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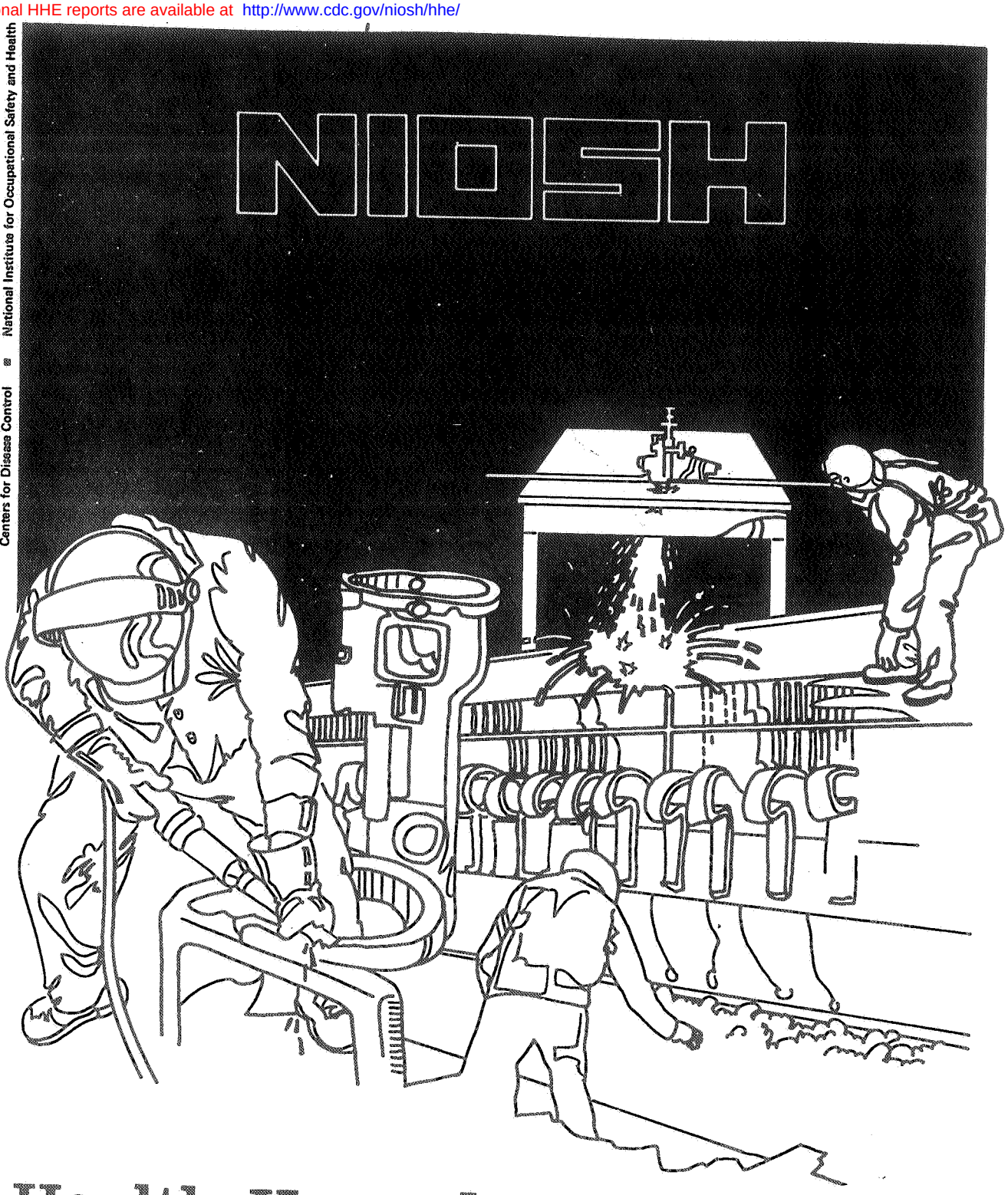

Health Hazard Evaluation Report

HETA 83-275-1394
KAUTT AND BUX MANUFACTURING
MUNDELEIN, ILLINOIS

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 83-275-1394
DECEMBER 1983
KAUTT & BUX MFG.
MUNDELEIN, ILLINOIS

NIOSH INVESTIGATOR:
Daniel Almaguer, I.H.

I. SUMMARY

On May 16, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate possible health effects from occupational exposures to asbestos and 1,1,1-trichloroethane at Kautt & Bux Manufacturing, Mundelein, Illinois.

In June 1983, a NIOSH investigator conducted an initial survey, followed by an environmental survey later that month. During these surveys, personal breathing zone and general area air samples were collected to assess employee exposures to asbestos, copper dust, and 1,1,1-trichloroethane. Additionally, employees working in the area of concern were interviewed.

Two personal breathing zone samples collected for asbestos showed concentrations of 0.03 fibers greater than 5 microns in length per cubic centimeter of air (fibers/cc) and 0.04 fibers/cc for operators working at the standard injection molding line and the HK standard compression molding line, respectively. One general area sample collected at mid-plant showed a concentration of 0.03 fibers/cc. The Occupational Safety and Health Administration (OSHA), on November 4, 1983, issued an emergency temporary standard for asbestos, changing the permissible exposure limit (PEL) for asbestos to 0.5 fibers/cc. NIOSH has recommended that, due to the carcinogenic nature of asbestos, employee exposures be reduced to the lowest feasible limit.

Personal breathing zone air samples collected for 1,1,1-trichloroethane showed that only one of three samples had a detectable level of 0.001 parts 1,1,1-trichloroethane per million parts of air (ppm). The current OSHA standard for 1,1,1-trichloroethane is 350 ppm averaged over and eight-hour work shift. NIOSH has recommended that the permissible exposure limit be changed to a ceiling of 350 ppm averaged over a 15-minute period. Samples collected for copper dust showed levels of 0.007 milligrams copper per cubic meter of air (mg/M^3) for the saw operator on the standard injection molding line and 0.012 mg/M^3 for an operator on the HK standard compression molding line. An area sample collected at mid-plant showed a concentration of 0.008 mg/M^3. The current OSHA standard and NIOSH recommended level is 1 mg/M^3 as an eight hour TWA. Informal employee interviews did not reveal any symptoms or complaints related to the process.

On the basis of the data collected in this study, NIOSH concludes that a potential health hazard exists due to exposure to asbestos. Hazardous exposures to 1,1,1-trichloroethane, and/or copper dust did not exist at the time of this evaluation. Recommendations designed to prevent potential employee exposures are included in the full body of this report.

Keywords: SIC 3621 (electrical commutators), asbestos, copper dust, 1,1,1-trichloroethane.

II. INTRODUCTION

On May 16, 1983, the National Institute for Occupational Safety and Health received a request from the International Association of Machinists and Aerospace Workers Union, District 140, to conduct a health hazard evaluation at Kautt and Bux Manufacturing, Mundelein, Illinois. The requestor was concerned with the potential for exposure to asbestos and 1,1,1-trichloroethane during the manufacture of electrical commutators.

On June 8, 1983, a NIOSH investigator conducted an initial survey during which background information on the facility was obtained. This survey consisted of an opening conference with representatives of management and labor, followed by a walk-through inspection of the facility. Discussions centered around previous industrial hygiene sampling conducted at the facility, process descriptions, engineering controls, personal protective equipment, medical surveillance and medical facilities.

On June 15, 1983, a follow-up environmental survey was conducted during which general area and personal breathing zone air samples were collected to assess employee exposures to 1,1,1-trichloroethane, asbestos, and copper dust. Additionally, employees working in the areas of concern were questioned about any work related health problems. A status letter was sent to the company and the requestor on July 25, 1983.

III. BACKGROUND

A. Plant Production and Workforce

Kautt and Bux is an international manufacturer of electrical commutators. The Mundelein, Illinois plant was built and completed approximately three years ago. The plant operates two shifts per day, five days per week, and employs approximately 39 production workers. Of these production workers, only about 14 employees are directly involved in the handling of 1,1,1-trichloroethane and asbestos reinforced plastic materials.

B. Process Description and Employee Duties

Copper rings (shells), two types of asbestos reinforced plastics, and a non-asbestos plastic are used in the production of the commutators. Copper is bought in the shell form and the plastics come in the form of small pellets. Plastics are stored in a temperature and humidity controlled environment which is physically separated from the general workroom environment.

1. Standard Injection Molding Line

Plastics are received at the plant in 50 pound sacks or 200 pound sealed cartons. Approximately once a week an employee is required to empty the 50 pound sacks into 55 gallon drums which are then sealed and

transferred to the molding lines. The employee is required to wear a NIOSH/MSHA approved respirator while performing this job. The 200 pound sealed cartons are taken to the molding line as needed, sealed. Copper shells are run through a completely enclosed and automated vapor degreasing system, located approximately 50 feet from the molding lines, after which they are transferred to the molding lines.

Shells are placed into a mold loading plate by an employee and plastic is fed from the 55 gallon drums or 200 pound sealed cartons into a vaccumm feed injection gun which fills the copper shells with plastic material. Parts are then sent via an automatic conveyor system to the flash remover, which removes excess plastic and places a counter bore in the commutator plastic. They are then automatically fed into a sawing machine which places several evenly spaced verticle cuts through the copper shell, edge to edge.

The commutators fall into metal trays which are then moved by an employee to a fully automated oven for curing of the plastic. After the curing period, the commutators are sent to the final line, which machines the proper inside and outside diameter of the commutator and then forms the tangs (prongs). From here they are sent to the final testing and inspection area.

2. HK standard compression molding line

The HK line is similar to the standard injecion molding line, with a few exceptions. The degreasing unit for the HK line (a completely enclosed tank system, 12" x 20" x 18" high) which is located 4.5 feet from the employee who run the cut-off shrink press. Secondly, the plastic used in this operation comes in tablet form about one (1) inch in diameter and one half (1/2) inch in thickness. These commutators differ slightly in size, but the production process is basically the same. The tablets of asbestos reinforced plastic are placed in a molding press along with prepared copper segments and are molded to the appropriate size. Shavings of excess plastic material fall into a large barrel for collecting. Plastic reinforced asbestos as well as non-asbestos shavings which fall to the floor are cleaned up using dry sweeping methods.

C. Engineering, Administrative, and Personal Protective Controls

All cutting, sizing, brushing, and sawing machines at this plant are fully automated and individually local exhaust ventilated. The employees only responsibility is to operate the machines. The management requires all employees to wear safety glasses while operating a machine. One paramedic is employed in the plant and the company has two additional employees trained and certified in first aid.

IV. EVALUATION DESIGN AND METHOD

The environmental evaluation of June 15, 1983, consisted of personal breathing zone and general area air sampling for 1,1,1-trichloroethane,

asbestos, and copper dust. Employees were selected for personal sampling based upon those who were believed to be most at risk. General area samples were placed at approximately mid-plant. Additionally, bulk samples of the asbestos reinforced plastic were collected and analyzed to determine the type and percentage of asbestos.

Asbestos samples were collected on AA filters attached via Tygon® tubing to personal sampling pumps operating at 2.0 liters per minute (lpm). Personal exposures were obtained by placing the filter cassette in the workers' breathing zone. All asbestos samples were collected with the filter cassette open face and were analyzed according to NIOSH Method P&CAM 309.[1]

Copper dust samples were collected on AA filters attached via Tygon® tubing to personal sampling pumps operating at 1.5 lpm. Samples were analyzed according to NIOSH Method P&CAM 173.[1]

Methyl chloroform (1,1,1-trichloroethane) samples were collected on charcoal tubes attached via Tygon® tubing to personal sampling pumps operating at 10 cubic centimeters per minute. Samples were analyzed according to NIOSH Method No. S328.[2]

V. EVALUATION CRITERIA

A. Environmental Criteria

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor

(OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8 to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high, short-term exposures.

Table I presents a summary of the environmental standard/criteria used in this evaluation.

A. 1,1,1-trichloroethane[3,4]

The current OSHA standard for methyl chloroform (1,1,1-trichloroethane; 1,1,1-trichloroethane stabilized) is 350 parts of methyl chloroform per million parts of air (ppm) averaged over an eight-hour work shift. This may also be expressed as 1910 milligrams of methyl chloroform per cubic meter of air (mg/M^3). NIOSH has recommended that the permissible exposure limit be changed to a ceiling of 350 ppm (1910 mg/M^3) averaged over a 15-minute period.

NIOSH recommends that 1,1,1-trichloroethane (methyl chloroform) be closely monitored for carcinogenic effects in humans and/or laboratory animals and that it also be treated in the workplace with caution because of its° relation to four chloroethanes shown to be carcinogenic in laboratory animals.

NIOSH is concerned about the carcinogenic potential of chloroethanes based on emerging data from the NCI bioassay program. Concern for the carcinogenic potential of all members of the chloroethane series is based upon structural similarities within the group, as well as the structural similarities to other carcinogenic organochlorine compounds. Extreme care must be used when selecting possible substitues, and the alternatives should be fully evaluated with regard to human effects.

At present, NIOSH is not aware of any evidence associating chloroethane compounds with an increased risk of cancer in man. However, animal studies are valuable in helping identify human carcinogens. Substances that cause cancer in experimental animals must be considered a potential cancer risk in man. Safe levels of exposure to carcinogens have not been demonstated, but lowered exposure to carcinogens decreases the probability of cancer development.

B. Asbestos[5]

Asbestos is a generic term applied to a number of hydrated mineral silicates, including chrysotile, amosite, crocidolite, tremolite, and anthrophyllite. Asbestos consists of fibers of varying size, color, and texture. The uses of asbestos are numerous and include thermal and electrical insulation, fire blankets, safety garments, filler for plastics, and roofing materials. The most toxic route of entry is inhalation. The most widely recognized diseases caused by asbestos are asbestosis, cancer of the lungs and digestive tract, and mesothelioma.

Asbestosis is a lung disorder characterized by a diffuse interstitial fibrosis, including pleural changes of fibrosis and calcification. Asbestos bodies may be found in the sputum, and the worker exhibits restrictive pulmonary function. Accompanying clinical changes may include fine rales, finger clubbing, dyspnea, dry cough, and cyanosis. These findings may be delayed in onset 10 - 15 years following cessation of exposure.

Bronchogenic carcinoma and mesothelioma of the pleura and peritoneum are also caused by asbestos exposure. Excesses of cancer of the stomach, colon, and rectum have been found among asbestos workers. These cancers may occur following a very limited exposure 20 to 30 years earlier.

The ACGIH-TLV of 0.10 fibers greater than 5 microns in length per cubic centimeter (fibers/cc) were established to protect against asbestosis and reduce to an acceptably low risk the possibility of the development of neoplasms. NIOSH has recommended that employee exposures to asbestos be reduced to the lowest feasible level, due to the carcinogenic nature of this substance.

C. Copper Dusts[6]

The current OSHA standard for copper dusts or mists is 1 milligram of copper dust per cubic meter of air (mg/M^3) averaged over an eight-hour work shift. The NIOSH recommendation and ACGIH recommended TLV for copper dust is also 1 mg/M^3.

Copper dusts can affect the body if they are inhaled or if they come in contact with the eyes, the skin, or if they are swallowed. Copper dusts may cause a feeling of illiness similar to the common cold with sensations of chills and stuffiness of the head.

VI. RESULTS AND CONCULSION

Results of samples collected during the environmental survey showed very low levels of asbestos, 1,1,1-trichloroethane, and copper dust. Table I contains a summary of the environmental standards and criteria used in this evaluation and is provided for comparison to the the actual levels found, see Tables II, III, and IV.

The results of asbestos sampling were below the standards and criteria used. Two personal samples collected, one at the standard injection molding line and one at the HK standard compression molding line, showed concentrations of 0.03 fibers per cubic centimeter (fibers/cc) and 0.04 fibers/cc, respectively. One general area sample collected at approximately mid-plant showed a concentration of 0.03 fibers/cc. All asbestos samples submitted were below the OSHA emergency temporary standard permissible exposure limit of 0.5 fibers/cc and the ACGIH-TLV of 0.1 fibers/cc. NIOSH recommends that exposure to asbestos be reduced to the lowest feasible limit.

Results of environmental sampling for 1,1,1-trichloroethane showed only one of three samples with detectable levels. All three samples were personal samples and were collected on the same individual for the reason that this individual worked closest to the degreasing unit of the HK line and would be expected to have the highest exposure. Two of the three samples collected were below the analytical limit of detection of 0.01 milligrams per sample, while the third showed a level of 0.001 parts per million (ppm) compared to the NIOSH recommended limit of 350 ppm.

Results of samples collected for copper dusts showed levels of 0.007 mg/M^3 as an eight-hour TWA for the saw operator on the standard line, 0.012 mg/M^3 as an eight-hour TWA for the lathe operator on the HK standard compression molding line, and an area sample collected at mid-plant showed a concentration of 0.008 mg/M^3 as an eight-hour TWA. The current OSHA standard is 1 mg/M^3 as an eight-hour TWA.

Results of informal employee interviews did not reveal any symptoms or complaints related to this process or job.

On the basis of the data collected in this study NIOSH has concluded that a potential health hazard exists due to exposure to asbestos. Hazardous exposures to 1,1,1-trichloroethane, and copper dust did not exist at the time of this study. However, this does not preclude the possibility of increased exposures under conditions other than those present during the evaluaton.

While all samples for asbestos were below the current OSHA temporary emergency standard permissible exposure limit of 0.5 fibers/cc and the ACGIH-TLV of 0.1 fibers/cc, higher exposures to asbestos may occur during the filling of 55 gallon drums with asbestos reinforced plastic pellets. The employee performing this task is provided with a NIOSH/MSHA approved respirator however, local exhaust ventilation is not present in the area where this operation is performed. It would therefore be advisable to implement engineering controls to be used during this operation or alternatively, as this task is performed only about one time per week, additional personal protective equipment should be provided to the employee as appropriate.

The present system for collecting excess shavings from the HK line should be improved to reduce the likelihood of employee exposures to asbestos fibers should they be released from the plastic. The present procedure for cleaning up excess plastic shavings at the HK line should

require vacuum cleaning procedures rather than dry sweeping methods which are currently being used. The use of dry sweeping methods presents the possibility of reentraining asbestos fibers in the general workroom air thus increasing the likelihood of exposure to the employee performing this task.

VII. RECOMMENDATIONS

1. Engineering controls should be installed, to be used in conjuction with the filling of 55 gallon drums with asbestos reinforced plastic pellets used at the molding lines, or additional personal protective equipment (e.g. disposable coveralls, hair cap, and shoe covers) should be provided to the employee performing this task to reduce exposures during the performance of this task.

2. Use of respirators during the filling of the 55 gallon drums with asbestos reinforced plastic should be strictly enforced to minimize employee exposures.

3. A vacuum equipped with a High Efficiency Particulate Air (HEPA) filter should be used in cleaning up excess asbestos reinforced plastic shavings.

4. Eating, drinking, and smoking should be prohibited at work stations and should be allowed only at designated lunch and break areas.

VIII. REFERENCES

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IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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1. International Association of Machinists, District 140
2. Kautt and Bux Manufacting Company
3. NIOSH, Region V
4. OSHA, Region V

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.

Table I

SUMMARY OF ENVIRONMENTAL STANDARDS/CRITERIA

Substance	NIOSH	OSHA	ACGIH-TLV
1,1,1-trichloroethane (Methyl Chloroform)	350 ppm 15 min. ceiling	350 ppm 8 hr. TWA	350 ppm 450 ppm STEL
Asbestos	LFL	0.5 fibers/cc	0.1 fiber/cc
Copper dust	1 mg/M^3	1 mg/M^3	1 mg/M^3

Abbreviations: fibers/cc - fibers per cubic centimeter
ppm - parts per million
TWA - Time Weighted Average
mg/M^3 - milligrams per cubic meter
STEL - Short Term Exposure Limit, 15 minute time weighted average
LFL - lowest feasible limit

Table II

General Area and Personal Breathing Zone Air Concentrations of Asbestos

Kautt and Bux Manufacturing
Mundelein, Illinois

June 15,1983

Location	Sampling Time (Minutes)	Asbestos Concentration (fibers/cc)
Injection Molding Standard Line	427 min.	0.034
HK Line	451 min.	0.042
Area (Mid-plant)	454 min.	0.033
Blank	-0- min.	<0.005

Abbreviation: fibers/cc - fibers per cubic centimeter

Table III

General Area and Personal Breathing Zone Air Concentrations of 1,1,1-TCE

Kautt and Bux Manufacturing
Mundelein, Illinois

June 15,1983

Location	Sampling Time (Minutes)	1,1,1-TCE (parts per million)	1,1,1-TCE (8 hr. TWA)
Cut-off shrink press HK line	70 min.	<LOD	<LOD
"	240 min.	<LOD	<LOD
"	157 min.	0.004	0.001
Blank	-0- min.	<LOD	<LOD

Abbreviations: 1,1,1-TCE - 1,1,1-trichloroethane (methyl chloroform)
TWA - time weighted average
LOD - limit of detection

Note: the limit of detection for this analysis was 0.01 milligrams per sample for 1,1,1-trichroloethane (methyl chloroform) on charcoal tube samples.

Table IV

General Area and Personal Breathing Zone Air Concentrations of Copper Dust

Kautt and Bux Manufacturing
Mundelein, Illinois

June 15,1983

Location	Sampling Time (Minutes)	Copper Dust Conc. (mg/M^3)	Copper Dust Conc. (8 hr. TWA)
Saw Operator Standard line	443 min.	0.008	0.007
Lathe HK Line	483 min.	0.012	0.012
Area (mid plant)	477 min.	0.008	0.008
Blank	-0- min.	<LOD	<LOD

Abbreviations: mg/M^3 - milligrams per cubic meter
TWA - time weighted average
LOD - limit of detection

Note: limit of decection for this analysis was 1 microgram of copper.