U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 77-84-450

McCOURT LABEL COMPANY
42-54 BENNETT STREET
BRADFORD, PENNSYLVANIA 16701
December 1977

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on July 12, 1977, in the Plate Making Department at McCourt Label Company, Bradford, Pennsylvania. It has been determined on the basis of this environmental sampling that an exposure to chlorine exceeded the most recent evaluation criteria, therefore, a potential health hazard did exist at the time of this evaluation. Chlorine is known to produce nose, throat and skin irritation - symptoms which were reported by the workers in the health hazard request.

It has been determined that an exposure to perchloroethylene, butyl alcohol, hydrochloric acid and ethyl acetate did not exceed the recommended environmental criteria within the worksite. These determinations were based on environmental measures of airborne concentration contaminants, observation of employees' work practices, existing engineering controls and a review of the present literature available on these agents.

Airborne concentrations of perchloroethylene, butyl alcohol, hydrochloric acid and ethyl acetate were monitored in the workers breathing zone and the general work area. Chlorine levels were monitored using certified (TC-84-042) gas detector tubes.

II. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) McCourt Label Company

b) Authorized representatives of Local 330, International Printing and Graphic Communications Union

c) International Printing and Graphic Communications Union

d) U.S. Department of Labor - Region III

e) NIOSH - Region III

For the purpose of informing the two "affected employees" in the plate making department, the employer shall promptly "post", for a period of thirty calendar days, this Determination Report in a prominent place(s) near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S. Code 669 (a)(6) authorizes the Secretary of Health, Education, and Welfare, following a written request by an 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.

NIOSH received such a request from an authorized representative of Local 330, International Printing and Graphic Communications Union. The request alleges that employees at McCourt Label Company are being exposed to perchloroethylene, butyl alcohol, chlorine, hydrochloric acid and ethyl acetate during the plate making operation.

IV. HEALTH HAZARD EVALUATION

A. Process Description - Conditions of Use

The McCourt Label Company, Bradford, Pennsylvania, is a printing company which produces labels for different products. The plate making department at McCourt is one of the primary activities in the production of these labels. At the time of the evaluation the plate making operation required only one full time employee (5 days/week, 7:00 am - 3:30 pm) and two people who assisted in the operation according to production demands.

The plate making department at McCourt Label Company can prepare any one of five different types of printing plates. The type of plate used is dependent on the quantity of labels to be printed, the number of colors that will be used for that particular label and the type of printing press that will be used in the production of that label.

On the day of the evaluation, Cyril Plates, that is, plates which are used on the Webtron printing press were being developed for label production. The Cyril Plate is made of a plastic material that has a strippable mylar cover sheet which is used to protect the surface of the plate prior to exposure. The plate must go through the following six stages before it can be used on the Webtron press:

1. Plate Burning - Here the plate material is placed inside an Exposure Unit and exposed with the mylar cover sheet side down. The plate is then turned over and the mylar sheet peeled off and placed in the exposure unit again, stripped side up, for a negative exposure. With the negative emulsion side down, the plate goes through a final burn.

2. Washout - Here the plate is placed on a drum inside a Washout Tank, with the image side up and clamped on the drum to hold the plate in position. The plate goes through the washout for approximately six minutes in a solution of perchloroethylene and butyl alcohol. Finally, the plate is removed and the face of the plate is rinsed with a squeeze bottle of fresh washout solution.

3. Drying - The plate is placed in a drying tray, image side up, for approximately four minutes. The plate is placed in an area overnight to assure that the plate is sufficiently dry. The surface of the plate remains tacky throughout this period.

4. Finishing - The tacky surface is eliminated by immersing the plate in finishing solution for four minutes. This solution is made up of 90 percent water, 1.2 percent hydrogen chloride and 9 percent chlorine. The plate is then removed, rinsed with tap water and blotted dry with a towel.

5. Plate Cleaning - Spots of dried polymer are often formed on the plate backing. These are removed by placing the plate, image side down, on a dry surface and rubbed clean with ethyl acetate.

6. Post Exposure - To harden the plate material the finished plate is post exposed, image side up, in the exposure unit for ten minutes.

B. Evaluation Design and Methods

The sampling logistics included personal breathing zone sampling, general work area sampling and the use of gas detector tubes. The collection and laboratory analysis for these substances are discussed below.

The perchloroethylene, ethyl acetate, and butyl alcohol concentrations were determined by collecting personal and area samples on charcoal tubes. Sipin pumps were used to draw the air sample through the charcoal tube. The pumps operated at a 50 cc/minute flow rate. The charcoal samples were

analyzed by gas chromatography. All charcoal tubes were changed after half of the shift, that is, prior to the lunch break. The hydrochloric acid values were determined by both personal and area samples. All of these samples were collected in midget impingers which contained 15 cc of sodium acetate solution. A Mine Safety Appliance (MSA) vacuum pump whose flow rate was 1.7 liters per minute (lpm) was used to draw the air sample through the impinger unit.

C. Evaluation Criteria

1. Environmental Assessment

There are several criteria used to evaluate the toxic air contaminants of an employee's work environment: (1) NIOSH Criteria Documents for a Recommended Occupational Health Standard, (2) Proposed and Recommended Threshold Limit Values (TLV's), as suggested by the American Conference of Governmantal Industrial Hygienists (ACGIH), 1976, and (3) the OSHA standards. These values are based upon the current state of knowledge concerning toxicity of these substances. The values for each contaminant are designed to allow an occupational exposure for an 8-hour work day up to a 10-hour work day, 40-hour work week Time Weighted Average (TWA) over a normal lifetime, without the worker experiencing discomfort. In some instances, a few employees may experience discomfort at or below the criteria. There are some airborne contaminants for which this TWA is inappropriate, consequently, a ceiling value for an interval of 15 minutes or less is given. This ceiling concentration should never be exceeded.

The present health criteria has been tabulated below.

Substance	Time Weighted Average (TWA 8-Hour)	Ceiling Value	Maximum Exposure Minutes
Perchloroethylene[1] (Skin)*	670 mg/M^3**	No	--
Butyl Alcohol[2] (Skin)	150 mg/M^3	Yes	15
Hydrochloric Acid[3]	7.0 mg/M^3	Yes	15
Ethyl Acetate[4]	1,400 mg/M^3	No	--
Chlorine[5]	0.5 ppm***	Yes	15

* "Skin" Notation refers to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eyes, either by airborne, or more particularly, by direct contact with the substance.

** mg/M^3 = approximate milligrams of substance per cubic meter of air.

*** ppm = parts of substance per million parts air.

1-4) The ACGIH TLV Document and OSHA Standard (1976)

5) NIOSH Criteria Document (May 1976)

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2. Toxicological Effects

a. Perchloroethylene: Irritation of the eyes, nose and throat may be observed after exposure to high concentrations of this substance. There are also some indications of nausea and gastrointestinal upset. The major response to perchloroethylene at high concentrations is central nervous system depression. Changes in the liver and kidneys also are observed following chronic exposure.

b. Butyl Alcohol: Exposure to vapors of this alcohol may induce the following symptoms at high levels: irritation of the nose, throat, and eyes. Also, headaches, vertigo, and drowsiness may result. Contact dermatitis, involving the fingers and hands, also may occur.

c. Hydrochloric Acid: HCl is seldom inhaled in concentrations high enough to cause serious intoxication because of its irritant nature. However, hydrochloric acid is very irritating to the throat on short exposures. The evaluation criteria of 7 mg/M^3 will prevent toxic injury but is borderline as far as irritation is concerned. Skin contact may cause burns depending on concentration.

d. Ethyl Acetate: Produces a mild narcotic action among unacclimated workers. Workers exposed regularly to 1400 mg/M for several months showed no unusual signs or symptoms.

e. Chlorine: The sensitivity to chlorine varies greatly. Depending on the individual's sensitivity, the following symptoms at levels 3 to 6 mg. of chlorine/cu. meter (1 or 2 ppm) may produce respiratory irritation and inflammation of the mucous membrane of the nose. Concentrations from 1-3 mg of chlorine/cu. meter (1 or 2 ppm) may cause irritation of the eyes and nose. Workers rapidly lose their ability to detect the odor of chlorine at low concentrations. It should be noted that concentrations of 15 mg/M^3 often results in disease of the bronchi and may also lead to moderate reduction in pulmonary function.

D. Results and Discussion

Chlorine determinations were obtained by using gas detector tubes. The results of this survey are presented in Table I. NIOSH certified gas detector tubes identified chlorine levels, which ranged from 0.5 parts of contaminant per million parts of air by volume (ppm) to 1.0 ppm. The samples were collected in different areas of the room depending on where the plate maker was using the chlorine. Each sample was drawn within inches of the plate maker's face in order to sample within the breathing zone (area).

Personal and area samples were analyzed for perchloroethylene, butyl alcohol, and ethyl acetate. The results are presented in Table II. All of these samples were analyzed via gas chromatography. None of the samples collected for the three substances exceeded the recommended criteria. In some instances, all the butyl alcohol and a portion of the ethyl acetate sample concentrations were measured to be less than the lowest limit of detection. Consequently, the acronym N.D. (non-detectable) was annotated for each concentration value. Finally, personal and area samples were collected for hydrochloric acid and the results are listed in Table III. These samples were analyzed using a chloride ion specific electrode and an expounded scale millivolt/pH meter. None of the samples exceeded the recommended standards for exposure to hydrochloric acid.

RECOMMENDATIONS

Based on the results received on the substances measured at McCourt Label Company, as well as personal communications with individuals at McCourt since the July visit, the following recommendations should be attended to as soon as possible:

A. Engineering Controls

Whenever possible, engineering controls are the preferred method for decreasing environmental exposure to toxic substances for the protection of the employees' health. Therefore, due to the lack of proper exhaust ventilation where chlorine is being used in the plate making department the employer should provide a means of exhausting the air in this area of the room in the proper manner. That is, local exhaust ventilation is preferred due to its greater efficiency in removing contaminants and being the more economical way for contaminant control compared with general or dilution ventilation. Also, by using local exhaust ventilation, smaller exhaust air volume results in lower heating costs, compared to high volume general room exhaust air requirements.

B. Medical

Medical surveillance shall be made available as specified below for all workers subject to occupational exposure to chlorine.

1. Comprehensive preplacement and annual medical examinations shall be provided for employees exposed to chlorine. Examination should include medical and occupational histories in sufficient detail to document the occurrence of cardiac disease as well as bronchitis, tuberculosis, pulmonary abscess, and other chronic respiratory diseases. Medical examination should also include simple tests of olfactory deficiency and a chest x-ray, 14 x 17 (posterior - anterior).

2. Medical records shall be maintained at least 5 years after the individual's employment is terminated. These records shall be available to the medical representatives of the Secretary of Labor, of the Secretary of Health, Education, and Welfare, of the employer, and of the employee or former employee at his or her request.

C. Safety Equipment

1. Protective glasses (with side shields), impervious aprons and gloves should be used throughout the chemical mixing process. These should also be worn during the disposal of used chemicals. Note: Gloves should be used with sleeve ends turned out towards the fingers while working with wet chemicals.

2. A respirator (pocket or mouthpiece type) should be available to those working in the plate making department in case of chemical spills. Note: NIOSH Publication (1733-00153-7) a "Guide to Industrial Respiratory Protection" is available upon request to assist in the proper use of respirators.

D. Laboratory Equipment

In order to facilitate proper laboratory procedures, as well as the reduction of potential hazards which can be associated with improper lab techniques, i.e., mixing, pouring or measuring of chemicals, the following laboratory equipment is recommended for the plate mixing department.

1. Glassware - beakers, stir rods, burets, etc., should be used as needed.

2. Crucible forceps or tongs should be used for transferring wet materials.

3. A drop-in self-closing door waste receptacle should replace the present open lid type. Vermiculite should be added here for an absorbing agent. Note: The contents of this receptable should be discarded at least twice a day.

4. Trays for transferring wet materials from one area of the department to another should be used in order to reduce the possibility of spillage.

E. Other Recommendations

1. The perchloroethylene storage drum and waste drum should have a tighter fit between the hoses and the spouts running from these drums. This should then reduce the amount of vapors escaping from these drums.

2. Employees should be discouraged from eating on the job because of possible inhalation and ingestion of contaminated foods.

3. A plastic door, similar to the existing one, should be added to the lower front of the Hypo Plate Dryer in order to reduce any vapors or gases which may be escaping from this area of the plate dryer.

4. The table used to blot the plate material (during the finishing phase) should have a non-porus surface and the blotting paper used in this operation should be changed daily.

5. Until engineering controls can be established, the use of barrier or protective creams, which have met with some success in preventing certain dermal conditions, could be used to reduce or eliminate the skin irritation described by the employees. Refer to Appendix for types of protective creams.

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REFERENCES

1. Criteria for a Recommended Standard ... Occupational Exposure to Chlorine, (May 1976), HEW Publication No. (NIOSH) 76-170.

2. P & CA Method Numbers 24, 27, 49.01, 126, and 168 NIOSH Manual of Analytical Methods, HEW Publication No. (NIOSH), 75-121.

3. Industrial Hygiene and Toxicology, second edition, Frank Patty (editor), Interscience Publishers, 1967, Vol. II.

4. Industrial Toxicology, third edition, Hamilton and Hardy, Publishing Service Group, Inc., 1974

5. Documentation of Threshold Limit Values, ACGIH, 3rd Edition, Cinti., Ohio, 1971.

6. Encyclopedia of Occupational Health and Safety, International Labor Office, McGraw-Hill Book Co., New York

APPENDIX

Protective Creams

West Protective Cream #211 or #311
West Chemical Products Company
42 - 16 West Street
Long Island City, New York 10017

Ply #9
Milburn Company
3246 E. Woodbridge
Detroit, Michigan 48207

Kerodex #51
Ayerst Labs
685 - 3rd Avenue
New York, New York 10017

Note: NIOSH does not endorse trade names or commercial products.

Table I

Atmospheric Concentrations of Chlorine

McCourt Label Company
July 12, 1977

Sample Number	Location	Time of sample	Chlorine ppm	Type of sample
1	Sink area	During use	0.7	DT/BZ
2	Inspection stand	During use	0.5	DT/BZ
3	Plate Dryer area	During use	1.0	DT/BZ
4	Plate Dryer area	During use	0.8	DT/BZ

Evaluation Criteria 0.5 ppm ceiling value

ppm = parts of substance per million parts air
DT = Detector Tube
BZ = breathing zone

Table II

Atmospheric Concentrations of
Perchloroethylene, Butyl Alcohol, and Ethyl Acetate

McCourt Label Company

July 12, 1977

Sample Number	Location	Time of Sample	Perchloroethylene	Butyl Alcohol mg/M^3	Ethyl Acetate	Type of Sample
1-A	Plate Maker	09:40-11:40	27.8	N.D.*	13.2	BZ
2-A	Work Table	09:40-11:40	25.0	N.D.	13.7	General Room
3-A	Heater Area	09:40-11:40	93.6	N.D.	11.9	General Room
1-B	Plate Maker	01:35-03:35	86.4	N.D.	N.D.	BZ
2-B	Work Table	01:35-03:35	99.3	N.D.	N.D.	General Room
3-B	Heater Area	01:35-03:35	94:9	N.D.	N.D.	General Room
Evaluation Criteria			670 mg/M^3	150 µg/M^3	1,400 mg/M^3	
NIOSH Limits of Detection			0.04 mg/sample	0.01 mg/sample	0.04 mg/sample	

mg/M^3 = appropriate milligrams of substance per cubic meter of air
BZ = breathing zone
*N.D. = None detectable or below the NIOSH limit of detection

Table III

Atmospheric Concentrations of Hydrochloric Acid

McCourt Label Company
July 12, 1977

Sample Number	Location	Time of Sample	Hydrochloric Acid Mg/M^3	Type of Sample
1-A	Plate Maker	09:40-11:40	1.28	BZ
2-A	Plate Maker	09:40-11:40	2.22	BZ
3-A	Work Table	09:40-11:40	1.67	General Room
4-A	Heater Area	09:40-11:40	1.83	General Room
1-B	Plate Maker	01:35-03:35	.61	BZ
2-B	Plate Maker	01:35-03:35	.39	BZ
3-B	Work Table	01:35-03:35	.50	General Room
4-B	Heater Area	01:35-03:35	.61	General Room

Evaluation Criteria 7 mg/M^3 ceiling value

NIOSH Limit of Detection 0.22 mg/sample

mg/M^3 = approximate milligrams of substance per cubic meter of air
BZ = breathing zone