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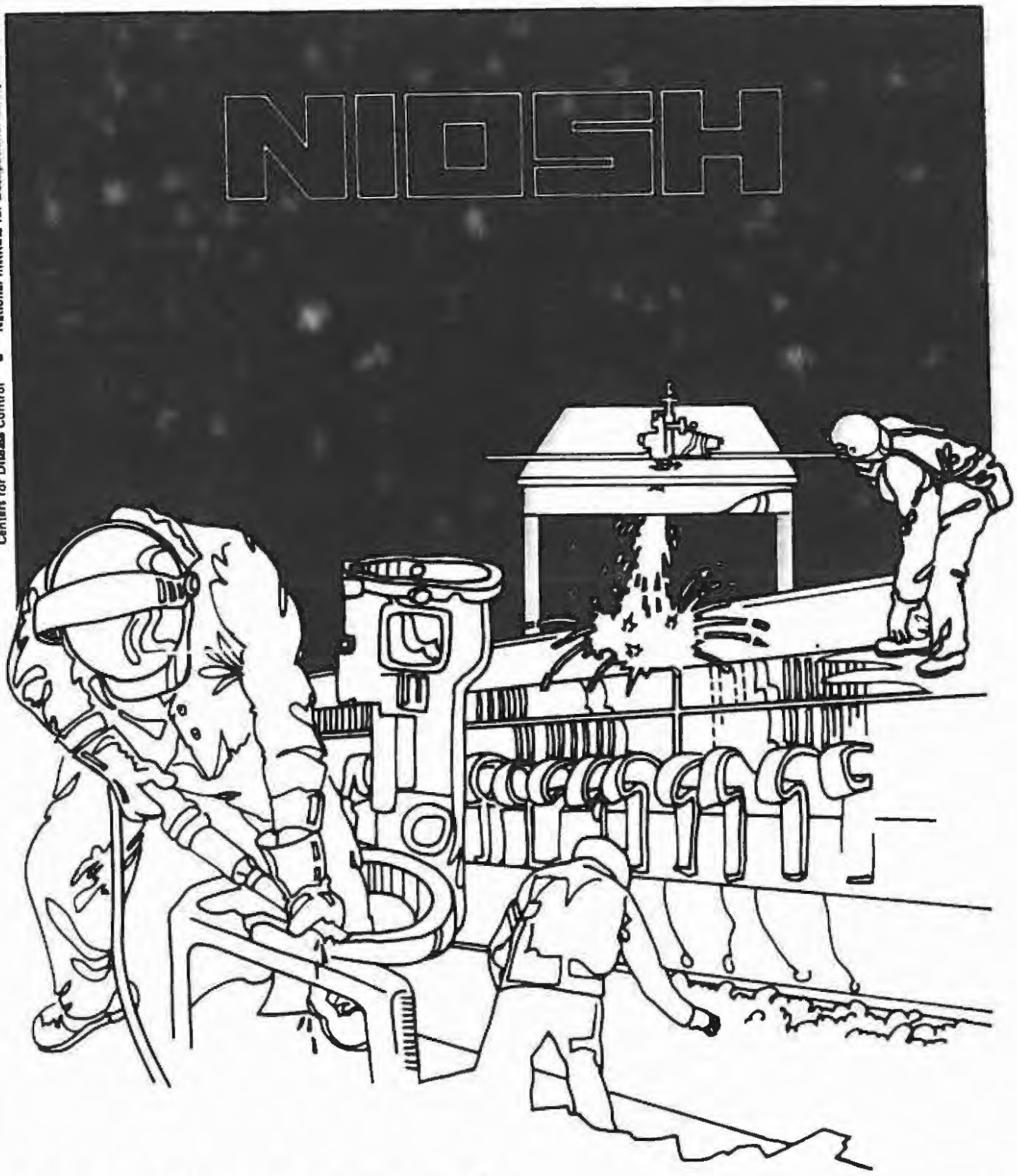

Health Hazard Evaluation Report

HHE 80-077-847
SIGNETICS CORPORATION
SUNNYVALE, 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.

HHE 80-077-847
March 1981
Signetics Corporation
Sunnyvale, California

NIOSH Investigators:
Pierre L. Belanger, I.H.
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I. SUMMARY

On February 25, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation at Signetics Corporation, Sunnyvale, California. The employee requestor was concerned that clerical staff working in the Military Division office may be exposed to fumes and soot, and uncirculated air. Employees were said to have complained of sore eyes, nose irritation, sinus irritation, and tiredness in the afternoon.

On September 30 and October 1-2, 1980 NIOSH conducted an environmental and medical survey at Signetics Corporation. Twenty-one general area air samples were collected for trichlorotrifluoroethane (Freon 113), formaldehyde, isopropanol, carbon monoxide and carbon dioxide in the Military Division office in the Cushman building. Freon concentrations ranged from 0.34 - 25.3 ppm, and isopropanol concentrations ranged less than detectable to 2.87 ppm. Both contaminants were measured at concentrations well below the NIOSH recommended criteria and the California Safety and Administration (CAL-OSHA) standard for each. Gas detector tubes were used to sample formaldehyde, carbon monoxide and carbon dioxide and concentrations of each were less than the NIOSH recommended criteria and/or CAL/OSHA standard.

Medical interviews were conducted with fifteen of the approximately fifty employees who usually work in the area. All the employees interviewed complained about the heating and air-conditioning system. The most frequent complaints were of stuffy air, poor air circulation, uneven temperature control and excessive heat.

On the basis of the environmental and medical data obtained during this investigation, NIOSH has determined that employees in the Military Division office area were not overexposed at the time of the investigation to trichlorofluoroethane, isopropanol, formaldehyde, carbon monoxide and carbon dioxide. However, it appears that deficiencies in the heating and air-conditioning system often provided an uncomfortable work environment.

It is recommended that adjustments be made to the heating and ventilation system to eliminate the reported complaints.

KEYWORDS: SIC 3674 (Administrative Personnel, Office Workers), Trichlorofluoroethane, Isopropanol, Formaldehyde, Carbon Monoxide, Carbon Dioxide.

II. INTRODUCTION

On February 25, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation (HHE) from an authorized employee at Signetics Corporation, Sunnyvale, California pursuant to section 20 (a)(6) of the Occupational Safety and Health Act of 1970. The request sought evaluation of workers exposure to fumes and soot in the Military Division office. It was alleged that the room air in the office was uncirculated. The employees were reported to have suffered soreness of the eyes, nose and sinuses and of tiredness in the afternoon. An initial environmental and medical survey was conducted on October 1-2, 1980 to evaluate workers exposure to trichlorofluoroethane (Freon 113), isopropanol, formaldehyde, carbon monoxide and carbon dioxide.

III. BACKGROUND

Signetics Corporation is a large semi-conductor manufacturer which operates approximately 10 facilities in Sunnyvale, California. The Military Division office located in the Cushman Building, is an open rectangular space (115,000 cubic feet) subdivided into workstations by shoulder high partitions. Several small adjoining offices are attached on two sides of the room. Approximately 50 employees work at desks in the area of concern.

IV. HEALTH HAZARD DESIGN

A. Evaluation Criteria and Health Effects Data

Exposure criteria have been developed to provide guidelines for control of workers' occupational exposure to chemical substances. Two sources of criteria were used in the investigation to evaluate workroom concentrations: (1) NIOSH criteria for a recommended standard, (2) California Occupational Safety and Health Administration standards. These values represent concentrations of substances that most workers may be exposed for an 8-hour day 40-hour work week during a working lifetime without experiencing adverse health effects. Table I lists the substances of concern in this investigation and the health effects and the appropriate evaluation criteria for each.

B. Materials and Methods

1. Environmental

Twenty-one general area air samples were collected on charcoal tubes using a MSA vacuum pump. The charcoal tubes were analyzed for freon 113 according to NIOSH Physical and Chemical Analytical Method (P&CAM) number S-129. A representative sample was analyzed by gas chromatography-mass spectrometry (GC-MS) to confirm the presence of freon 113 and to identify and other significant chemical peaks.

Thirteen gas detector tubes were also used to sample formaldehyde, carbon monoxide and carbon dioxide. Comparative samples were collected outside the building to determine concentrations in the ambient air.

2. Medical

Approximately 50 employees work in the office. Sixteen employees were interviewed (15 female; 1 male). They were selected in a systematic fashion according to their locations in all areas of the office. Their job descriptions were as follows: Scheduler, production control or assembly (5), Specification writer/engineer (4), Specification area supervisor (1), Production marketing engineer (2), Account representative (1), and Administrative assistant (3). A structured questionnaire was administered and questions were asked about symptoms experienced, past medical history, current health problems, allergies, previous work history and chemical exposures.

V. RESULTS

A. Environmental

Freon 113 concentration in air sampled ranged from 0.34 to 25 ppm (parts of a vapor or gas per million parts of air by volume) and were well below the CAL-OSHA standard of 1000 ppm. Isopropanol was also identified in concentrations that ranged from below the limits of detection to 2.8 ppm. The NIOSH recommended exposure criteria is 400 ppm.

No formaldehyde was detected using gas detector tubes. Carbon monoxide concentrations ranged from about 1 to 6 ppm. These concentrations were well below the NIOSH recommended criteria (35 ppm). Carbon dioxide concentrations were below the limits of detection.

Three air-conditioning units reportedly provide 501,000 cubic feet of air per hour to the office of which approximately 22% (109,000 cubic feet/hour) is outside air. Thus there are about 4.4 air changes per hour. It should be noted that this does not imply that the make-up air is necessarily being evenly distributed throughout the work area.

The comfort chart recommendations developed by the American Society of Heating and Refrigeration and Air-Conditioning Engineers, Inc., recommend 7 to 25 cubic feet of air per minute (cfm) per person for sedentary adults, and the California State energy code recommends 14 cfm per person. Thus the calculated outside make-up air volumes (36 cfm/person) are great enough to meet either of the recommended comfort control flow rates.

B. Medical

All of the employees interviewed complained of problems associated with the heating and air-conditioning system. Complaints of stuffy air, poor air circulation, uneven temperature control and excessive heat were most frequent. No medically significant symptoms or health effects were identified.

VI. CONCLUSIONS

On the basis of the environmental study and of interviews with employees we conclude that a health hazard did not exist at the time of the survey. The heating and ventilation system of the area does not appear to provide optimal comfort conditioning; therefore ventilation adjustments should be attempted to improve comfort control.

VII. REFERENCES

1. NIOSH Manual of Sampling Data Sheets, DHEW (NIOSH) Publication No. 77-159.
2. NIOSH Manual of Analytical Methods, DHEW (NIOSH) Publication No. 77-157 A, B, C, and 79-141.
3. Occupational Disease, A Guide to Their Recognition, Revised Edition, DHEW (NIOSH) Publication No. 77-181 (June 1977).
4. Nick H. Proctor, Ph. D., and James P. Hughes, M.D., Chemical Hazards of the Workplace, Lippincott Company, 1978.
5. Criteria for a Recommended Standard . . . Occupational Exposure to Isopropanol Alcohol, DHEW (NIOSH) Publication No. 76-142.
6. Criteria for a Recommended Standard . . . Occupational Exposure to Formaldehyde, DHEW (NIOSH) Publication No. 77-126.
7. Criteria for a Recommended Standard . . . Occupational Exposure to Carbon Monoxide, DHEW (NIOSH) Publication No. 73-11000.
8. Criteria for a Recommended Standard . . . Occupational Exposure to Carbon Dioxide, DHEW (NIOSH) Publication No. 76-194.
9. "The Industrial Environment - Its Evaluation and Control" NIOSH Publication completed under contract No. HSM-99-71-45, GPO No. 017-001-00396-4, 1973 3rd Edition.

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Copies of this report have been sent to:

1. Requestors
2. Signetics Corporation
3. CAL-OSHA
4. U.S. Department of Labor - Region IX

For the purpose of informing the affected employee, 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
Environmental Evaluation Criteria
Signetics Corporation
Sunnyvale, California

February, 1981
HHE 80-77

Substance	Recommended Environmental Limit[1] (ppm)[2]	Reference Source	Primary Health Effects
Freon 113	1000	CAL-OSHA	Central nervous system depression and mucous membrane irritation.
Isopropanol	400	NIOSH	Irritation to the eyes and mucous membrane.
Formaldehyde	1.0[c]	NIOSH	Irritation to the eyes and respiratory tract allergy, skin rashes
Carbon Monoxide	35	NIOSH	Headaches, dizziness, vomiting, drowsiness, collapse, coma, brain damage.
Carbon Dioxide	5000	CAL-OSHA	Asphyxia, unconsciousness and death from oxygen deficiency in concentrations above 10%.

(1) Concentrations are expressed as time-weighted average exposures for up to a 10-hour work day, except where noted.

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

(c) Ceiling concentration, not to be exceeded based on a 30-minute sample.

AREA AIR SAMPLING RESULTS COLLECTED
AT THE MILITARY DIVISION ON OCTOBER 1-2, 1980
SIGNETICS CORPORATION
SUNNYVALE, CALIFORNIA

Job Classification or Location	Sample Period	Sample Volume (Liters)	Concentration (ppm)[1] Freon 113	Concentration (ppm)[1] Isopropanol
PC Product Control	0750-0913	41.5	0.54	0.57
PC Product Control	0915-1054	9.9	0.87	1.56
PC Product Control	1055-1248	11.3	1.10	2.31
PC Product Control	1249-1505	19.6	0.65	1.18
Military Marketing	0751-0908	38.5	0.51	0.75
Military Marketing	0911-1056	9.5	1.10	2.27
Military Marketing	1058-1250	11.2	1.20	2.87
Military Marketing	1251-1506	19.5	0.84	1.36
Spec. Engineering	0755-0916	40.5	0.34	0.50
Spec. Engineering	0918-1050	9.2	0.94	ND[2]
Spec. Engineering	1053-1245	11.2	1.20	2.25
Spec. Engineering	1246-1503	19.6	0.67	0.89
PC Product Control	0734-0912	9.8	1.65	ND
PC Product Control	0913-1149	15.4	1.74	2.09
PC Product Control	1149-1436	16.7	1.77	1.80
Military Marketing	0735-0911	9.6	1.09	NO
Military Marketing	0911-1151	16.0	1.65	2.50
Military Marketing	1153-1438	16.5	1.79	2.30
Spec. Engineering	0733-0910	9.7	1.50	NO
Spec. Engineering	0910-1142	15.2	2.53	1.90
Spec. Engineering	1145-1434	16.9	1.85	1.40

(1) ppm - Parts of a vapor or gas per million parts of contaminated air.
(2) ND - None Detected
(3) TWA - Time Weighted Average

TABLE III

DETECTOR TUBE RESULTS COLLECTED
AT THE MILITARY DIVISION ON OCTOBER 1-2, 1980
SIGNETICS CORPORATION
SUNNYVALE, CALIFORNIA

HHE 80-77

SUBSTANCE	LOCATION	TIME SAMPLED	CONCENTRATION
Formaldehyde	Spec. Engr.	1030	ND[2]
Carbon Monoxide	" "	1035	6.0 ppm[1]
Carbon Dioxide	" "	1040	< 0.1 percent
Carbon Monoxide	Outside of Bldg.	1050	5.0 ppm
Carbon Dioxide	Outside of Bldg.	1055	< 0.1 percent
Carbon Monoxide	Team-S-Engr.	1440	ND
Carbon Dioxide	" " "	1445	< 0.1 percent
Carbon Monoxide	Spec. Engr.	1030	Trace[3]
Carbon Dioxide	" "	1035	< 0.1 percent
Carbon Dioxide	Outside of Bldg.	1045	< 0.1 percent
Carbon Monoxide	" "	1050	Trace
Carbon Dioxide	Team-S-Engr.	1420	< 0.1 percent
Carbon Dioxide	" " "	1425	ND

1) PPM - Parts of a vapor or gas per million parts of air by volume.

2) ND - None Detected

3) Trace - Less than 1-2 ppm

4) TWA - Time Weighted Average - This is based on a work day exposure up to 10 hours per day 40 hours per week

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