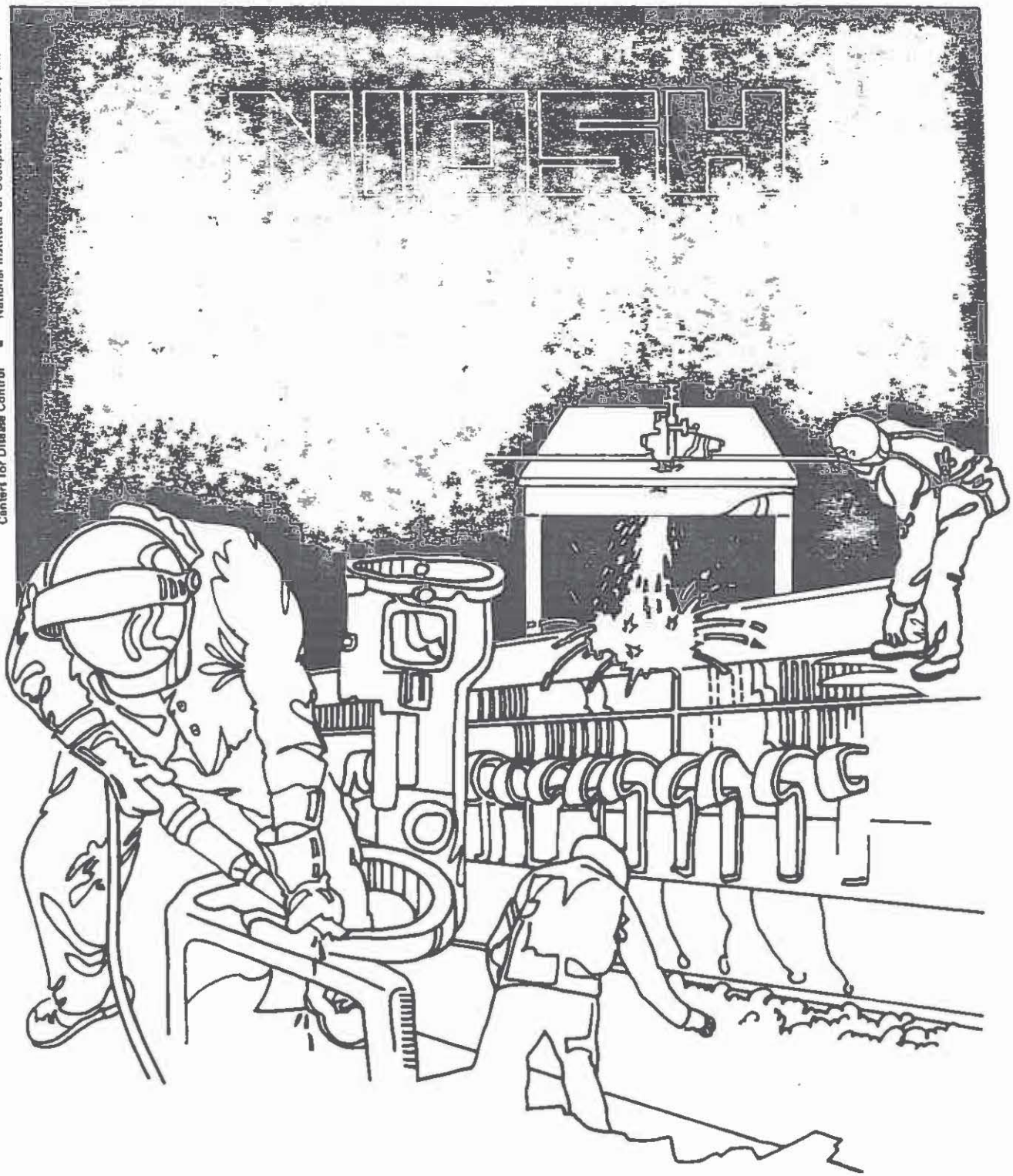
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health



Health Hazard Evaluation Report

80-072-787

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. 699(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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HHE 80-072-787
DECEMBER, 1980
FISCHER AND PORTER COMPANY
WARMINSTER, PENNSYLVANIA

NIOSH INVESTIGATOR:
Walter J. Chrostek, III

I. SUMMARY

On February 19, 1980, NIOSH received a request from Fischer and Porter Company, Warminster, PA, for a health hazard evaluation in "C" Building, Second Floor, known as 12 PZ weld area, where rotometer housings are assembled. The request alleged that two employees had nose bleeding while other employees complained about headaches and watering of the eyes.

A walk-through survey was conducted on March 6, 1980. During this visit, the conditions of use and non-directed medical interviews were conducted. At that time, it was determined that atmospheric evaluations would be conducted for ozone, nickel, tantalum, 1,1,1-trichloroethane, fluorides and cadmium.

Twelve employees are engaged in assembling rotometers. The operations consist of punch pressing, hydraulic pressing, TIG and laser welding, silver soldering, degreasing, assembly, vacuuming, silicone oil filling and checking.

Non-directed medical questionnaires were administered to eleven of the twelve employees who were present. The following complaints were elicited: burning of the eyes - 3, nose bleeds - 3, sinus problems - 3.

Environmental evaluations were conducted on April 15 and 21, 1980. Personal samples were collected for nickel, tantalum, ozone, cadmium and fluoride. Since 1, 1,1-trichloroethane was replaced with 1,1,2-trichloro 1,2,2-trifluoroethane, a general work area environmental air sample was collected for the latter.

Analysis of the environmental samples show that exposures are below the lower limit of detection for ozone, nickel, tantalum, fluorides and cadmium. The airborne concentration of 1,1,2-trichloro 1,2,2-trifluoroethane was 5.4 milligrams per cubic meter of air sampled (mg/M^3) which is well below the permissible criteria of 7600 mg/M^3. Since the initial visit of March 6, 1980, the Fischer and Porter Company had set up proper degreasing procedures, made engineering changes on the degreaser and set the thermostat at the manufacturer's specification.

During the visit on April 15, 1980, the relative humidity ranged from 28-33% whereas on April 21, 1980, it ranged from 21 to 30%. The health complaints on April 15, 1980, were minimal whereas on April 21, 1980, there were complaints of burning of the eyes.

On the basis of the environmental data obtained in this investigation, NIOSH determined that a hazard from overexposure to air contaminants did not exist, however, low humidity on certain days and areas may be the source of complaints of sinus and eye problems.

Accordingly, recommendations along with a discussion of the relative humidity have been incorporated into this report.

KEYWORDS: SIC 3824 (Measuring and Controlling instruments), ozone, nickel, tantalum, fluorides, cadmium, 1,1,2-trichloro 1,2,2-trifluoroethane.

II. INTRODUCTION

Under the Occupational Safety and Health Act of 1970, NIOSH investigates the toxic effects of substances found in the workplace. On February 19, 1980, a request was submitted by the Fischer and Porter Company, Warminster, Pennsylvania, for a health hazard evaluation at the "C" Building, Second Floor. The request stated that two employees had frequent nose bleeding and others were complaining about headaches and watering of the eyes.

The NIOSH Regional Industrial Hygienist met with company and union representatives for the opening and closing conferences and walk-through survey on March 6, 1980. Environmental sampling was performed April 15 and 21, 1980. An interim report was sent April 1980 to the union and management.

III. BACKGROUND

The area of the evaluation is approximately 100'x40', screened off from a larger work area. Twelve employees are engaged in assembling of the housing for rotometers. The operations consist of punch pressing, hydraulic pressing, TIG and laser welding, silver soldering, degreasing, assembling, silicone oil vacuuming, filling and checking. The weld stations use argon and argon/hydrogen mix. The silver solder contained cadmium. A degreaser which used 1,1,1 trichloroethane and which was located outside the area had been recently relocated into the middle of the 12 PZ weld area. Welding is performed on stainless, Monel and tantalum alloys. Most of the parts are manufactured elsewhere and assembled in this area.

This building is fluorescent light heated and has ten complete air changes per hour.

IV. EVALUATION DESIGN AND METHODS

On April 15, 1980, environmental sampling was performed for cadmium, fluorides at the silver soldering operation and ozone at the welding operation. Since the 1,1,1 trichloroethane was replaced with 1,1,2-trichloro 1,2,2-trifluoroethane, an area sample was collected for this atmospheric contaminant. Since the laser and TIG welding units were not in operation at the time, atmospheric evaluations for nickel and tantalum were performed on April 21, 1980.

Average relative humidity tests were made on both April 15 and 21, 1980, utilizing a Bendix psychrometer.

Atmospheric samples for cadmium, nickel and tantalum were collected on .8u polyester membrane utilizing personal sampling pumps with a flow rate of 1.75 liter per minute (LPM). The samples for cadmium and nickel were analyzed by NIOSH P&CAM 173[1] method. Perchloric acid was used for the cadmium and nickel samples during the filter ashing to insure complete oxidation. The sample for tantalum was ashed using nitric and hydrochloric acids, and the metals solubilized with 5% nitric acid. The resulting solutions were analyzed by ICP-AES using the variable channel at 226.1 nm.

A sample for ozone was collected at a rate of 1.8 LPM in a midget impinger containing 10 milliliters of 1% potassium iodide 1 N Sodium hydroxide. This sample was subsequently analyzed by NIOSH method No. S8[1].

An atmospheric sample was collected at a rate of 1.7 LPM on a filter backed-up by a alkali impregnated cellulose pad membrane for particulate and gaseous fluorides. This sample was analyzed by NIOSH method P&CAM 212[1].

A bulk sample and an area environmental sample for 1,1,2-trichloro 1,2,2-trifluoroethane were collected. The bulk sample was used to set up a limit of detection. The area environmental was collected approximately eight feet from the degreaser utilizing a charcoal tube with a flow rate of 200 cc per minute. This sample was analyzed by NIOSH method P&CAM 127[1].

The logic used in sampling for the aforementioned air contaminants is that they are contributors to symptoms such as enumerated in the health hazard evaluation request and symptoms which were enumerated in responses to questions in the non-directed medical interviews.

V. EVALUATION CRITERIA[2,3,4]

The following environmental standards (8-10 hours TWA) for this evaluation were taken from three sources, viz., OSHA, NIOSH and ACGIH.

Substance*	OSHA	NIOSH	ACGIH
Ozone	0.2		0.2
Nickel	1.	0.015	1.
Tantalum	5.		5.
1,1,1 trichloroethane	1900	350	1900
Fluorides	2.5	2.5	2.5
Cadmium	0.1	0.05	0.05(C)**
1,1,2-trichloro-1,2,2-trifluoroethane	7600		7600

* Denotes milligrams of contaminant per cubic meter of air sampled.
** 15 minute ceiling value that should not be exceeded.

VI. TOXICITY[5]

Ozone

Ozone is irritating to the eyes and all mucous membranes. In human exposures, the respiratory signs and symptoms in order of increasing ozone concentrations are: dryness of upper respiratory passages; irritation of mucous membranes of nose and throat; choking, coughing, and severe fatigue; bronchial irritation, substernal soreness, and cough. Pulmonary edema may occur, sometimes several hours after exposure has ceased. In severe cases the pulmonary edema may be fatal.

Nickel
Skin sensitization is the most commonly seen toxic reaction to nickel and nickel compounds and is seen frequently in the general population. This often results in chronic eczems "Nickel itch", with lichenification resembling atopic or neurodermatitis. Nickel and its compounds are also irritants to the conjunctiva of the eye and the mucous membrane of the upper respiratory tract. Several epidemiological studies have shown an increased incidence of cancer of the paranasal sinuses and lungs among workers in nickel refineries and factories; suspicion of carcinogenicity has been focused primarily on respirable particles of nickel.

1,1,1 Trichloroethane
Liquid and vapor are irritating to eyes on contact. This effect is usually noted first in acute exposure cases. Mild conjunctivitis may develop but recovery is usually rapid. Repeated skin contact may produce a dry, scaly, and fissured dermatitis, due to the solvent's defatting properties. 1,1,1 Trichloroethane causes central nervous system depression.

Fluorides
Fluorine and some of its compounds are primary irritants of skin, eyes, mucous membranes, and lungs. Thermal or chemical burns may result from contact; the chemical burns cause deep tissue destruction and may not become symptomatic until several hours after contact, depending on dilution. Nosebleeds and sinus trouble may develop on chronic exposure to low concentration of fluoride or flourine in air. Accidental fluoride burns, even when they involve small body areas (less than 3%), can cause systemic effects on fluoride poisoning by absorption of the fluoride through the skin.

Cadmium
Cadmium is an irritant to the respiratory tract. Prolonged exposure can cause anosmia and a yellow stain or ring that gradually appears on the necks of the teeth. Cadmium compounds are poorly absorbed from the intestinal tract, but relatively well absorbed by inhalation. Skin absorption appears negligible. Once absorbed cadmium has a very long half-life and is retained in the kidney and liver. Occupational exposure to cadmium has been implicated in a significant increase in prostate and respiratory tract cancer.

Fluorocarbons
Typically, fluorocarbons have very low levels of toxicity. These compounds may produce mild irritation to the upper respiratory tract. Dermatitis occurs only rarely. Mild central nervous system depression may occur in cases of exposure to very high concentration of fluorocarbons.

VII. Results and Discussion

Twelve employees work in the 12PZ weld area. Non-directed medical questionnaires were administered to eleven of the employees who were present on March 6, 1980. The following complaints were elicited from the employees: burning of the eyes - 3, nose bleeds - 3, sinus problems - 3.

On April 15, 1980, environmental air samples were collected for ozone, fluorides, cadmium and 1,1,2-trichloro 1,2,2-trifluoroethane. On April 21, 1980, environmental air samples were collected for nickel and tantalum. Relative humidity determinations were made on both days.

Ozone
An environmental personal air sample was collected at the Heliwelding operation for approximately 80 minutes which was the duration of the operation. The lower limit of laboratory detection for ozone was three micrograms-per sample. Analysis of this sample showed that this value was not exceeded.

Nickel-Cadmium-Tantalum
A personal environmental air sample was collected for each of these air contaminants. The sampling duration for cadmium and tantalum was approximately seven hours while that for nickel was approximately four hours. The lower limit of laboratory detection for each of these metals was one microgram-per-sample. Analysis of the samples showed that this value was not exceeded.

Fluorides
A personal environmental air sample was collected on treated filters at the silver soldering operation for approximately seven hours. This sample was analyzed for soluble and insoluble fluorides. The lower limit of detection was three micrograms-per-sample. Laboratory analysis showed that this value was not exceeded.

1,1,2-Trichloro - 1,2,2-trifluoroethane
Although during the walk-through conducted on March 6, 1980, 1,1,1-trichloroethane was utilized as the degreasing solvent, it was replaced with 1,1,2-trichloro - 1,2,2-trifluoroethane prior to the evaluation date of April 15, 1980. One general air sample was collected in the degreasing area. The airborne concentration of this contaminant in the work atmosphere was 5.4 milligrams per-cubic-meter of air sampled. This concentration is well below the permissible criteria.

In general, environmental exposures to all environmental air contaminants were well below their respective permissible levels.

Relative Humidity

Relative humidity measurements were made during the day both on Tuesday, April 15 and Monday, April 21, 1980. (See Table.) On April 15, the relative humidity ranged from 28-33 percent. The outdoor humidity measured in the morning was 33 percent. On Monday, April 21, the relative humidity during the day ranged from 21-30 percent. The outdoor relative humidity was 39 percent. On April 15, no complaints were elicited from the employees, while on April 21, there were complaints of dryness of the throat and burning and dryness of the eyes. Authorities [6,7] state that a relative humidity of 15-30 percent is a discomfort zone while 30-70 percent is a comfort zone. Studies also show that there is evidence that raising the indoor relative humidity reduced incidence or duration of upper respiratory infection.

It should further be noted that during the weekend all heating is turned off and restarted prior to the employees returning to work on Monday. A higher temperature would be set to warm up the area. April 15 was a Tuesday when the area temperature would be stabilized, while April 21 was a Monday and a higher temperature would be required to stabilize the room temperature. Heating is supplied from the fluorescent lighting.

Increasing the heat would cause a drying of the air, thereby causing a decrease in the relative humidity.

It also was noted that the relative humidity decreased as the day progressed.

VIII. Recommendations

Since the degreasing trays have been redesigned and the solvent has been replaced as recommended in the April 30, 1980 interim report, no recommendations are being made at this operation.

Install a humidity control system to assure that the relative humidity does not fall below 30 percent.

IX. Authorship and Acknowledgements

Evaluation Conducted and Report Prepared By:	Walter J. Chrostek Regional Industrial Hygienist Project Leader, HETAB, NIOSH
Originating Office:	Hazard Evaluations and Technical Assistance Branch Division of Surveillance, Hazard Evaluations and Field Studies Cincinnati, Ohio
Report Typed By:	Elaine M. Turner, Secretary NIOSH, Region III Philadelphia, Pennsylvania

Acknowledgements

Laboratory Analysis: Utah Biomedical Test Laboratory
Salt Lake City, Utah

X. 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 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:

1. Director of Safety & Security, Fischer & Porter Co.
2. Independent Union of Rotometer Workers
3. NIOSH, Region III
4. OSHA, Region III

XI. References

1. NIOSH Manual of Analytical Methods, Vols. 1 & 2, (NIOSH) Publication #77-157A and B, 1977.

2. U.S. Department of Labor, Occupational Safety and Health Administration, Federal Register, Vol. 39, No. 125, June 27, 1974, (Revised Nov. 7, 1978).

3. NIOSH Criteria for a Recommended Standard, Occupational Exposure to Methylene Chloride, Publication #76-138, March 1976 (NIOSH).

4. American Conference of Governmental Industrial Hygienists, Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment, 1979.

5. Occupational Diseases: A Guide to Their Recognition, USPHS, CDC, NIOSH, Publication #77-181, Revised June 1977.

6. Frank A. Patty, Industrial Hygiene and Toxicology, Vol. 1, 2nd Revised Edition, February 1958. Pages 108, 109 and 215.

7. G.H. Green, Indoor Humidity and Respiratory Health, Respiratory Technology, Vol. 11, No. 3, 1975.

TABLE
FISCHER AND PORTER COMPANY
WARMINSTER, PENNSYLVANIA

REPORT NO. 80-72

Relative Humidity Determinations

DATE	LOCATION	RELATIVE TIME	DRY BULB	WET BULB	PERCENTAGE RELATIVE HUMIDITY
April 15, 1980	Outdoors	10:05	78	60	33
	12 PZ Weld	09:20	74	57	33
	"	10:42	75	58	32
	"	13:25	75	57	30
	"	14:15	77	57½	28
April 21, 1980	Outdoors	08:00	74	59	39
	12 PZ Weld	08:15	75	57	30
	"	11:30	76	56	27
	"	13:25	78	56	21

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

Third Class Mail

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HHS
HHS 396

U.S. GOVERNMENT PRINTING OFFICE 1981 -757-010/6