

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
Report No. 78-56-511

WESTCLOX-DIVISION OF GENERAL TIME CORP.
PERU, ILLINOIS

July, 1978

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on March 27, 1978 at the Westclox-Division of General Time Corporation in Peru, Illinois. At the time of this evaluation, breathing zone and general area samples were collected for trichloroethylene. Results of the environmental sampling indicate that employees were not exposed to airborne contaminants at toxic concentrations during the investigation. However, considering the fact that the request was submitted following a mechanical failure of the system causing an overexposure of several employees to trichloroethylene fumes, specific recommendations are presented to prevent such a reoccurrence.

II. DISTRIBUTION AND AVAILABILITY

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After ninety (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, Ohio address.

Copies of this report have been sent to:

- a) Westclox-Division of General Time Corporation
- b) Authorized Representative for Employees, United Steelworkers of America - Local 12573
- c) United Steelworkers of America International, Pittsburgh, Pennsylvania
- d) U. S. Department of Labor - Region V
- e) NIOSH - Region V

For the purpose of informing the 54 affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S. C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health received a request from an authorized representative of employees regarding exposure to trichloroethylene from a degreasing operation in the Fuse Sub-assembly Department 627 of The Westclox-Division of General Time Corporation, Peru, Illinois. The request was prompted by an incident in which a mechanical failure caused at least four persons to be overcome by trichloroethylene fumes on the evening of January 20, 1978.

IV. HEALTH HAZARD EVALUATION

A. Process Evaluated

The Westclox plant is in the business of producing clocks and timing devices. The plant has been in operation for about 90 years; with the area of specific request beginning to produce timing devices for World War 1. The plant encompasses about 750,000 sq. ft. of floor space; however, the request area is only a small portion of the total area.

The specific area (3rd floor "down", Depart 627, Fuse Sub-assembly) has not had significant changes since 1963 - except following a loss-of-coolant incident on January 20, 1978. This area processes parts for fuses; operations include milling, drilling, repiercing, de-burring and cleaning.

B. Evaluation Design

An initial and environmental survey was conducted March 27, 1978. A NIOSH Regional Consultant made a walk through, accompanied by management and union representatives.

Eleven employees were given nondirected interviews to determine if they had experienced health problems as a result of their work place exposure. Except for employees involved in the "exposure" incident; no symptoms were reported regarding day to day activities; except a sporatic "whiff of something."

C. Evaluation Methods

Breathing zone and general area atmospheric samples for trichloroethylene were collected on organic vapor charcoal sampling tubes using portable battery powered sampling pumps operating at approximately 200 cubic centimeters (cc) per minute. Samples were analyzed by gas chromatography. Other identifiable constituents of the solvent (benzene and tetrachloroethylene) are also reported.

D. Evaluation Criteria

In order that workers and management may better understand the potential health hazards associated with the chemical substances evaluated during this study, the following discussion is provided.

Benzene--is a highly toxic substance which can cause progressive malignant disease in the body's blood forming system. Blood changes such as aplastic anemia can result from long term exposure to benzene. Recent epidemiologic studies have also indicated that exposure to benzene can cause leukemia.²

The permanent OSHA standard for benzene, which was to have become effective March 13, 1978 is 1 PPM for an 8 hour TWA, with 5 PPM as a maximum peak above the acceptable ceiling for a maximum duration of 15 minutes.¹ NIOSH recommends a 1 PPM ceiling concentration as determined from a 120 minute air sample collected at 1 liter of air per minute.

Trichloroethylene³ -- The Federal standard is 100 ppm (535 mg/M³) as an 8-hour TWA with an acceptable ceiling concentration of 200 ppm; acceptable maximum peaks above the ceiling of 300 ppm are allowed for a 5 minutes duration in a 2-hour period. The NIOSH Criteria for a Recommended Standard recommends limits of 100 ppm as a TWA and a peak of 150 ppm determined by a sampling time of 10 minutes.

Exposure to trichloroethylene vapor may cause irritation of the eyes, nose, and throat. The liquid, if splashed in the eyes, may cause burning irritation and damage. Repeated or prolonged skin contact with the liquid may cause dermatitis.

Acute exposure to trichloroethylene depresses the central nervous system exhibiting such symptoms as headache, dizziness, vertigo tremors, nausea and vomiting, irregular heart beat, sleepiness fatigue, blurred vision, and intoxication similar to that of alcohol. Unconsciousness and death have been reported. Alcohol may make the symptoms of trichloroethylene overexposure worse. If alcohol has been

consumed, the overexposed worker may experience skin flush. Trichloroethylene addiction and peripheral neuropathy have been reported. Recent reports indicate that exposure to trichloroethylene may induce liver tumors in mice.

Tetrachloroethylene, -- The Federal standard is 100 ppm (670 mg/M³) as an 8-hour TWA with an acceptable ceiling concentration of 200 ppm; acceptable maximum peaks above the ceiling of 300 ppm are allowed for 5 minutes duration in a 3-hour period. NIOSH has recommended a time-weighted average limit of 50 ppm and a ceiling limit of 100 ppm determined by 15-minute samples, twice daily. Repeated contact may cause a dry, scaly, and fissured dermatitis. High concentrations may produce eye and nose irritation.

Acute exposure to tetrachloroethylene may cause central nervous system depression, hepatic injury, and anesthetic death. Cardiac arrhythmias and renal injury have been produced in animal experiments. Signs and symptoms of overexposure include malaise, dizziness, headache, increased perspiration, fatigue, staggering gait, and slowing of mental ability. These usually subside quickly upon removal into the open air.

However, in a January 20th, 1978 NIOSH Current Intelligence Bulletin NIOSH questions whether either of these levels may provide adequate protection from potential carcinogenic effects because they were selected to prevent toxic effects other than cancer. NIOSH has instituted several studies of this potential carcinogen and has recommended that worker exposure be minimized.⁶

E. Evaluation Results

Results from the personal breathing zone and area samples collected are shown in Table 1. All samples are well below the evaluation criteria used in this report.

F. Discussion and Recommendations

No evidence is known which associates trichloroethylene with an increased risk of cancer in humans. However, epidemiology studies to test for such an association have only recently been initiated. The first reports provide preliminary results of studies underway in Finland and Sweden. No association of trichloroethylene with cancer has been found. The investigators cautioned against ruling out carcinogenicity, however, as the sensitivity of the studies is low and the period of observation short.

Based upon this special review of all these data, NIOSH concludes that trichloroethylene has a carcinogenic potential in the workplace; however, it is not considered to be a potent carcinogen. The results of NIOSH surveys indicated that substantial exposures are occurring in vapor degreasing operations that could be largely abated by proper maintenance, modification, and operation of existing equipment, and by the education of employees and supervisors as to the potential hazards of trichloroethylene.⁵

Considering the elevated levels of trichloroethylene to the south and east of the degreasing unit; consideration should be given to relocating and/or improving the system of distilling and recycling/ restoring of the solvent.

Precautions had already been taken to avoid a reoccurrence of the loss of coolant (mechanical failure) that caused some of the employees to be overcome. These mechanical devices should be routinely inspected and properly maintained to assure adequate protection for the employees.

V. REFERENCES

1. DOL/OSHA Permanent Standard for Occupational Exposure to Benzene; Title 29, Section 1910:1028.
2. NIOSH Revised Recommended Standard for Occupational Exposure to Benzene, NIOSH, Cincinnati, Ohio (1976).
3. Occupational Diseases - A Guide to Their Recognition, Revised Edition, June 1977; USDHEW-PHS-CDC-NIOSH.
4. Ibid (3)
5. Special Occupational Hazard Review with Control Recommendations, Trichloroethylene; DHEW(NIOSH) Publication 78-130, January 1978.
6. NIOSH, Current Intelligence Bulletin 20, Tetrachloroethylene, DHEW (NIOSH) Publication No. 78-112, January 20, 1978.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE 1
 ATMOSPHERIC CONCENTRATIONS OF SOLVENT CONSTITUENTS
 WESTCLOX-DIVISION OF GENERAL TIME CORPORATION
 FUSE SUB-ASSEMBLY
 March 27, 1978

<u>SAMPLE NUMBER</u>	<u>CLASSIFICATION</u>	<u>TYPE OF SAMPLE</u>	<u>SAMPLING TIME (HOURS)</u>	<u>TRICHLOROETHYLENE PPM</u>	<u>BENZENE PPM</u>	<u>TETRACHLOROETHYLENE PPM</u>
C-1	Stockboy- Degreaser	BZ	0912-1446	33	ND	0.3
C-2	Blank	BZ		ND	ND	ND
C-3	West of Degreaser	Area	0917-1553	5	0.01	0.7
C-4	East of Degreaser	Area	0922-1553	6	0.003	0.3
C-5	Southeast corner of Dept. 627	Area	0926-1552	61	0.02	0.3
C-6	Middle of Dept. 627	Area	0931-1551	18	0.003	0.1
C-7	Power Press Operator	BZ	0947-1447	49	0.03	0.3
Evaluation Criteria NIOSH Limit of Detection				100 PPM 0.002mg/sample	1 PPM 0.001mg/sample	100 PPM 0.003mg/sample

N.D. = below NIOSH Limit of Detection

BZ = breathing zone

PPM = Parts of solvent per million parts of Air by volume