R & D REPORT

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TITLE

EVALUATION OF ASBESTOS EXPOSURES TO THE ASSISTANT OPERATORS, CHLORINE II PLANT, 47 BUILDING, DOW CHEMICAL OF CANADA LIMITED, SARNIA DIVISION

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DESCRIPTIVE SUMMARY WITH CONCLUSIONS: (Include in this space references to data books, and to earlier related reports, patents and publications.)

Asbestos exposure to the Assistant Operators was evaluated while "dumping" asbestos, "drawing" the cells and "pulping/souping". Time-weighted average (TWA) exposures to asbestos fibers $\geq$ 5 microns were acceptable.

PLAINTIFF'S EXHIBIT DOW 24

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FORM C-35545

PROBLEM

The Industrial Hygiene Laboratory of Health and Environmental Research was asked to re-evaluate asbestos dust exposures to the Assistant Operators during the preparation and "drawing" of cells and while "pulping/souping" the cells in series.

CONCLUSIONS AND RECOMMENDATIONS

1. Atmospheric concentrations of asbestos fibers were found to be below the acceptable time-weighted average (TWA) exposure for the Assistant Operators when drawing, pulping, chipping and cutting.

2. The use of "bunny suits" or throw-away coveralls and respiratory protection is good practice and should be continued.

3. Although the TWA was below 2 fibers per ml while pulping or souping, further engineering controls are encouraged to reduce peak exposures.

4. The asbestos containers located on top of the cells in the cell house could be located in a central control area similar to the "penthouse" at Chlor Alkali 1, Sarnia Division. A ventilating system should be considered in such an instance. In the meantime, the asbestos materials in the hold container should be wet down each day souping

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is necessary.

5. The use of "mouth bit respirators" or "sucker masks" are designed for escape purposes only. These masks should not be used in place of the recommended dust and organic vapor type respirators (for use in the cell area).

6. The practice of "cutting asbestos rope" for the new cells does not appear to present an immediate hazard to health under the use conditions measured, however, the employees should continue to be encouraged to wear all protective clothing and respirators supplied as fibers were noticeable as the rope was unrolled.

7. "Chipping" does not present a hazard to health from asbestos as measured under work conditions.

8. The vented hopper helps to contain fibers, during "dumping" of dry asbestos.

9. Good housekeeping is essential in reducing exposures to asbestos fibers. The areas surveyed at the Chlorine II complex appear to be adhering to this policy.

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10. For those individuals working in areas where dry asbestos is handled long hair should be either covered or the individual should be encouraged to shorten the hair. Showers should also be encouraged and careful examination should insure that no asbestos fibers are transported to the home.

PROCESS

Drawing of the cells is dependent in part on the use of asbestos and caustic. The two materials are combined to form a slurry in which the cells are lowered and coated by suction.

The slurry was prepared by adding two bags of GAF-H No. 2 asbestos, (short fibers) into a ventilated hopper. Glove covered hands were used in adding the contents of the bags. Once inside, a small rake was used to break up the larger pieces of asbestos. A caustic solution was then added and mixed. From this point it is transferred to the draw tank.

For a given period of time suction is applied to this cell which enables the slurry close contact with the screens and pockets of the cells (cathode side). The cells are then wiped (smoothed) and checked for potentially leaky areas (visually). The cells are then baked or cured.

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a. The substance shall be isolated.

b. Adequate ventilation shall be provided.

c. Personnel protective clothing or equipment shall be worn.

Section 80:

Where a person may be exposed to concentrations of lead, benzol or asbestos, likely to endanger his health, a notice stating the dangers involved and the precautions necessary for the protection against such dangers shall be posted in a conspicuous place.

Section 81:

Where a container is used to hold any substance which contains lead, mercury, asbestos, isocyanates, silica, enzymes, fluoride, benzol or other toxic liquid, solid or gas, the container shall be marked or labelled in clear legible type so as to identify the presence of the toxic material and its principal hazards.

Disposable "bunny suits" or coveralls and proper respiratory protection was used while dumping asbestos and cutting asbestos rope. All time-weighted average exposures based on current Ontario Law of 2 fibers per ml were within acceptable limits. It is encouraged however, that the protective equipment now being used continue to be issued and worn as good work practice.

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"Chipping" is generally done by the same workers that "draw the cells". This operation involves a small hand held motorized hammer which they use to remove the worn seals and asbestos rope from the cells.

"Rope cutting" is another function which the same operators may or may not be involved. Asbestos rope (generally in 30-pound boxes) is unrolled to about 30 foot length, cut and re-rolled. Asbestos fibers could be seen as the material was unrolled.

"Pulping or souping" was done by two men, also classed as Assistant Operators, however, these men were not involved in the preparation and drawing of cells. They have as part of their responsibility the job of plugging leaks in the operating cells. This is done by preparing a mixture of asbestos, water or brine in an open bucket. This mixture was poured through a funnel leading to the effected cell area. The number of buckets needed is dependent on the severity of the leak.

DISCUSSION

The Industrial Safety Act, 1971, of the Ontario Regulation No. 259/72 Section 79, 80 and 81 states that "all measures necessary to prevent exposure to any toxic substance by inhalation . . . shall be taken . . . where any toxic substance is used or produced".

The bunny suits are also worn while souping and in most cases the proper respiratory protection is worn. Levels approaching the 10 fibers per ml ceiling limit for asbestos was measured when the operators transferred asbestos into open buckets (6 to 8 fibers per ml were noted). Two types of asbestos were used concurrently while pulping or souping.

1. GAF-H No. 1 (long fiber asbestos)
2. J&M 7M asbestos (very fine grain)

One of the operators was wearing approved respiratory protection good for both dust and organic acid gases. The other was using a mouth bit respirator or sucker mask generally used for emergency escape purposes only. This practice is not recommended.

Threshold Limit Values (TLV's) or time-weighted averages (TWA) are defined as being those concentrations that an individual can be exposed throughout an 8-hour work day without adverse effects on their health.

The current Threshold Limit Value for asbestos is 2 fibers per ml (cc) for an 8-hour period of time, 10 fibers per cc ceiling limit, Ontario Law. Ceiling exposure guidelines simply mean that a worker under no circumstances should be subjected to exposures above that level regardless of duration of exposure.

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Exposures above the accepted TWA but below the ceiling must be offset by exposures below the TWA.

SAMPLING AND ANALYSIS

General and breathing zone samples were taken in the cell maintenance and cell house area of 47 Building, Chlorine II Plant on February 25, 1975. Fifteen samples in all were obtained.

Three types of pumps were used to pull the sampled air through filter paper. A Mine Safety Appliance 8-hour pump and a Bendix Unico were used for personnel samples. A high volume RAC pump was used to obtain specific short-term breathing zone samples and long-term breathing zone area samples.

Air samples were obtained by drawing a known volume of air through a 37 mm millipore filter cassett or 47 mm diameter millipore open face filter. (Calibration data is included in original data file.)

When sampling was complete, a wedge shaped portion of the filter was removed and placed dust side up on a drop of mounting solution and a cover slip placed on top of the specimen. The sample was examined using a binocular phase contrast microscope equipped with 450 X magnification. A porton reticle eye piece was used

to define the counting field and to assist in making length judgment. Only those fibers with at least a 3 to 1 aspect ratio and greater than or equal to 5 microns in length were counted for the 20 fields. Analysis methodology used is as follows:

a. Effective Area of 47 mm filter = 961 sq. mm
   Effective Area of 37 mm filter = 855 sq. mm

b. Porton Reticle = 5μ x 100μ = 5000 sq. μ
   The number of fields counted = 20
   The area of 20 fields = 0.1 sq. mm

c. (Count) $\frac{\text{Area of filter}}{\text{Area of 20 fields}}$ = total fibers/sample

d. $\frac{\text{Total fibers/sample}}{\text{ml air sampled}}$ = Fiber/ml

PRESENTATION OF DATA

Table 1 indicates all areas sampled in the cell house and cell maintenance area of the Chlorine II Plant. Also included in this data are the actual number of fibers counted and the resulting fibers per ml.

Figure 1 is an overview of the above 2 areas covered with the sampling sites (number 1 through 15) corresponding to Table 1.

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Table 2 represents the Assistant Operator's daily exposure when dumping, drawing, and cutting rope. Table 5 represents that same operator's potential daily exposure when chipping only is done. Table 3 shows peak exposure concentrations to asbestos while carrying out specific job duties by an Assistant Operator. Table 4 includes chipping, cutting, drawing and dumping operations as done by the Assistant Operator on a monthly basis. Tables 6 through 8 show daily, weekly, and peak exposures for the Assistant Operator's responsible for pulping/souping in the cell house of the Chlorine II Plant.

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TABLE 1

BREATHING ZONE ASBESTOS SAMPLES FOR THE ASSISTANT OPERATORS IN CHLORINE II

Job/Location	ml air	Total Fibers Counted	Total Fibers Sample	Fibers/ml
1. Chipping asbestos from old cell. (BZ personnel)	17290	0	--	0
2. 4' from cell being chipped (BZ)	122500	0	--	0
3. Operator loading & drawing (BZ personnel)	83200	6	51300	0.62
4. Operator loading & drawing (BZ personnel)	71300	7	59850	0.84
5. Dumping asbestos into hopper (BZ)	70000	28	269332	3.85
6. Filling draw tank (BZ)	70000	0	--	0
7. Drawing the cell ~ 6' from operator (BZ)	142400	0	--	0
8. Removing loose, wet asbestos from cell (BZ)	35000	0	--	0
9. BZ Personnel sample while operator is pulping	32100	6	51300	1.6
10. Transferring asbestos while pulping (BZ)	12280	9	76950	6.27

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TABLE 1 CONTINUED

Job/Location	ml air	Total Fibers Counted	Total Fibers Sample	Fibers/ml
11. Filling cells $\bar{c}$ slurry (BZ)	6140	0	--	0
12. Same as #10	9200	9	76950	8.36
13. Cutting asbestos rope (BZ personnel)	46000	9	76950	1.67
14. Cutting & unrolling rope (BZ)	105000	5	48095	0.46
15. Same as #1	20600	2	17100	0.83

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TABLE 2

BZ PERSONNEL SAMPLES WHILE DUMPING, DRAWING AND CUTTING ROPE - BASED ON EXPECTED DAILY EXPOSURE

Job	(Min) Sample Time	A *T/480	B Avg. Fibers/ml	A x B Daily TWA Fibers/ml
Dumping asbestos, breaking it up, filling the draw tank, removing loose asbestos from cell	68	0.75	0.73	0.55
Cutting Rope	15	0.125	1.67	0.25
Misc. areas, Lunch and breaks	--			0
		1.0		0.8
Ontario TLV				2.0

* (T) Expected work time (minutes) ÷ 480 minutes (8-hour work/day)

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TABLE 3

BZ SHORT TERM SAMPLES TO DETERMINE

PEAK EXPOSURES FOR SPECIFIC OPERATIONS

Job	Sample Time (Min)	Fibers/ml
Dumping asbestos & breaking it up	4	3.85
Filling "draw tank" with slurry	4	0
Taking off loose wet asbestos from cell	2	0
Unwinding rope, cutting & rewinding	6	0.46

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TABLE 4

ESTIMATED TIME-WEIGHTED AVERAGE EXPOSURES, BASED ON 8 DAYS WORK/MONTH CHIPPING AND 10 DAYS/MONTH DUMPING & CUTTING ROPE

Job	(Min) Sample Time	A *T/9600	B Avg. Fibers/ml	A x B Monthly TWA
Dumping & drawing	68	0.375	0.73	0.27
Cutting	15	0.062	1.67	0.10
Chipping	7 & 19	0.3	0.415	0.12
Misc. areas, Lunch & breaks				0
				0.49

*(T) Expected work time (minutes) ÷ 9600 minutes (8 hr work/day, 40 hr/wk for 4 weeks.

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TABLE 5

BZ SAMPLES WHILE CHIPPING OLD CELLS (ONLY)

Job	(Min) Sample Time	A **T/480	B Avg. Fibers/ml	A x B Daily TWA
Cell Maint.	7 & 19	0.75	0.415	0.31

**(T) Expected work time (minutes) ÷ 480 minutes (8 hr work/day)

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TABLE 6

WEEKLY TWA BASED ON BZ PERSONNEL SAMPLES

WHILE PULPING AND/OR SOUPING

Job/area	Sample Time (min)	A *T/2400	B Avg. Fibers/ml	A x B TWA
Top of cell series	30	.075	1.6	0.12

*(T) Expected work time (minutes) ÷ 2400 minutes (8 hr/day, 5 days/week).

TABLE 7

DAILY TWA BASED ON BZ PERSONNEL SAMPLES

WHILE PULPING/SOUPING

Job/area	Sample Time (min)	A **T/480	B Avg. Fibers/ml	A x B TWA
Top of cell series	30	0.125	1.6	0.2

**(T) Expected work time (minutes) ÷ 480 minutes (8 hr work/day)

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TABLE 8

BZ PEAK EXPOSURES WHEN PULPING/SOUPING

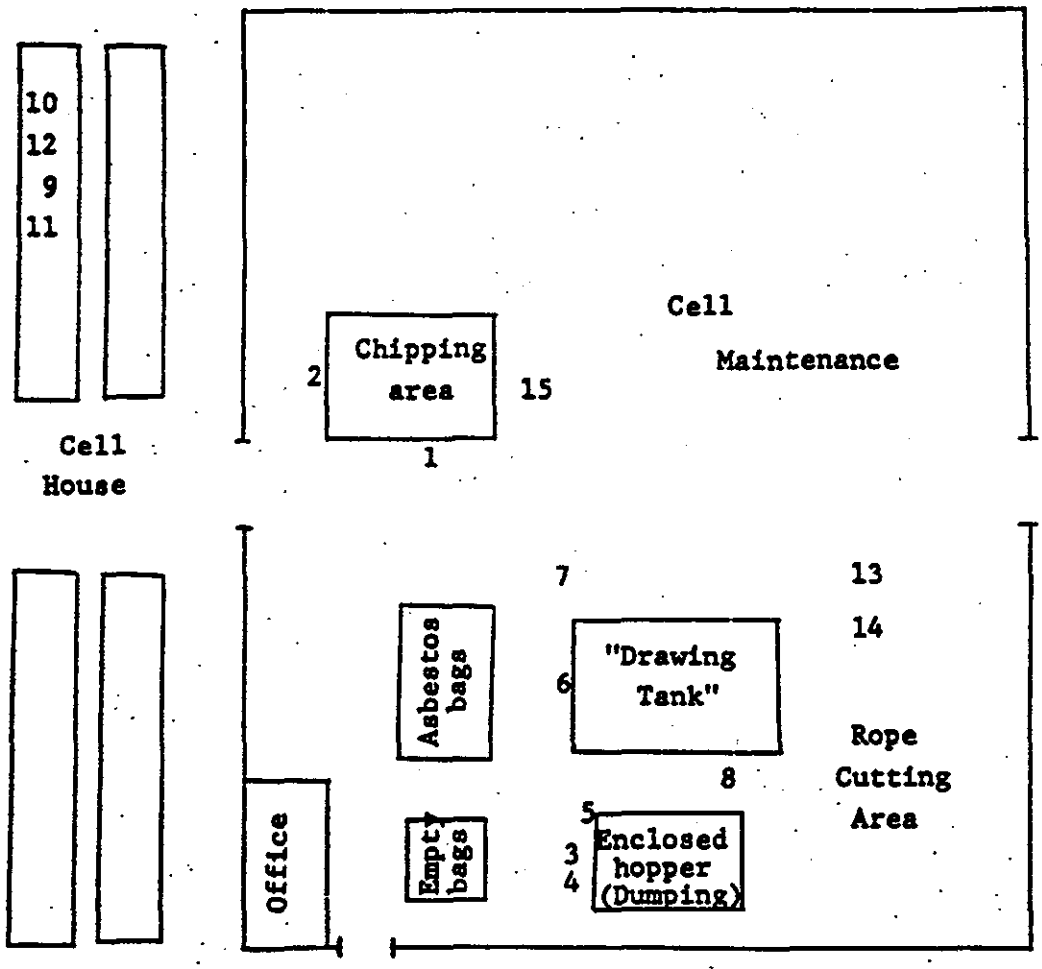
Job	(Min) Sample Time	Fibers/ml
Transferring into bucket (hands used - asbestos is damp)	3 & 4	6.3 & 8.4
Filling cells $\bar{c}$ slurry	2	0

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FIGURE 1

SAMPLING SITES IN THE CELL MAINTENANCE

AREA AND CELL HOUSE OF 47 BUILDING, CHLORINE II PLANT



DRAWING NOT TO SCALE

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