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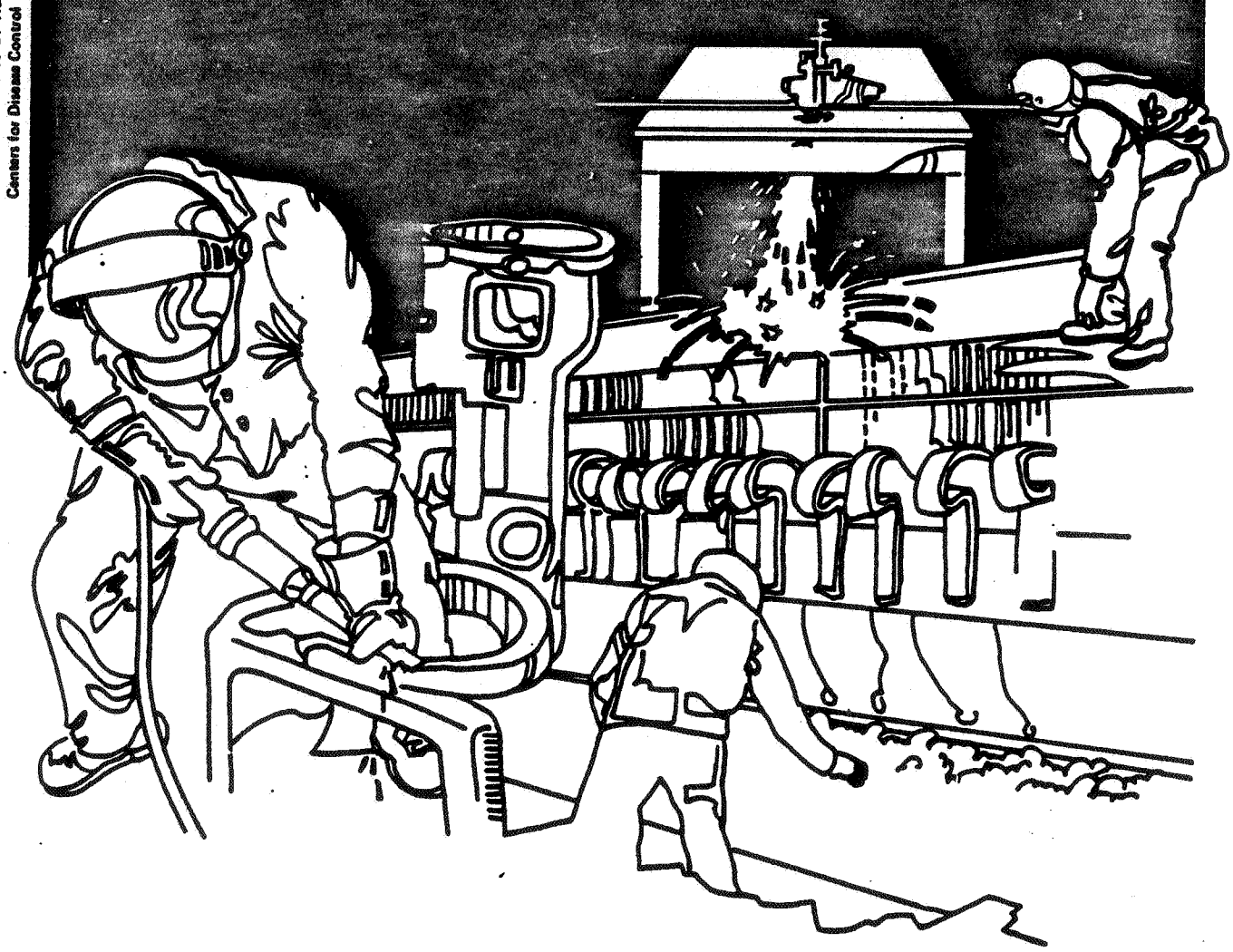

Health Hazard Evaluation Report

HETA 85-047-1632
GENERAL TELEPHONE AND EQUIPMENT COMPANY
CARPENTERIA, CALIFORNIA

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.

HETA 85-047-1632
NOVEMBER, 1985
GENERAL TELEPHONE AND
EQUIPMENT COMPANY
CARPENTERIA, CALIFORNIA

NIOSH INVESTIGATOR:
Pierre L. Belanger, I.H.

I. SUMMARY

In November 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate whether equipment maintainers, employed at General Telephone and Equipment Company in Santa Barbara, California, were being exposed to excessive air concentrations of chemicals in the course of repairing and lubricating electro-mechanical switches.

On January 30 and 31, 1985 an initial environmental survey was conducted at the Carpenteria facility during the maintenance of switches. One bulk sample of the bank cleaning fluid was analyzed and found to have mineral spirits as the primary constituent. Three personnel air samples were collected during bank cleaning to measure mineral spirits (0.8 to 3.4 ppm) and benzene air concentrations. No benzene was detected, and the mineral spirits air concentrations were below the NIOSH evaluation criteria of 55 ppm. Three personnel air samples were collected for methyl chloroform during the maintenance of rotary switches (5.2 to 10.1 ppm) and during switch cleaning and lubrication (4.8 to 7.9 ppm), but these were well below the NIOSH evaluation criteria of 350 ppm as a ceiling exposure.

Five employees were interviewed to determine if they were experiencing any symptoms related to solvent exposure. Two workers reported previously having lightheadedness or headache after working with methyl chloroform from 15 to 60 minutes. These symptoms dissipated about 15 minutes after discontinuing the use of the solvent. Another worker reported having white fingers after handling the solvent, but no other symptom. Employees reported that no protective equipment was worn while handling methyl chloroform.

No excessive exposures to methyl chloroform or mineral spirits were measured during the environmental survey, and no benzene was detected in the air samples. Only one worker currently experiences symptoms of solvent exposure when using methyl chloroform which are believed to be due to dermal exposure. Recommendations are included in section VIII of this report to prevent unnecessary solvent exposures.

KEYWORDS: 3361 (Telephone and Telegraph Appartus, Office Switching Equipment), methyl chloroform

II. INTRODUCTION

In November 1984, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from a representative of the Communications Workers of America (CWA), local 11576, Santa Barbara, California. The representative requested NIOSH to determine whether employees working in the switching offices were exposed to excessive air concentrations of 1,1,1 Trichloroethane (methyl chloroform), bank cleaning fluid or lubricant while cleaning and lubricating mechanical switches.

On January 30 and 31, 1985 an initial environmental survey was conducted at the General Telephone and Equipment Company (GTE) office located in Carpenteria, California. Environmental air monitoring was conducted during this survey. In April 1985, the environmental air sampling results were telephoned to labor and management representatives.

III. BACKGROUND

GTE operates 12-14 telephone switching offices throughout the Santa Barbara area. Approximately 50 equipment maintainers work eight hours a day, 40 hours a week at various offices performing equipment maintenance which includes: rotary switch cleaning, bank cleaning, and switch cleaning and lubricating.

NIOSH was requested to evaluate these three operations at the Carpenteria facility. The facility operates two shifts, however, switch cleaning and maintenance is primarily done during the second shift. Rotary switch cleaning and switch cleaning and lubing are done yearly whereas bank cleaning is done twice a year. An employee can clean and adjust 20 rotary switches in one day.

Rotary switch cleaning: The operator disassembles, cleans, assembles and adjusts the switch. A plunger can containing methyl chloroform is used to wet a rag and cotton sleeving to clean the switch. Afterwards, the switch is assembled and adjusted. Workers are required to wear a hand cream (barrier cream) to protect the skin during this operation. It should be noted that workers indicated that there are no requirements to wear protective gloves or barrier cream during this operation and that nothing had been worn up to the time of this survey.

Bank cleaning: A "Flushing Unit #KS 16297" used in this operation consists of a pressurized (hand pumped) container that contains a bank cleaning fluid. A roller is passed over the unit guides where the cleaning fluid is sprayed onto the roller. The roller is rolled over a cloth to remove excess fluid and then rolled over the switch bank to remove dust and coat the switch with a watch oil. No protective equipment is worn by the worker during this operation.

Switch cleaning and lubricating: The employees use methyl chloroform in a plunger can to wet a paint brush. The brush is used to remove the green lube from the switch afterwhich the switch is re-lubricated using a small brush. The worker wears goggles and latex gloves during this operation.

In November, 1983 a consulting industrial hygiene firm evaluated the rotary switch cleaning operation to characterize personnel exposure to methyl chloroform. Three ceiling and one time-weighted average (TWA) air samples were collected. The ceiling air concentrations were measured to be 37, 120, and 270 parts per million (ppm), and the TWA air sample was 25 ppm for methyl chloroform.

IV. DESIGN AND METHODS

Five workers were interviewed to determine if they experienced any symptoms of overexposure to the chemicals used in the switch cleaning and lubricating operation.

One bulk sample of the cleaning fluid was collected and qualitatively analyzed by gas chromatography/mass spectrometry (GC/MS). The bulk liquid was screened directly by GC using an HP 5880 GC equipped with a flame ionization detector and a 30 meter SE-30 fused silica capillary column (split mode). The bulk was then analyzed by GC/MS for chemical compound identification of the detected peaks. The pattern of the major peaks closely resembled a mineral spirits pattern, and no benzene was detected. The limit of detection for mineral spirits was 6 micrograms per sample (ug/sample).

Nine personal air samples were collected on charcoal tubes and analyzed according to NIOSH Method 1500. Three of the charcoal tube air samples were analyzed for components found in the bulk liquid (mineral spirits). Six charcoal tubes were analyzed for methyl chloroform, and the limit of detection was 4 ug/sample. In addition, no benzene was identified in the air samples.

V. EVALUATION CRITERIA

Environmental

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 healtn 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 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 solely 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 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 8-10-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 A

SUBSTANCE	PERMISSIBLE EXPOSURE LIMIT 8-HOUR TIME-WEIGHTED EXPOSURE BASIS (ppm)[1]	CEILING
Benzene (NIOSH)	LFL[2]	---
Benzene (Cal-OSHA)	10	50
Methyl Chloroform (NIOSH)	200	350
Methyl Chloroform (Cal-OSHA)	350	800
Mineral Spirits (NIOSH)	55	282
Mineral Spirits (Cal-OSHA)	---	---

1. ppm-parts of a vapor or gas per million parts of contaminated air by volume.
2. LFL-Lowest feasible limit (suspect or confirmed carcinogen), use best control technology.

B. Toxicology

Solvents: Methyl Chloroform and Mineral Spirits: These solvents are primarily absorbed by inhalation or through the skin in workplace exposures. Excessive exposure to solvents may result in neurologic effects and dermatologic effects, including: eye and upper respiratory tract irritation, sleepiness, fatigue, headache, memory disturbance, difficulty concentrating, nausea, vomiting, abdominal cramps, loss of appetite, weight loss, flushed skin, skin defatting and irritation, and folliculitis (inflammation of hair follicles). The intoxicating effects of alcohol are frequently increased when alcohol is consumed after exposure to solvents.

VI. RESULTS AND DISCUSSION

On January 31, 1985 one bulk sample of cleaning fluid and three personnel air samples were collected during the switch cleaning and lubrication operation. The bulk sample was analyzed and found to contain a number of chemical peaks closely resembling the standard mineral spirits pattern. In addition, one other solvent peak was identified to be methyl chloroform. No benzene was identified in the bulk sample. Three charcoal tube air samples collected during bank cleaning were analyzed for mineral spirits and methyl chloroform (Table I). The mineral spirits air concentrations ranged from 0.8 to 3.4 ppm, and the methyl chloroform air concentrations ranged from none detectable to 1.1 ppm (Table I). Both chemicals were measured to be well below the evaluation criteria listed in Table A.

Six charcoal tube air samples were collected during rotary switch cleaning and switch cleaning and lubrication. Methyl chloroform air concentrations ranged from 4.8 to 10.1 ppm which is below the evaluation criteria. In addition, charcoal tubes were analyzed for benzene but none was detected.

Five employees were interviewed to determine if they were currently experiencing any symptoms of solvent exposure. One worker reported dizziness, headache, and numbness of fingers about 15 minutes after using methyl chloroform. This worker reported that no protective equipment was worn while cleaning the rotary switches. A second worker, who did not wear protective equipment during rotary switch cleaning, reported having white fingers after using the solvent but with no other symptoms, and another worker reported lightheadedness several months earlier after using methyl chloroform for about one hour with symptoms dissipating within 15 minutes after discontinuing the use of methyl chloroform. All workers indicated that there is no "mandatory requirement" to wear protective equipment including a barrier cream. Also, all workers indicated that they do not wear protective gloves when handling the solvent because gloves are too cumbersome when disassembling and assembling the rotary switches. It should be noted that management representatives indicated that workers are required to wear a barrier cream during equipment maintenance to prevent dermal exposure to methyl chloroform. The worker

performing equipment maintenance during the day of the survey was wearing a barrier cream, and he did not experience white fingers or any other symptoms associated with solvent exposure. This is a good indication that the barrier cream is adequately protecting the skin during the short time in which skin is in contact with the solvent.

VII. CONCLUSIONS

No overexposures to methyl chloroform or mineral spirits were measured on the dates of this survey, and no benzene was detected in the air samples. Based on air monitoring data, observations of the operation, and the work practices, airborne overexposure to methyl chloroform are not likely to occur. The workers symptoms (lightheadedness, headache, and white fingers) are consistent with solvent exposure most probably dermal exposure to methyl chloroform during rotary switch cleaning.

VIII. RECOMMENDATIONS

1. Based on employee interviews, there appears to be some confusion on the part of the workers as to the protective equipment requirements when handling methyl chloroform. Thus, it is recommended that workers receive periodic training regarding chemical handling.

2. Since it is not practical to wear gloves during the maintenance of mechanical switches, it is recommended that workers be instructed how to properly wear the barrier cream during the short time in which workers handle methyl chloroform to clean the rotary switches.

2. Workers should receive periodic training regarding the toxic effects of methyl chloroform, mineral spirits and any other chemicals used while performing their jobs.

IX. REFERENCES

1. NIOSH Manual of Analytical Methods, third ed., HHS (NIOSH) Publication No. 84-100.

2. Criteria for a Recommended Standard...Occupational Exposure to Refined Petroleum Solvents, DHEW (NIOSH) Publication No. 77-192.

3. Occupational Diseases, A Guide to Their Recognition, Revised 1977, DHEW (NIOSH) Publication No. 77-181.

4. Criteria for a Recommended Standard...Occupational Exposure to 1,1,1 Trichloroethane (Methyl Chloroform), DHEW (NIOSH) Publication 76-184.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of tnis Determination Report are currently available upon request from NIOSH, Division of Standards Developement and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, Virginia, 22151. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address.

Copies of this report have been sent to:

1. Communications Workers of America, Local 11576.
2. General Telephone and Equipment Company of California.
3. U.S. Department of Labor, Region IX.
4. California-Occupational Safety and Health Administration.

For the purpose of informing the affected employees, copies of the 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 PERSONNEL AIR SAMPLES
COLLECTED DURING SWITCH CLEANING,
LUBRICATION AND BANK CLEANING

General Telephone Company
Carpenteria, California
HETA 85-047
January 31, 1985

Sample Number	Description/Location	Exposure Period (min)	Volume Liters	Solvent Concentration (ppm)[1] Methyl Chloroform	Mineral Spirits
1	Rotary switch cleaning	25	11.3	5.2	N/A[2]
2	Rotary switch cleaning	15	2.6	10.1	N/A
3	Rotary switch cleaning	17	3.2	6.2	N/A
4	Bank cleaning	15	3.4	1.1	1.7
5	Bank cleaning	30	5.7	0.4	3.4
6	Bank cleaning	15	2.9	ND[3]	0.8
7	Switch cleaning and lubrication	66	3.5	4.8	N/A
8	Switch cleaning and lubrication	15	2.6	7.9	N/A
9	Switch cleaning and lubrication	15	2.7	5.9	N/A

1. ppm-Parts of a vapor or gas per million parts of contaminated air by volume

2. N/A-Not applicable

3. ND-None detected