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TEXAS OPERATIONS

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TITLE

EVALUATION OF EMPLOYEE EXPOSURES TO ASBESTOS, MATERIAL HANDLERS, B-2606, ENVIRONMENTAL OPERATIONS, TEXAS OPERATIONS, NOVEMBER, 1988

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SUMMARY

From December 1987 through November 1988, employee exposures to asbestos were monitored for the Material Handlers who haul and unload dums of asbestos containing material at the B-5100 asbestos landfill. This survey was a follow-up recommended in a previous study conducted in 1987.

Survey results show that the Material Handlers' average exposure to asbestos was less than the Industrial Hygiene Guide of 0.2 fibers per cubic centimeter of air (f/cc). Exposures ranged from 0.01 to 0.51 f/cc with an overall average of 0.04 f/cc (n=12). These data are similar to exposures measured in the 1987 study.

Analysis of the data showed there was no difference in exposure levels for Material Handlers who hauled dums of asbestos materials versus those who did not haul dums of asbestos materials. Exposure samples were collected on days when asbestos containing materials were hauled and unloaded. Exposure samples were also collected on days when the Material Handlers performed normal dino hauling but had no asbestos materials. There was no statistical difference in the exposure levels using standard parametric and non-parametric analysis techniques. The source of asbestos exposure is still under investigation. Plans are to conduct additional area and personnel monitoring for the Active Landfills personnel to identify area ambient levels.

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PURPOSE

An industrial hygiene survey for asbestos was conducted for the Material Handlers as part of a follow-up to a survey conducted in 1987. In the 1987 survey, employee 8-hour time-weighted average (TWA) exposures to asbestos ranged from 0.01 to 0.36 fibers per cubic centimeter of air (f/cc).¹ The overall average TWA asbestos exposure was 0.07 f/cc which was less than the Action Level and Industrial Hygiene Guide (IHG) of 0.1 and 0.2 f/cc, respectively. The one extraneous sample (0.36 f/cc) above the Action Level was not explained. Procedure changes were implemented to reduce potential truck cab and clothing contamination, and require half mask air purifying respirators (with HEPA cartridges) during certain activities. This current study was to better define employee exposures and assess the effectiveness of the procedure and administrative changes.

CONCLUSIONS

1. Personal TWA exposures to asbestos for the Material Handling Technician and the Chief Material Handling Technician ranged from 0.01 to 0.51 f/cc with an overall average of 0.04 f/cc (n=12).
2. Two out of the twelve samples exceeded the IHG of 0.2 f/cc. The high exposures could not be explained. In one case, the employee hauled no dinos containing asbestos while the sample was collected.
3. The source of asbestos exposures may be something other than the hauling and dumping process. The data showed that there was no statistical differences of asbestos exposures when hauling versus not hauling the dinos containing asbestos.

RECOMMENDATION

1. Additional monitoring needs to be conducted to further identify the source of exposures. Plans are to monitor employees assigned to the Active Landfills.

RESULTS AND DISCUSSION

Between December 1987 and November 1988, asbestos exposures were monitored for the Material Handlers. The Material Handlers were responsible for hauling dinos of asbestos containing materials or bags from the asbestos removal job sites to the Active Landfill area, B-5100. The asbestos is normally encased with bags or a tarp-like covering on the dinos. Dinos were unloaded in the landfill while the Material Handler watched from the truck cab. Usually, the Material Handler did not exit the cab during the dumping procedure.

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Employee TWA monitoring for the Material Handlers is summarized in Table 1. Average personal TWA exposures to asbestos were less than the Action Level of 0.1 f/cc but a wide range of exposures was measured. Exposures ranged from 0.01 to 0.51 f/cc with an overall average of 0.04 f/cc. Three out of the twelve personal TWA samples were collected on shifts when 1-3 dnos of asbestos containing materials were hauled and placed in the landfill. For these three samples, asbestos exposures were 0.04, 0.01 and 0.20 f/cc.

Asbestos exposures were also monitored on days when no dnos of asbestos containing materials were hauled by the Material Handlers. The Material Handlers conducted other normal hauling activities of dnos, demsters, etc. Nine samples were collected, one of which exceeded the IHG of 0.2 f/cc. Two other samples exceeded the Action Level of 0.1 f/cc. These data were not explained.

The data indicates that there is no difference in asbestos exposures for Material Handlers who haul dnos of asbestos versus those who do not haul dnos of asbestos. The data from this current study was combined with the survey data collected in the 1987 study and is summarized in Table 2. Data from the two sample sets (hauling asbestos versus not hauling asbestos) were compared using standard parametric and non-parametric statistical tests. The Wilcoxon Rank Sum Test showed there to be no difference between the sample populations at the 0.01 level. A one factor Analysis of Variance Test showed that there was no statistical difference between the means of the two sample populations at the 1 per cent level. Combined, both tests indicate that asbestos exposures are not totally dependent on hauling dnos containing asbestos.

EXPOSURE EVALUATION CRITERIA

Industrial Hygiene Guides are concentrations of airborne substances to which it is believed nearly all employees may be exposed throughout the working lifetime without suffering adverse health effects. IHGs are intended to be used as guidelines for evaluating exposures and as aids for designing/modifying plant operations. Generally, safety factors are incorporated into the IHGs but IHGs are not fine lines between safe and unsafe levels of exposure. Each individual exposure case must be evaluated based on several factors: the airborne concentration and it's consistency (reproducibility); the IHG and it's safety factor; the material's warning properties and it's acute/chronic health implications; individual susceptibility; and, the significance of other potential exposure routes.

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Most IHGs represent time-weighted average (TWA) airborne concentrations for an 8-12 hour workday, 40 hour work week. Limited exposures greater than the IHG are acceptable for most materials as long as the 8 hour TWA exposure does not exceed the IHG. For some materials, Excursion IHGs have also been established if the material could cause adverse effects from brief exposures to elevated concentrations. Frequency or duration limits are not established for the Excursion IHGs, rather, professional judgement should be used to assess the health implications of each individual exposure situation. A few materials have Ceiling IHG limits indicating that exposures should never exceed the the Ceiling IHG, even for brief periods. A "C" notation next to the the IHG indicates the Ceiling IHG.

IHG are usually expressed in parts per million (ppm), volume per volume, or in milligrams of contaminant per cubic meter of air (mg/m3). A designation of A1 or A2 indicates that the material is known human carcinogen or suspect human carcinogen, respectively. A "skin" or "S" notation next to the IHG indicates that the material may be absorbed through the skin and may cause effects other than at the point of contact with the skin. For these materials, skin contact may contribute to the overall exposure; therefore, inhalation exposure alone may not adequately characterize total exposure.

IHG may be developed within Dow or may be adopted from the exposure criteria published by non-Dow organizations. The Dow-generated IHGs are generally established for chemicals which lack published exposure criteria. They are developed by occupational health teams using toxicology information, industrial hygiene data, medical experience and plant operating experience, and are approved by the Dow Corporate Occupational Health Board. Other sources of IHGs are the exposure criteria published by several external organizations of health professionals i.e. American Conference of Governmental Industrial Hygienists - Threshold Limit Values (ACGIH-TLV). Most of these published criteria are accepted by Dow and used as IHGs. In a few instances, Dow may establish an IHG which differs from the published criteria.

In some global Dow locations, exposure guidelines for a given chemical may be set by government regulation. Regardless, each site uses whichever exposure guideline is most stringent: the Dow IHG or the local regulation.

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The exposure criteria being used for the airborne contaminants in this current study are shown in the following table:

<u>MATERIAL</u>	<u>IHG</u>	<u>EXCURSION</u>	<u>SOURCE</u>
Asbestos	0.2 f/cc 0.1-Action Level	1 f/cc-30 min TWA	OSHA

Asbestos is specially regulated by OSHA, 29 CFR 1926.58. If personnel exposures exceed the Action Level, employees must receive annual asbestos training, semi-annual respirator fit testing, and annual medical surveillance.

POTENTIAL HEALTH EFFECTS

The principal concern is that chronic asbestos inhalation exposures can cause disabling respiratory diseases and various types of cancers (mesothelioma and lung cancer). Usually the diseases and cancers do not appear for 20 or more years after initial exposures. Mesothelioma is a rare cancer of the thin membrane lining in the chest and abdomen. Symptoms include shortness of breath, pain in the chest wall and/or abdominal pain. Furthermore, epidemiology studies indicate that the risk of lung cancer among exposed workers who smoke cigarettes is greatly increased over the risk for non-smokers.

SAMPLING AND ANALYSIS METHODOLOGY

Airborne asbestos particulates were collected by drawing a known volume of air through 25 millimeter mixed cellulose ester membrane filters (pore size 0.8 micrometers). Air flow rates were set at approximately 2 liters per minute. Pumps and filters were calibrated both before and after sampling. After sampling, the filter cassettes were plugged and submitted for analysis by McKee Environmental Health Services who used phase contrast microscopy as outlined in NIOSH method P&CAM 239.

Blanks were submitted with each set turned in for analysis. The analysis results for the blanks were averaged for each sample set and then subtracted from the reported asbestos count on the actual filters used for workplace monitoring. The reported asbestos counts on the blanks ranged from 0.6-1.27 fibers per square millimeter.

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TABLE 1. MATERIAL HANDLERS EXPOSURE TO ASBESTOS DURING DINO HAULING,
ENVIRONMENTAL OPERATIONS, B-2602, DECEMBER 1987-NOVEMBER, 1988

<u>Personnel Number</u>	<u>Date</u>	<u>Sample Time(min)</u>	<u>Vol(l)</u>	<u># of Asbestos Dinos Hauled</u>	<u>Asbestos Conc (f/cc)</u>
139518	12-03-87	440	924	2	0.04
133885	12-03-87	455	1047	0	0.01
134128	01-06-88	250	500	0	0.51
133885	02-16-88	482	1012	1	0.20
134128	06-27-88	440	910	0	0.03
133885	06-27-88	435	896	2	0.01
134128	10-28-88	465	949	0	0.10
139745	10-28-88	465	930	0	0.01
134128	10-31-88	470	954	0	0.10
450-34-7683	10-31-88	465	1028	0	0.01
134128	11-01-88	490	1156	0	0.01
450-34-7683	11-01-88	480	974	0	0.08

Geometric Mean 0.04 f/cc
GSD 3.9
95% UCL 0.08

IHG 0.2 F/CC
Action Level 0.1

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TABLE 2. SUMMARY OF ASBESTOS EXPOSURES FOR THE MATERIAL HANDLERS,
ENVIRONMENTAL OPERATIONS, 1987-1988

<u># of Asbestos Dinos Hauled</u>	<u>Sample Date</u>	<u>Time(min)</u>	<u>Asbestos (f/cc)</u>
5	02-12-87	440	0.02
6	02-19-87	457	0.04
6	03-02-87	457	0.36
2	03-23-87	455	0.02
1	04-08-87	468	0.01
2	12-03-87	440	0.04
1	02-16-88	482	0.20
2	10-27-88	435	0.01
Geometric Mean = 0.04 f/cc			
95% UCL = 0.09 f/cc			
0	03-23-87	464	0.03
0	04-02-87	498	0.04
0	04-08-87	489	ND(0.01)
0	12-03-87	455	0.01
0	01-06-88	250	0.51
0	10-27-88	440	0.03
0	10-28-88	465	0.10
0	10-28-88	465	0.01
0	10-31-88	470	0.10
0	10-31-88	465	0.01
0	11-01-88	490	0.01
0	11-01-88	480	0.08
Geometric Mean = 0.03 f/cc			
95% UCL = 0.06 f/cc			
IHG = 0.2 f/cc			
OSHA Action Level = 0.1 f/cc			

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