U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. HE 80-7-661

JAN CLOPTON COMPOSITION
ATLANTA, GEORGIA

FEBRUARY 1980

I. SUMMARY

On October 15, 1980, the National Institute for Occcupational Safety and Health (NIOSH) received a formal written request to evaluate complaints of nausea, headache, and dizziness from employees working with typesetting equipment and photographic chemicals at Jan Clopton Composition, in Atlanta, Georgia.

To determine if these symptoms were work related, NIOSH conducted an environmental evaluation of the workplace. Air quality in the typesetting area was checked using direct reading detector tubes. Samples of air discharged from typesetting and photographic equipment were collected on organic vapor adsorbing charcoal tubes and submitted to the NIOSH laboratory for analysis. Measurable quantities of aldehydes, sulfur dioxide, and ozone were not found using detector tubes. Carbon monoxide was detected at a level of 5 parts per million (PPM), which is well below the NIOSH recommended limit of 35 PPM. Laboratory analysis of the air samples collected from typesetting and photographic equipment found trace amounts of 1,1,1-trichloroethane (methyl chloroform) and low-molecular-weight aliphatic hydrocarbons (C_6 to C_{10} alkanes). Exposures to these substances at the levels detected were not considered hazardous.

On the basis of the environmental data obtained in this investigation and the results of the confidential interviews with employees, NIOSH determined that the small quantities of airborne contaminants detected at Jan Clopton Composition are not hazardous for exposed employees. Recommendations for improving air quality in the building through modifications to the heating and air conditioning system are discussed on page 5 of this report.

II. INTRODUCTION

The Occupational Safety and Health Act of 1970*, 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

*Section 20(a)(6), 29 U.S.C. 669(a)(6)

employment has potentially toxic effects in such concentrations as used or found. NIOSH received such a request from the owner and manager of Jan Clopton Composition, Atlanta Georgia. Typesetters had complained of nausea, dizziness, and headache. The manager was concerned symptoms might be work related or caused by exposure to some unknown airborne contaminant in the typesetter's work area. Photographic chemicals used in the RC P101 Compugraphic Processor were suspected to be a possible source of the contaminant. A small exhaust fan had been installed in the area to improve air quality, but one typesetter employee continued to experience symptoms.

On October 5, 1979, in response to a telephone request, an initial survey was conducted by the Regional Industrial Hygienist from the NIOSH, Region IV Office, in Atlanta. An environmental survey of all work areas was performed. The building ventilation system was inspected and all chemicals found in work areas and storage areas were inventoried. Confidential interviews were conducted with 6 employees: 3 typesetters, 2 paste-up artists, and 1 proofreader/camera operator. Atmospheric samples of the air discharged from cooling fans on photographic equipment were collected and subsequently analyzed by NIOSH to determine if evaporation of photographic chemicals was releasing toxic vapors into the work area. Workroom air in the typesetting area was tested for sulfur dioxide (SO_2), ozone (O_3), and carbon monoxide (CO).

III. HEALTH HAZARD EVALUATION

A. Background

Jan Clopton Composition provides camera-ready art for advertising displays. Typesetting is performed on video display terminals and text on the display screen is then transferred to photographic film by means of optical/electronic systems in the typesetting equipment. The exposed film is then fed through a developing machine containing developer, fixer, and rinsing solutions. After developing, the film is cut and pasted to a mat using a spray adhesive. The layout is then proofread and photocopied by the camera operator. Actual printing of the camera-ready copy is performed by the company's customers. Jan Clopton Composition has been in business 15 years, 3 years in its present location. The company has 14 full-time and one part-time employees. The photographic chemicals used in the compugraphics developing machine are supplied by the manufacturer. The developer, fixer and rinse water are contained in small tanks and the entire system is enclosed inside the machine. A slight odor of photographic chemicals was noted only when the cover of the developer machine was removed. The developer solution was a mixture of potassium hydroxide, sodium sulfite, and hydroquinone in water and is neutralized with acetic acid after being added to the tank. The fixer solution is an ammonium thiosulfate and acetic acid solution mixed with aluminum sulfate. Tap water is used in the rinse tank. The fixer and developer are changed once per week. The small exhaust fan was wall mounted approximately 3.5 feet above

the developing machine. The fan exhaust volume was approximately 155 cubic feet of air per minute (CFM).

B. Evaluation Methods

Six employees were given confidential interviews concerning their present and past health status, smoking history and work history. They were also asked if they had experienced health problems or symptoms which they felt were work related. The group interviewed included 3 typesetters, 2 paste-up artists and the proofreader/ camera operator. Air quality in the typesetting area was tested with direct reading, length-of-stain detector tubes. A known volume of air was drawn through the tubes, which contained chemicals that change color when exposed to specific contaminants. The length of the color change is proportional to the concentration of the contaminant. Detector tubes for SO_2, CO, and ozone were used. Atmospheric samples for organic vapors were collected in vapor-adsorbing tubes containing activated charcoal. Samples were collected by means of battery operated air sampling pumps which were set to pull air through the charcoal tubes at 200 cubic centimeters (cc) of air per minute. The vapors adsorbed on the charcoal were analyzed by desorbing with carbon disulfide and identifing by gas chromatograph/mass spectrometry.

Other chemicals in the developer and fixer, such as hydroxides, salts, and acids, do not readily evaporate, and therefore do not become airborne unless agitated by mechanical action to form a mist. Since these chemicals did not become airborne, exposure was not measured. They were judged not to present an airborne exposure hazard.

C. Evaluation Criteria

The primary sources of environmental evaluation criteria considered for this study were: 1) NIOSH criteria documents, 2) the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) federal occupational health standards. The criteria judged most appropriate for this study are as follows:

Substance	Short Term Exposure Limits (15 Min.)	8-Hour Time Weighted Average	Source
Carbon Monoxide	200 PPM	35 PPM	NIOSH[1]
Ozone	0.2 PPM	0.1 PPM	OSHA[2]
Sulfur Dioxide	2-3 PPM	0.5 PPM	NIOSH[3]
1,1,1-Trichloroethane	350 PPM	-	NIOSH[4]
Alkanes	1,800 mg/m^3	350 mg/m^3	NIOSH[4]

NOTE: PPM = parts per million parts of air
mg/M^3 = milligrams per cubic meter of air

The adverse health effects from excess exposure (exposures to airborne concentrations above the criteria) are summarized below:

Carbon Monoxide--Carbon monoxide combines with hemoglobin in the blood reducing the oxygen carrying capacity of the blood. Symptoms of CO poisoning are headache, dizziness, drowsiness, nausea, vomiting, collapse, coma, and death. Long term low level exposure to CO can increase the risk of heart attack for some people.[1]

Ozone--Ozone is irritating to the eyes and upper respiratory tract. Symptoms of chronic exposure include headache, weakness, shortness of breath, drowsiness, reduced ability to concentrate, slowing of heart and respiration rate, and visual changes.[1]

Sulfur Dioxide--Sulfur dioxide is irritating to the upper respiratory tract. Chronic exposure can cause running nose, dryness of the throat, and cough. Long term low level exposure can cause chronic bronchitis and reduced pulmonary function.[3]

1,1,1-Trichloroethane--1,1,1-Trichloroethane is irritating to the eyes on contact. Exposure to the vapors depress the central nervous system. Symptoms include dizziness, incoordination, drowsiness, increased reaction time. Unconsciousness and death can occur from exposure to excessive concentrations.[1]

Alkanes--Alkanes irritate the skin and depress the central nervous system. Chronic exposures to certain alkanes, such as hexane, can result in persistent symptoms of numbness, muscular weekness. amd other nervous system disorders known as polyneuropathy.[4]

E. Evaluation Results and Discussion

The 6 employees interviewed, 2 males and 4 females, ranged in age from 23-35 years. Their length of employment with Jan Clopton Composition ranged from 2 months to 3 years with a median employment duration of 17.5 months. Of the 6 employees interviewed, 3 employees indicated they had health problems. Of the 3 with health problems, 2 believed their problems were not work related. The 1 employee reporting work related health problems had not experienced symptoms since the exhaust fan had been installed in the typesetting area. All 3 reported experiencing headache and lightheadness; 2 experienced the symptoms at work and when away from work. Both employees had consulted physicians about their problems.

After reviewing the material safety data sheets on the photographic chemicals used in the Compugraphics processor, discussing the potential for vapor release with the manufacturer, and

observing the Compugraphic Processor in operation, it appeared highly unlikely that hazardous levels of toxic vapors would be present in the area.

Detector tube tests did not detect aldehydes, ozone, or SO_2. Trace levels of carbon monoxide were detected at approximately 5 PPM. One employee was smoking in the area at the time of the test.

Analysis of the atmospheric samples detected trace amounts of 1,1,1-trichloroethane (methyl chloroform) and lower molecular weight alkanes in the C_6-C_{10} range. The samples were quantitated for 1,1,1-trichloroethane and C_6-C_{10} alkanes. The results are presented below:

Sample Location	Sample Volume (liters)	1,1,1-Trichloroethane	Alkanes
Air discharge-top of RCP101	45.6	4.6 PPM	26.1 mg/M^3
Air Discharge-top of VgS CPS 516 Camera	46.0	3.9 PPM	21.3 mg/M^3

A review of the above data shows that the amount of detectable vapors in the air coming from the Compugraphic Processor or the camera is very small, approximately 1% of the evaluation criteria for 1,1,1-trichloroethane, and 6% of the evaluation criteria for alkanes. It is likely that the concentration of 1,1,1-trichloroethane would be slightly higher in the paste-up area because the spray adhesive used by the paste-up artists contains 1,1,1-trichloroethane. However, exposure to vapors from the spray adhesive would not be continuous and the amount of adhesive used (1 spray can per 7-8 working days) is not sufficient to generate 1,1,1-trichloroethane vapors in excess of the evaluation criteria (350 PPM).

F. Recommendations

Although no health hazards were detected, air quality in the building could be improved by making several modifications to the heating and air conditioning system.

1. Close off the supply and return air ducts leading to the unused storeroom at the rear of the building.

2. Open the air intake damper in the duct leading from the roof of the building to provide additional fresh air (approx. 15%) to the building.

3. When the building is occupied, the blower fan should be set to run continuously.

IV. AUTHORSHIP AND ACKNOWLEDGEMENTS

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V. 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 the NIOSH Publications Office at the Cincinnati, Ohio address.

Copies of this report have been sent to:

a) Jan Clopton Composition, Atlanta, Georgia
b) U.S. Department of Labor - OSHA, Region IV
c) Official State OSH Consultation Program
d) Georgia Department of Human Resources

For the purpose of informing the approximately 15 "affected employees", the employer will promptly "post" the Determination Report for a period of thirty (30) calendar days in a prominent place(s) near where the affected employees work.

VI. REFERENCES

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

2. Occupational Safety and Health Administration "General Industry Standards" (29 CFR 1910), OSHA Publication 2206, revised, November 7, 1978

3. NIOSH Testimony before the Department of Labor, Occupational Safety and Health Administration Public Hearings on the Occupational Standard for Sulfur Dioxide, May 1977.

4. Summary of NIOSH Recommendations for Occupational Health Standards, DHEW (NIOSH) Publication, October 1978.