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PLAINTIFF'S EXHIBIT

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EVALUATION OF ASBESTOS EXPOSURES FOR THE ASBESTOS HANDLING
OPERATORS AT THE CHLOR-ALKALI PLANT, SARNIA DIVISION

A survey was conducted in the cell manufacturing building and the cell area of the Chlor-Alkali plant to determine the exposures to asbestos encountered by the operators during asbestos handling operations.

Estimated time-weighted average concentrations for the operators are within the acceptable level of 2.0 fibers/cc. The peak concentrations are also within the acceptable excursion limit of 10.0 fibers/cc. Proper asbestos handling procedures were not observed by some of the operators in the cell area and mouth-bit respirators were still being used instead of the recommended half-face cartridge respirators.

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Introduction

As part of the yearly re-survey program at the Chlor-Alkali plant, the Industrial Hygiene Section carried out a survey to evaluate the exposures to asbestos for the operators who handled asbestos in the cell manufacturing building and the cell area of the plant. The survey was conducted in the spring of 1976 before the new enclosed asbestos handling system in the cell manufacturing building was put into operation.

It was indicated in the 1975 survey that in the various phases of asbestos handling, airborne concentrations of asbestos dust were highest during asbestos dumping operations. In this survey, air sampling was concentrated on the asbestos dumping.

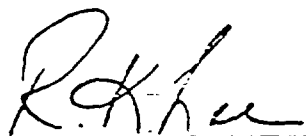
Conclusions

1. The time-weighted average (TWA) exposures for the asbestos handling operators are within the acceptable limit of 2.0 fibers/cc.
2. Peak exposures to asbestos in the cell manufacturing building and the cell area are below 10 fibers/cc during the various phases of asbestos handling.
3. In the cell manufacturing building, proper handling procedures were followed. Disposable dust respirators and coveralls were used during asbestos handling and were properly disposed of afterwards.
4. Some of the operators who handled asbestos in the cell area were not following proper handling procedures. Mouth-bit respirators were still being used instead of the half-face cartridge respirators selected for chlorine gas and asbestos dust; this was a problem identified in the 1975 survey.

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Recommendations

1. Asbestos handling operators, especially the new operators entering the Chlor-Alkali unit, should be adequately trained in the proper handling of loose asbestos. They should be made aware of the potential hazard for inhalation of airborne asbestos and the proper precautions to be taken to prevent intake of asbestos.
2. In the "penthouse" of the cell area, after asbestos is dumped into the wooden bins, it should be wetted down immediately with water before transporting in buckets to the cell series. Transportation of dry loose asbestos in a bucket to the cell series should be strongly discouraged.
3. Mouth-bit respirators should not be used as regular respiratory protection. Such respirators offer little protection unless the users are trained to breath properly through their mouths. If respirators are required as protection against potential high concentrations of chlorine on top of the cell series, half-face cartridge respirators for chlorine should be used.



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Evaluation Criteria

The Ministry of Health in the Province of Ontario recommends 2.0 fibers/cc as the acceptable guideline for occupational exposure to asbestos. The guideline is a TWA concentration to which nearly all workers could be exposed eight hours per day, 40 hours per week, throughout their working lifetime without adverse effects.

Excursions above the TWA guideline is permitted, provided that such excursions are compensated by excursions below the TWA guideline and the TWA exposure is below the 2.0 fibers/cc limit. The excursion limit recommended by the Ministry for asbestos is 10 fibers/cc.

Cell Preparation With Asbestos

At the time of this survey, the preparation of a cell with asbestos in the cell manufacturing building, involved several steps. First, two 100-lb bags of asbestos were dumped into the ventilated hopper. This involved the cutting open of each bag, manually lifting it to the opening of the hopper and then dumping the content of the bag into the hopper. The asbestos in the hopper was airveyed to the slurry mix tank and in order to facilitate airveying, the large asbestos clumps were broken into smaller pieces with a rake. The dumping and the raking took approximately 20 minutes. There was some potential for exposure to asbestos because of the manual handling of bags involved. Since that time, changes have been made to the handling procedure by using an enclosed system for dumping dry asbestos.

In the slurry mix tank, the asbestos was mixed with caustic solution to form a slurry. Since the slurry was mixed in a closed tank and the asbestos was wet, the exposure to asbestos dust was negligible.

When the slurry mixing was completed, it was pumped into the draw tank. A cell to be coated was hoisted with the overhead crane into the draw tank where the cell was immersed in the slurry. Suction was applied to the cell to create a flow of the slurry through the cell. After 20 to 30 minutes, a layer of wet asbestos was coated on the cell. The cell was lifted slightly out of the slurry and checked for flaws. The asbestos coating was perfected with a scraper.

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Cell Preparation With Asbestos (cont'd)

After the cell was drawn, it was lifted out of the tank and was allowed to drip dry. The cell was then baked to complete dryness in the oven. Once the asbestos was dried, it was in a bonded form.

In the cell area, operating cells were repaired with asbestos for leaks as often as necessary. This involved pouring thick asbestos slurry through an opening of an operating cell in order to plug up the leaks. The dry asbestos was handled in the "penthouse" in the cell area. Bags of dry asbestos were dumped into wooden bins which were not ventilated and water was then added to the asbestos to form a thick slurry. When the asbestos was used, it was taken out to the cell series in buckets and poured through a funnel into the cell.

Sampling and Analysis

Airborne asbestos dust was collected from the breathing zones of the operators during asbestos handling operations. The sampling train consisted of a 37 mm cassette filter connected with a piece of rubber tubing to a portable vacuum pump. The filter was a 37 mm membrane filter with 0.8 micrometer nominal pore size.

Two types of pumps were used: a MSA battery operated pump which was capable of moving air at a rate of 2 lpm (litres per minute) and a RAC high volume pump which was capable of sampling air at 13 lpm. The flow rates of the pumps were calibrated with the filters prior to the survey and were recalibrated after the survey.

The MSA pumps were worn by the operators during asbestos handling and air was sampled from the breathing zones. A sampling duration was determined by the duration of a particular phase of asbestos handling; it ranged approximately from 15 to 50 minutes.

Breathing zone air was also sampled with the RAC high volume pump to collect samples at various phases of asbestos handling. The sampling duration was approximately five minutes. The high volume, short duration samples were collected to determine the possible peak concentrations.

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Sampling and Analysis (cont'd)

After sampling was completed, the samples were transported to the Industrial Hygiene Lab. Wedges of the filters were mounted on slides and were rendered transparent with a mounting solution. The asbestos filters on the slides were counted under a light phase contrast microscope at 450 magnification.

The procedure outlined in "The Method Used By The U.S. Public Health Service For Enumeration Of Asbestos Dust on Membrane Filters" by G.H. Edwards and J.R. Lynch was used as the reference.

Results and Discussions

Table 1 presents a summary of the asbestos results of this survey. It is shown that none of the results exceed the acceptable excursion limit of 10.0 fibers/cc. The higher results in the cell area can be attributed to the absence of mechanical ventilation in the "penthouse" and the failure of operators in following proper handling procedures which require wetting of the dry, loose asbestos in the wooden bins immediately after dumping, before it is taken in buckets out to the cells.

In Tables 2 to 4, estimates of TWA exposures for the assistant operators who handled asbestos in the cell manufacturing building and in the cell area are presented. It is shown that all TWA exposures are below 2.0 fibers/cc. The TWA's are calculated on the basis of an eight-hour shift.

A couple of changes have been made since this survey. The Chlor-Alkali unit has switched to a 12-hour shift and an enclosed system has been installed to handle the asbestos dumping in the cell manufacturing building. The changes will alter the exposures of the asbestos handling operators. The exposures of the operators will have to be re-evaluated in the 1977 survey.

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SUMMARY OF ASBESTOS CONCENTRATIONS DURING ASBESTOS HANDLING AT THE
CHLOR-ALKALI PLANT, SARNIA DIVISION

<u>AREA/ACTIVITIES</u>	<u>NUMBER OF SAMPLES</u>	<u>ASBESTOS CONC. IN FIBERS/CC</u>	
		<u>RANGE</u>	<u>MEAN</u>
A. <u>CELL MANUFACTURING BUILDING</u>			
1. Drawing cell in draw tank 701	2	0.2 - 0.3	0.3
2. Opening bags and dumping asbestos into hopper 703	5	0.2 - 2.9	1.6
3. Raking asbestos in hopper 703	2	0.4	0.4
4. Background	1	-	0
B. <u>CELL AREA</u>			
1. Dumping asbestos into hopper in penthouse	1	-	3.6
2. 'Souping' asbestos on top of cell series	2	1.2 - 1.6	1.4
3. Background	1	-	0
ACCEPTABLE EXCURSION LIMIT		10.0	

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ESTIMATION OF TWA EXPOSURE FOR THE ASSISTANT OPERATION (ASBESTOS DUMPER)
IN THE CELL MANUFACTURING BUILDING, CHLOR-ALKALI PLANT, SARNIA DIVISION

<u>LOCATION/ACTIVITIES</u>	<u>ASBESTOS CONC. C IN FIBERS/CC</u>	<u>EXPOSURE TIME T IN MINUTES</u>	<u>(C x T) / 480 IN FIBERS/CC</u>
1. Opening bags and dumping asbestos into hopper 703	1.6	28	0.09
2. Raking asbestos in hopper 703	0.4	20	0.02
3. Background	0.0	<u>432</u>	<u>0</u>
	TOTAL	480	0.1
	ACCEPTABLE LIMIT		2.0

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ESTIMATION OF TWA EXPOSURE FOR THE ASSISTANT OPERATOR (CELL DRAWING
CRANE OPERATOR) IN THE CELL MANUFACTURING BUILDING, CHLOR-ALKALI
PLANT, SARNIA DIVISION

<u>LOCATION/ACTIVITIES</u>	<u>ASBESTOS CONC. C IN FIBERS/CC</u>	<u>EXPOSURE TIME T IN MINUTES</u>	<u>(C x T)/480 IN FIBERS/CC</u>
1. Drawing cell in draw tank 701	0.3	192	0.12
2. Background	0	288	0
	TOTAL	480	0.1
	ACCEPTABLE LIMIT		2.0

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ESTIMATION OF TWA EXPOSURE FOR THE ASSISTANT OPERATOR (CELL AREA)
IN THE CHLOR-ALKALI PLANT, SARNIA DIVISION

<u>LOCATION/ACTIVITIES</u>	<u>ASBESTOS CONC. C IN FIBERS/CC</u>	<u>EXPOSURE TIME T IN MINUTES</u>	<u>(C x T)/480 IN FIBERS/CC</u>
1. Dumping asbestos into hopper in penthouse of cell area	3.6	20	0.15
2. 'Souping' asbestos on top of cell series	1.4	92	0.27
3. Background	0	368	0
		—	—
	TOTAL	480	0.4

ACCEPTABLE LIMIT

2.0
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