:25 PM	12 min			
[illegible]		Above samples were taken through one complete drawing cycle						

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ENVIRONMENTAL SURVEY SAMPLE RECORD

BUILDING NO.	PROCESS	SUPERVISOR
B-622	CHLORINE CELL MAINT - DIAPHRAGM DRAWING	[illegible]

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
ASBESTOS	VACUUM PUMPS (MSA MONITAIRE)	FILTERS (MILLIPORE) 47mm

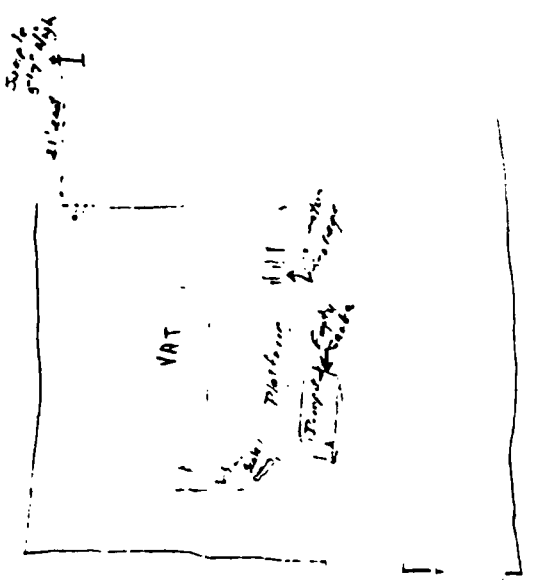
TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
VAT	10 [illegible]		NNW	14-18	[illegible]

REMARKS:

.275 [illegible] ASBESTOS [illegible] 40-[illegible] WAS DUMPED INTO VAT, OUT OF 3 BAGS PUMPS WERE WORN BY OPERATORS THROUGHOUT ENTIRE PROCEDURE.
AIR CALM IN BLDG.

Sample No.	Pump ~~Contain~~ No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ (MIN.)	Sample Volume	Analysis	Concentration
43	1	WORN BY OPERATOR (CHARLES GOLDEN)	1:54P	2:3[illegible]	40			.2
44	2	WORN BY OPERATOR RONNIE MARESH)	1:54P	2:34P	40			.5
45	4	ON POST IN CELL MAINT BLDG. APPROX 20 FEET FROM VAT. WIND IN BUILDING WAS BLOWING ACROSS OPERATORS AND VAT TOWARD PUMP ON POST.	1:54P	2:34P	40			.0
		ALL PUMPS WERE SET ON 10 FOR ENTIRE SAMPLING PERIOD.						
46	—	BLANK FILTER						

OPERATOR R. MARESH STATES THIS OPERATION TAKES PLACE APPROXIMATELY 8 TIMES EACH SHIFT.



WEST SIDE OF B-622

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DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 9-28-70

BUILDING NO.	PROCESS	SUPERVISOR
[illegible]	Diaphragm Pulling Cl #3	

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos	membrane filter	Millipore

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.

REMARKS

Johns-Manville JM 4L-12 asbestos
275 lbs dumped from 3 paper sacks.
275 lbs " " 5 " "

DP.S WORE DUST FOR 77's

ALL FANS OFF

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
Pump 1a		Operator breathing zone Rangel (HELPER) Rota-10	10:06	11:06	60min			0.05
Pump C Sample #C1		Pump location 30' east of diaphragm pulling operation. Rota ~~10~~ 9	9:55	11:10	75min			0.08
Pump #C		Pump location 70' east of asbestos operation Rota ~~10~~ 9-8 quick rock holder (Men working within 15'-Graphite dust etc.	10:00	11:14	74min			0.05
[illegible] #24		Other operator - breathing zone (OPERATOR) Rota 10	10:07	11:07	60min			0.11
#25		Control						0.

J.A. Barton 9-28-70

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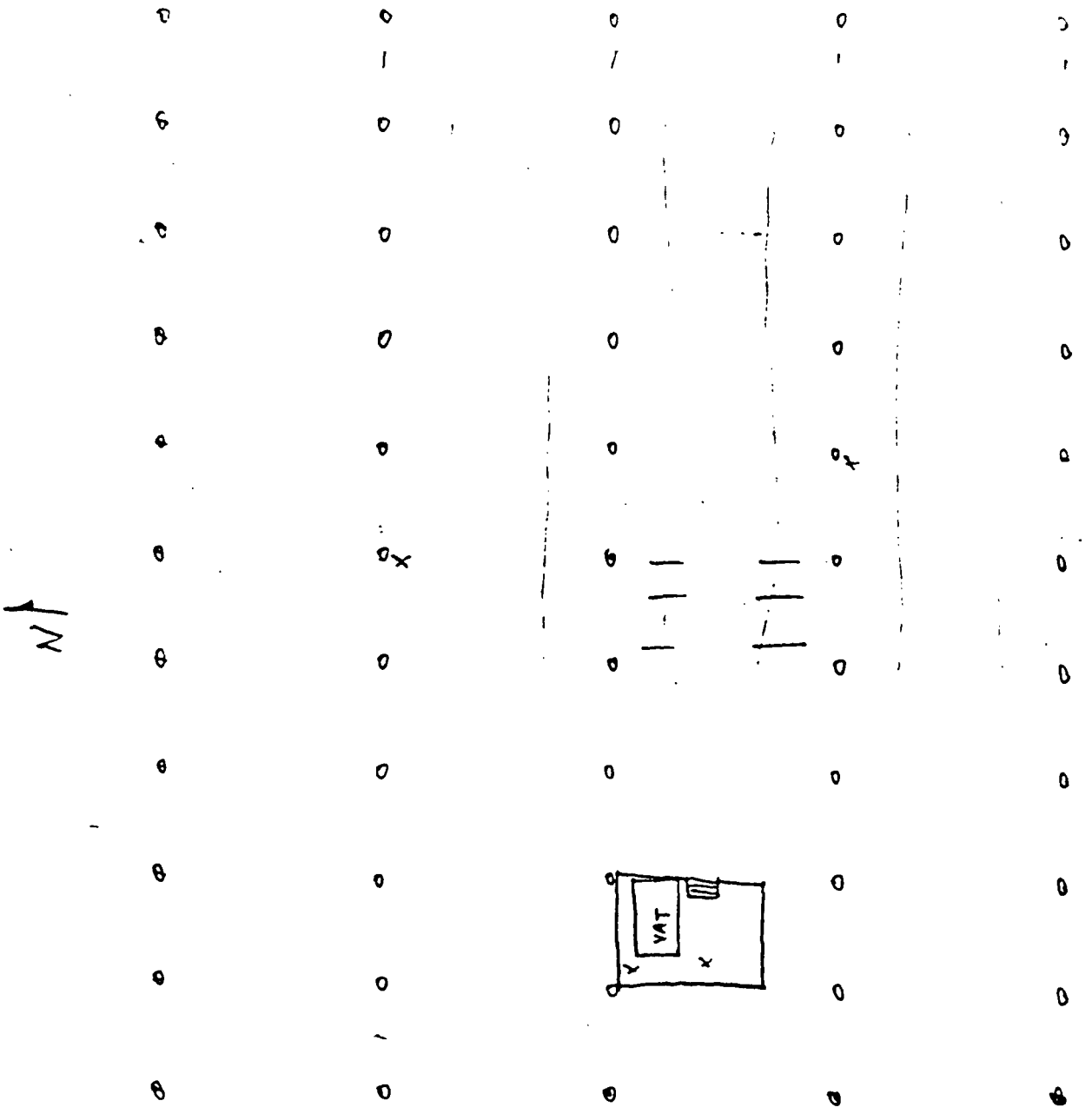
CHLORINE #3

9-22-70



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DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 8-18-70

BUILDING NO.	PROCESS		SUPERVISOR
B-622	CALORENE 3 DIAPHRAGM POLLING		E.W. KELLY RKH
MATERIAL OR CHEMICAL	SAMPLING METHOD		TRAPPING MEDIUM
	MONTAIRE & MEMBRANE FILTER		WILLIPORE AA
TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR. / VELOCITY / TEMP.
	ROTO = 10		

REMARKS DUST RESPIRATOR WORN EXCEPT WHEN CELL UNDER BATH MEN WORKING (SANDING COPPER, ETC.) IN LEFT OF REPAIR AREA.

LARGE FILTER HOLDERS

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
19	[illegible]	GENERAL AREA, CENTER OF CELL REPAIR AREA ~80' FROM SLURRY TANK, ~5½' OFF FLOOR. PUMP #4 4 MEN WORKING	13:28	14:05	37 MIN.			0
20	[illegible]	BREATHING ZONE OF OPERATOR. WHILE DUMPING 2½ BAGS (275 lb) OF ASBESTOS AND WHILE PLACING PLASTIC GUIDE BRACKETS ON DIAPHRAGM. ~3 MORE BAGS PLACED AGAINST VAT AND RIPPED OPEN BARE MAN WEARING FILTER STOOD DOWN WIND & IN WAY OF DUST. PUMP OFF WHEN SLURRY SUCKED BACK INTO SLURRY [redacted] TANK. PUMP #1	13:49	14:00	11 MIN.			0.1

J. A. Panton 8-18-70

ST0011451

12700 12-60

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 6-4-70

BUILDING NO.	PROCESS	SUPERVISOR
B-622	Chlorine #3	Al Williams

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
asbestos	MSA Monitaire + membrane filter	Millipore

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.

REMARKS

Hooker #1 (4D12)

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME (min) Start	Stop	Δ	Sample Volume	Analysis	Concentration
171	4-[illegible]	Breathing zone of operator during pulping of cell; operator picks up bucket of dry asbestos and applies it to portion of cell where needed.	1020	1032	12			0.04:
					J.A. Barton 6-4-70			

ST0014452

12700 12-60

ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 4-2-70

BUILDING NO.	PROCESS	SUPERVISOR
B-622	Chlorine 3 diaphragm pulling	E.W. Kelly, R T Crawford

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
asbestos	Monitaire + membrane filter	Millipore AA

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
	10 unless noted				

REMARKS

dust respirators not worn, sign in area says they "must be worn"
no overhead or wall fans on; large doors open
"large" filter holders used

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	(min) Δ	Sample Volume	Analysis	Concentration
14	large	General area near edge of cell repair area, ~ 50 ft from slurry tank Pump No. 1	10:25	11:31	66			~~0.~~ 0.[illegible]
[illegible]	large	Breathing zone of operator during 1 complete cycle Pump No. 4	10:28	11:00	32			~~0.~~ 0.
16	large	Breathing zone of operator during next complete cycle Pump No. 4	11:01	11:29	28			~~0.~~ 0..
					[illegible]	[illegible]	4-2-70	

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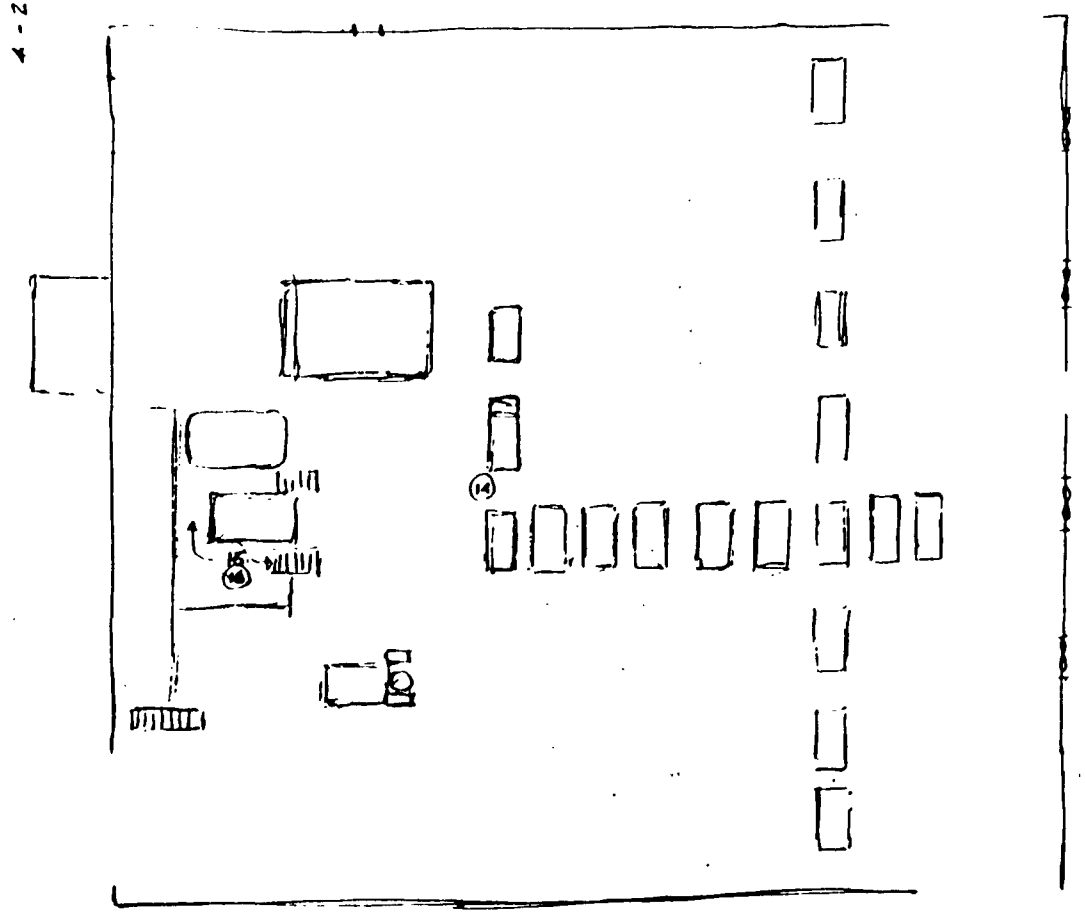
4-2-70



B-622
Chlorine 3

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INDUSTRIAL HYGIENE JOB ANALYSIS

PROCESS	MATERIAL	BLDG.	DATE
Chlorine V	Asbestos	A-1322	8-3-71

JOB CLASSIFICATION

Cell Maint. Operator (Diaphragm drawing)

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos, Caustic, Overhead Crane, Towmotor

(Freemen)

DESCRIPTION OF OPERATION	FREQUENCY	TOT. TIME IN ~~HOURS~~	CONCENTRATION
Breaking bags and dumping into drawing vat		12.0	0.80
Diaphragm drawing operation		324.0	0.147
Epoxying heads (Asbestos mixed w/epoxy)		10.0	0.031
TOTAL		346.0	
		480.0	
Time weighted 8 hour average = 0.1198 f/cc			

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NDUSTRIAL HYGIENE JOB ANALYSIS

	PROCESS	MATERIAL	BLDG.	DATE
	Chlorine V	Asbestos	A-1322	8-3-71

JOB CLASSIFICATION

Towmotor Operator

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos, cells & other material which may be used in Chlorine Production.

Operates Towmotor

(Freemen)

DESCRIPTION OF OPERATION	FREQUENCY	TOT. TIME IN HOURS	CONCENTRATION
Transports Asbestos from delivery point to hot house		30.00	0.084
Transports Asbestos from Hot house to drawing vat		5.00	0.084
Moving dumpsters of empty sacks from vat area to outside building		3.00	0.119
TOTAL		38.0	
		480.0	
Time weighted 8 hour average exposure =			.007 f/cc

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12700 12-40

Dow ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 7-2-70

BUILDING NO.	PROCESS	SUPERVISOR
A-1324	Chlorine 5 - pulping cells & storage of asbestos	J. Hart

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
asbestos	Monitaire + membrane filter	Millipore AA

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WND DIR.	VELOCITY	TEMP.

REMARKS

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
18	Yale 1	Breathing zone of man dry pulping three different places in chlorine cells; he carried bag of dry asbestos with him & applied material by hand into access ports at top of cell	0945	1000	15 min			0
		Flow rate – Rotameter = 10 (Pump No. 4)					7-2-70	
		2508 PARTICLES >2.5μ BY COUNT			X166 ÷ AIR VOL.			

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12700 12-60

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 3-31-70

BUILDING NO.	PROCESS	SUPERVISOR
A-1322	Chlorine V - diaphragm preparation	J. Hart

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
asbestos	Monitaire + membrane filters	Millipore AA

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
	10 unless noted				

REMARKS

All outside doors open but very little lateral air movement near tank
Overhead & window fans off
Johns-Manville 4D-12 ("Product of Canada"); rope from American Asbestos Textile Corp (N.H.) f/

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME (min) Start	Stop	Δ	Sample Volume	Analysis	Concentration
10	lg dia	Breathing zone of operator during dumping of 220# asbestos (Pump No. 2)	1:32:30	1:35:45	3.25			~~0.~~ 0.
"	small dia	General area (stationary) ~10' from slurry tank; Rotometer @ 9.5 (Pump No. 4) (@ 8 @ 2:15) one complete cycle	1:35	2:18	43			~~0.0~~ 0.0
12	lg dia	General area on upper level near coffee area (Pump No. 1) [8-9 men spent ~15 min in area from 1400 to 1415]	1:53	~~2:18~~ 2:53	60			~~0.0~~ 0.0
13	lg dia	Breathing zone of operator during one complete cycle; (1) loading 220# asbestos into mix tank (via suction), dumping asbestos into trough for next charge (220#), filling & agitation of slurry tank, drawing asbestos onto diaphragm, removing diaphragm from tank, loaded 220# asbestos (suction) Operation took ~26 min. (Pump No. 2)	2:24	2:50	26			~~0.0~~ 0.

R. F. Sirk 3-31-70

ST0014458

12700 12-60

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

11-16-70

BUILDING NO.	PROCESS	SUPERVISOR
	CHLORINE 5 — TRANSFER OF ASBESTOS ON PALLETS BY FORK LIFT TRUCK	

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
JOHNS MANSVILLE 4D-12 Asbestos	MILLIPORE AA FILTER	

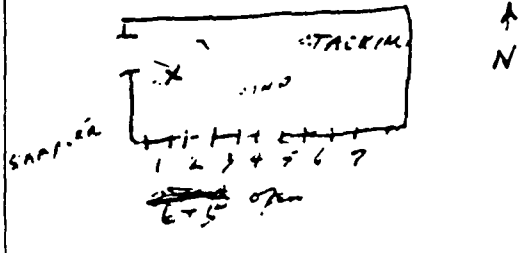
TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
MSA + Urinal pumps			SW 230°	10 mph	60

REMARKS

STORAGE BLDG (HOT HOUSE) HAS SOME VISIBLE PARTICLES IN THE AIR FROM BACKS - SACKS. THE ENTRY DOOR'S OPEN. STRONG WINDS OUTSIDE.

RECEIVE ~ 3 MULE TRAINS/MO. OF ~10 PALLETS EACH.
WHEN DRAW (~36 HR./SESSION) USE ~3 PALLETS.

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
~~[illegible]~~ 40	Pump #4	ON TOW MOTOR DRIVER - 7 PALLETS MOVED INTO HOUSE ROTO-10	2:05P	2:26	21 min.			0.15
~~[illegible]~~ 41	UNITED PUMP #1 holder	ON TOP OF 55 GAL DRUM AT W. END OF A-1303 IN OPEN DOORWAY. 2.8 l/min.	2:17P	2:40	23 min.			0.0
~~[illegible]~~ 42	Pump #4 #2 holder	ON TOMOTOR DRIVER, DELIVERED 1-PALLET FROM A-1303 TO DRAWING VAT IN A-1322 + BACK.	2:31	2:35	4 min.			0.1



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12700 12-60

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD DATE 1-15-71

BUILDING NO.	PROCESS	SUPERVISOR
	Cathode Drawing Operation	Loveless

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos		

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
MSA monitor Sampler	10	10	NNW	16 mph	69°

REMARKS

17²

(OHL = 5)

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Control
52	Pump 3	Pump on Mr. McConathy. Started pumping 4 2/3 bags of asbestos in drawing vat. Using Quick lock sample holder. 10 Just for dumping operation only. Door was open, the one near the drawing vat.	11:46	11:50	4 min			
53	Pump 4	on post in middle of bldg. (2nd post north of vat. Gravel area 10 50 feet from vat.	11:46	11:52	6 min			
(2)	Pump 3	Mr. McConathy moved from the vat ≈ 50 feet North and scooped asbestos out of a 5 gallon can and sprinkled asbestos over rack containg the cathode 10	11:50	11:52	2 min			
54		Blank						

ST0014460

IRONMENTAL SURVEY SAMPLE RECORD DATE: 3-23-70

PROCESS	SUPERVISOR
Chlorine V	J. M. Hart

HEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
bestos	Monitaire + membrane filters	Millipore

PMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
	10				

Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
[illegible]	"Control" - On bookcase in R.D Soule's office, B-101 Bldg. Pump #2	0835	0905	30 min.			~~[illegible]~~ 0.0[illegible]
[illegible]	BREATHING ZONE OF OPERATOR DUMPING 1 BAG OF ASBESTOS FOR SUCTION INTO MIXING TANK 100# Pump #2	1:35:10	1:35:55	45 sec.			~~[illegible]~~ [illegible]
2	150# dumped	1:48:10	1:49:50	100 sec. 2.41 min			
3	Pump #1 worn by Soule - walk around near operators while drawing diaphram (background)	1:50:00	2:10:00	20 m			[illegible] 0.01
2	250# dumped (F. ___ around awhile)	2:10:45	2:13:15	150 sec 4.91 min			

R. D. Soule 3-23-70

ST0014461

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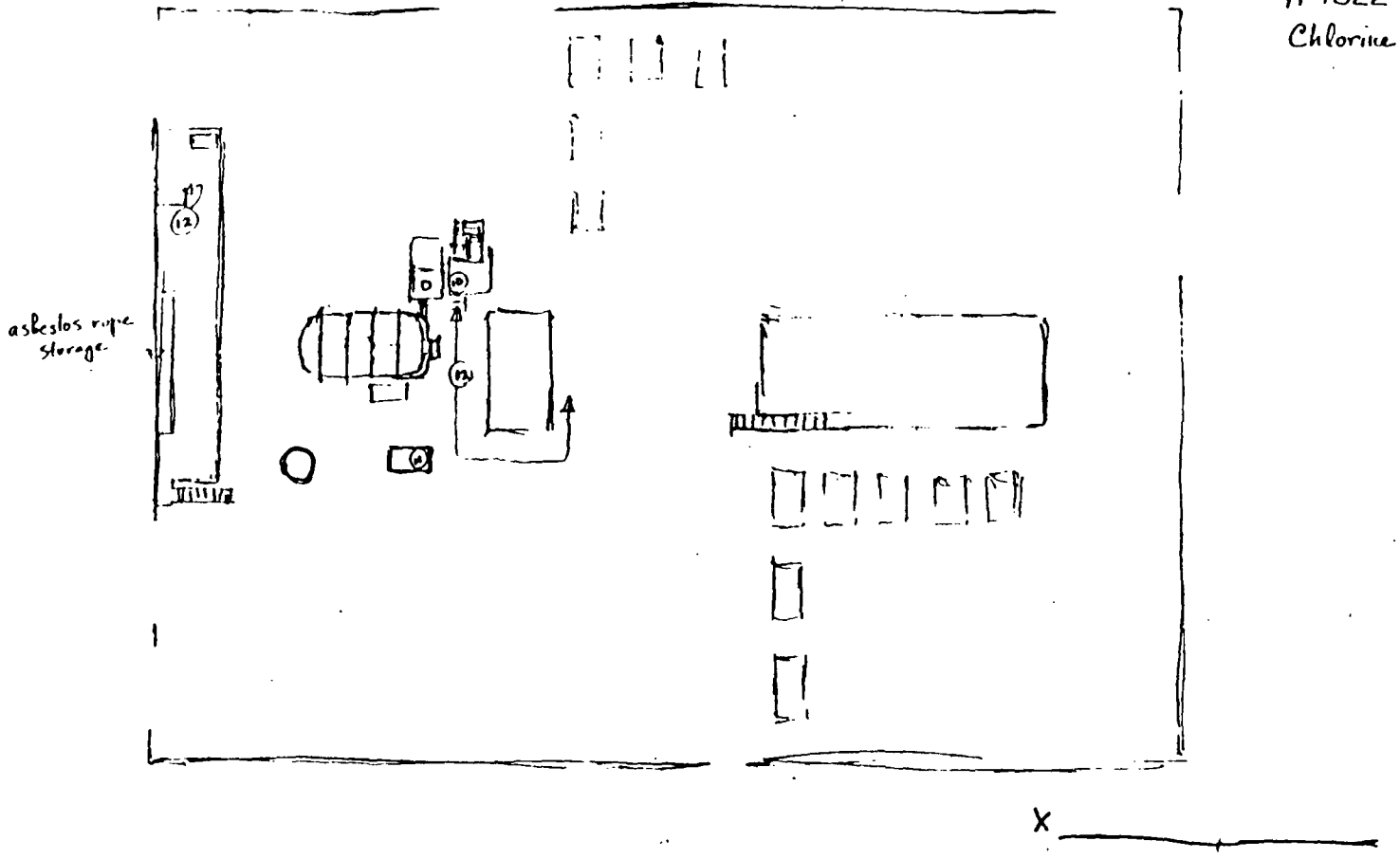
A-1322
Chlorine V



ST0014463

INDUSTRIAL HYGIENE JOB ANALYSIS

	PROCESS	MATERIAL	BLDG.	DATE
	Cell Mfg.	Asbestos	A-1022	10-27-71

JOB CLASSIFICATION

Operator

MATERIALS ENCOUNTERED AND EQUIPMENT OPERATED:

Asbestos - Hand Hoist - Misc. Valves

DESCRIPTION OF OPERATION	FREQUENCY	TOT. TIME IN ~~HOURS~~ Minutes	CONCENTRATION f/cc
* Dumping asbestos from bags into slurry tank		75	1.125
Analyzing slurry tank solution (asbestos & caustic)		75	0.677
Slurry tank operation (dipping cathode)		75	.145
Raking cathodes		100	.048
Breaks, Lunch, misc. duties & change time		155	

TWA : $\frac{E = CaTa + CbTb + CcTc\text{----}TaTn}{480}$

TWA 0.314 f/cc per 8 hour period

* Three operators perform these functions on an alternating basis.

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DOW ENVIRONMENTAL SURVEY SAMPLE RECORD 3/24.25

BUILDING NO.	PROCESS	SUPERVISOR
A-1022	CELL MANUFACTURING	S Thompson, B Erikson

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos	Moniture + membrane filter	Millipore AA

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
	10 (unless indicated otherwise)				

REMARKS

(1) OVERHEAD FANS OFF

(2) OPERATORS WORE DUSTFOE 77 DURING ASBESTOS DUMPING

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
4	Large filter holder	TOP OF EQUIPMENT LOCKER, N. END OF BLDG (DOWN WIND) PUMP #4 Rotometer @ 10, Asbestos dumped ~1 hr ago. 3-24-70 3-25-70	1:41	2:11	30 min			~~0.0~~ 0.0
5	Large	ON OPERATOR START AT BEGINNING OF ASBESTOS PUMP PUMP #2, Rotometer 10 (9:51-9:53 CLEANING CELLS WITH AIR BLAST, CENTER OF BLDG.) DUMPED 450 LB (2 men) ASBESTOS; 1 CAN FLAKE CAUSTIC (100#)	8:45	8:56:30	11.5			~~0.~~ 1.
6	Large	ON SOULE BACKGROUND, NEAR ASBESTOS STORAGE AREA, "DOWNWIND" OF SLURRY TANK AND ~10-15 FT. AWAY DURING DUMPING. PUMP #4, ROTOMETER ~10	8:46	9:06	20			~~0.~~ 0
7	Large	ON SOULE, REPRESENTS BREATHING ZONE OF MAN TENDING DIAPHRAGM DURING "PULLING" CYCLE, PUMP #2, Rotometer #10 9:40-9:55: BUFFING ON NEARBY CELLS	9:08 BREAK 9:37	9:15 10:01	31			~~0.~~ 0.
3	small	ON 2ND POLE FROM S. END Pump #4, ROTO. ~9.5	9:43	10:43	60			~~0.~~ 0.
9	Large	ON OPERATOR DURING (1) ANALYSIS OF SLURRY SAMPLES; (2) DUMPING 450 # ASBESTOS, 100 # CAUSTIC; (3) ~~MEASURING~~ (WEIGHING) ASBESTOS ~~FOR NEXT CYCLE~~ FOR ADDITION TO TANK TO MAKE UP PUMP #2, ROTOMETER @ 10	10:13	10:33	20			~~0.~~ 0.

[signature] 3-25-70

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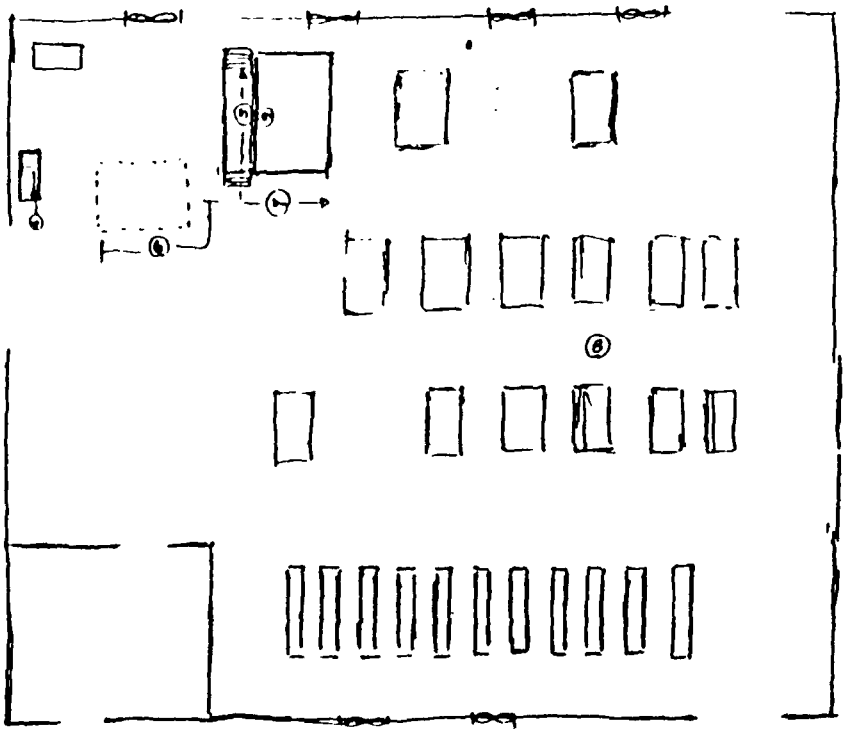
A-1022



12-60

ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 10-30-70

BUILDING NO.	PROCESS	SUPERVISOR
A-1322	Cathode Drawing Co.	

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
[illegible]		

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
			110° East	[illegible]	[illegible]

REMARKS: 6 pellets of ~16 bags of A-49750 - 4B-12 JM asbestos on bldg. - all abrasive, [illegible] with holes thin. - asbestos on floor & tank work stand. - dumpsters of "empty" bags [illegible] in bldg. - doors open, 1-ax fan on S. side - paper bags. Samples represent approximately [illegible]

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
30	Pump 2 ROTO-#9	General Area Sample. See attached Plot. Using Dicksons watch. 5.2 CFH	1:43	2:40	57 min			0.0[illegible]
31	Pump 3 ROTO-8	General Area Sample. See attached plot. Dicksons watch. Quick lock holder. 4.4 CFH	1:43	2:42	59 min			0.0
32	Pump 1 ROTO-10	Worn by operator in drawing area only. 465# or 4½ bags. Start when dump bags for new cycle. Brown. 5.55 CFH	1:46 2:18	2:05 2:36	19 36.5 min			0.4
33	Pump 4 ROTO-10	Worn by operator in drawing area and touch up area. Sprinkling dry asbestos on cathode pellet (J.C.). Start when dump bags for new cycle. 5.3 CFH	1:32 1:46 2:18	1:41 2:05.30 2:36	19 19.5 46.5 min			0.[illegible]

J. A. Barton 11-[illegible]-70

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10-22-30

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12700 12-60

ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 11-[illegible]-70

BUILDING NO.	PROCESS	SUPERVISOR
A 1022 A (OVEN)	CELL MFG. DIAPHRAGM DRAWING & DRYING	

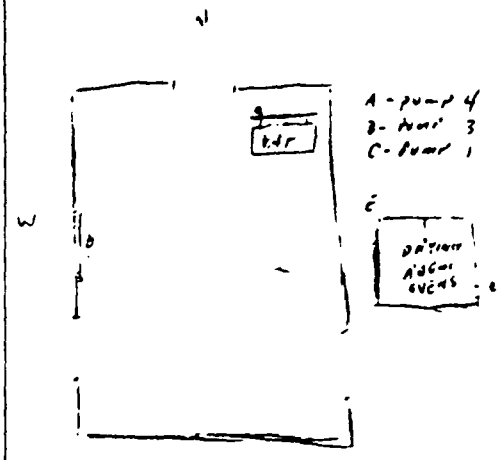
MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
ASBESTOS	FILTER	[illegible]

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
[illegible]			[illegible]	6	72°

REMARKS

Air flow through bldg is from east to west. N & E & W doors were open, and fans are off.

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	MIN. Δ	Sample Volume	Analysis	Concentration
# 47	1	Set up outside drying room door in front of louvers in bottom of door. Pump approx 8 inches from door. Pump set on 10 (101 OVEN B)	9:07A	9:52A	45			.00
# 49	#4	Misc air sample in cell bldg (A1022) Pump placed on hand rail next to vat. Appx 4½' off floor. Pump set on 10	9:20A	9:56A	36			~~.04~~ .00
# 48	#3	Misc air sample in cell bldg. (A1022) pump placed on shelf on west wall about 6' off floor. Pump set on 9	9:23A	9:59A	36			0.0



ST0014468

NORM FREEMAN & LEE SILVERTHORN

12703 12-68

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD DATE: 12-1-70

BUILDING NO.	PROCESS		SUPERVISOR
101 B - Oven	Cell Manf. (Drying)		
MATERIAL OR CHEMICAL	SAMPLING METHOD		TRAPPING MEDIUM
Asbestos	Filter		.8 μ millipore
TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR. / VELOCITY / TEMP.
MSA (Monitor-Air)			S.S.E. / 8 mph /

REMARKS

PUMP WAS SET UP JUST OUTSIDE DOOR ON 'B' OVEN ON A BLOCK OF WOOD ABOUT 10 INCHES HIGH AND 8" FROM LOUVERS ON BOTTOM OF DOOR.

DIAPHRAGMS WENT INTO OVEN — SAT. 11-28-70 AT NOON
DUE TO COME OUT — 12-1-70 AM OR 12-2-70 ORDINARILY (i.e. WHEN EVER PU

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	MIN. Δ	Sample Volume	Analysis	Concentration
~~49~~ 50	Pump 4	S.E corner of 101 B-oven ≈ 8" from door. At floor louvers at bottom of door. Meter set on 10.	1257 PM	1457	48			0.0
~~50~~ 51		BLANK						

ST00144469

12700 12-80

DOW ENVIRONMENTAL SURVEY SAMPLE RECORD

E: 5-[illegible]11-71

BUILDING NO.	PROCESS	SUPERVISOR
A-1022	Cathode Drowing	

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos (Johns-Manville 4D-12)		

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
MSA Monitaire Sampler	10		160°	8mph	76

REMARKS
All doors in bldg. A-1022 are open. A good breeze going thru bldg.

((Bill Airey))

Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Correction
56	Pump 4 Diaphragm 4	10-15' W of drowing operation on 1st pole. Started when they began dumping Asbestos. Stopped at 8:39 because they are not ready for actual drowing. (10)	8:31 9:29	8:39 10:06	[illegible] [illegible]			0
57	Pump 3 Diaphragm 3	J.O. Brown wearing pump only thru dumping of asbestos. 4¾ bags @ 100# a bag was dumped. 465 lbs total Johns-Manville Asbestos 4D-12 (10)	8:31	8:35	[illegible]			
58	Pump 3	J.O. Brown dumping asbestos again. Only for Asbestos dumping. Dumped 4½ bags. Total 435# (10)	10:24	10:26	[illegible]			
59	Pump 4	10-15' W of dumping operation on 1st pole. Didn't start actual drowing until 11:11 and broke for lunch and started up again at 12:00. During this operation they have swept around vat and are washing down around vat with H_2O. (10)	10:24 11:11 12:00	10:26 11:23 12:25	[illegible] [illegible] [illegible] 39 min.			

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#26

12700 12-60

ENVIRONMENTAL SURVEY SAMPLE RECORD

DATE: 10-23-70

BUILDING NO.	PROCESS	SUPERVISOR
	Cell Manufacturing	B.U. Eriksson

MATERIAL OR CHEMICAL	SAMPLING METHOD	TRAPPING MEDIUM
Asbestos Fibers		Membrane Filter

TYPE OF EQUIPMENT	FLOW INDICATOR	SAMPLING RATE	WIND DIR.	VELOCITY	TEMP.
0.8 μ Millipore AA					

REMARKS: Asbestos being used Johns Manville AD-12 from Canada.
Roots of Building open. Fan by drawing operation not operating. Other fans operating 4½ bags dumped.
Wind S-12 temp 77
DRAWING M-81 DIAPHRAGMS - AVE. 3-4 PER SHIFT, SELDOM WORK OVER

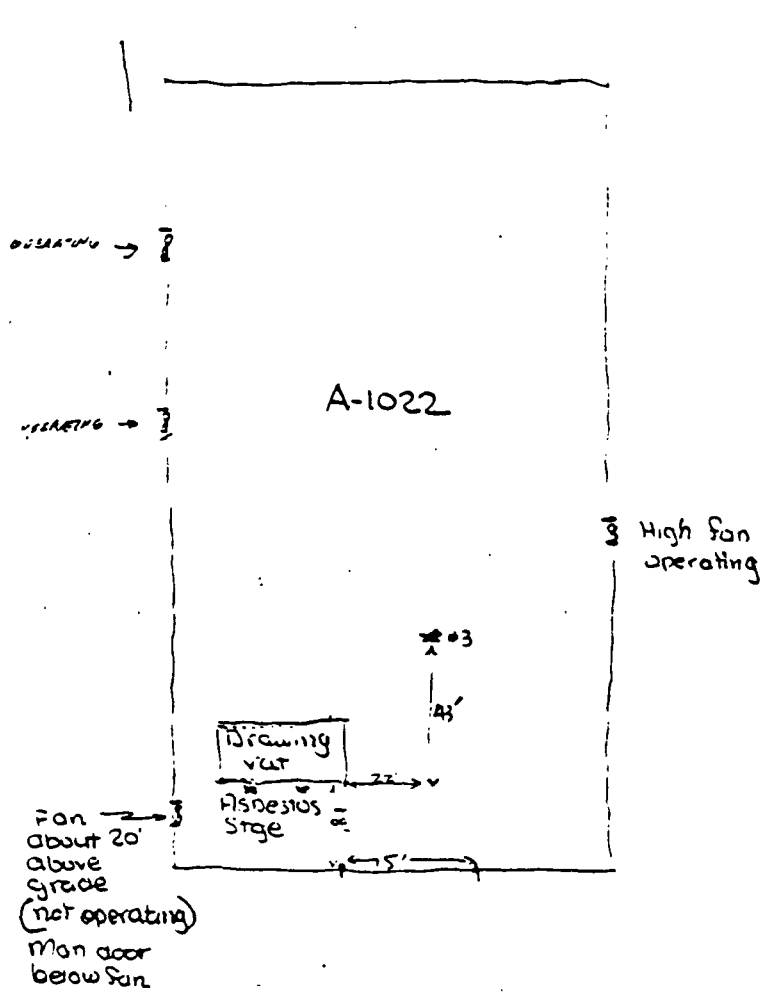
Sample No.	Container No.	SAMPLE DESCRIPTION	TIME Start	TIME Stop	TIME Δ	Sample Volume	Analysis	Concentration
#26	Pump #4	~~Frank~~ JO BROWN Operator breathing zone. Sampling rate 10 5.3 CFH	10:16½	11:11	54.5 min			0.13
#27	Pump #1	~~[illegible]~~ FRANK Operator breathing zone. Sampling rate 10 5.55 CFH	10:17	11:09½	52.5 min			0.31
28	Pump #3	Quick lock filter holder Sampling rate 9 See diagram for location of pump 5.1 CFH	10:18½	11:13	54.5 min			0.0
29	-	Blank						

J. A. Burton 10-23-70

ST0014471

ASBESTOS SURVEY
A-1000 Cell Manufacturing

JAB & BSH
10-23-79



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