U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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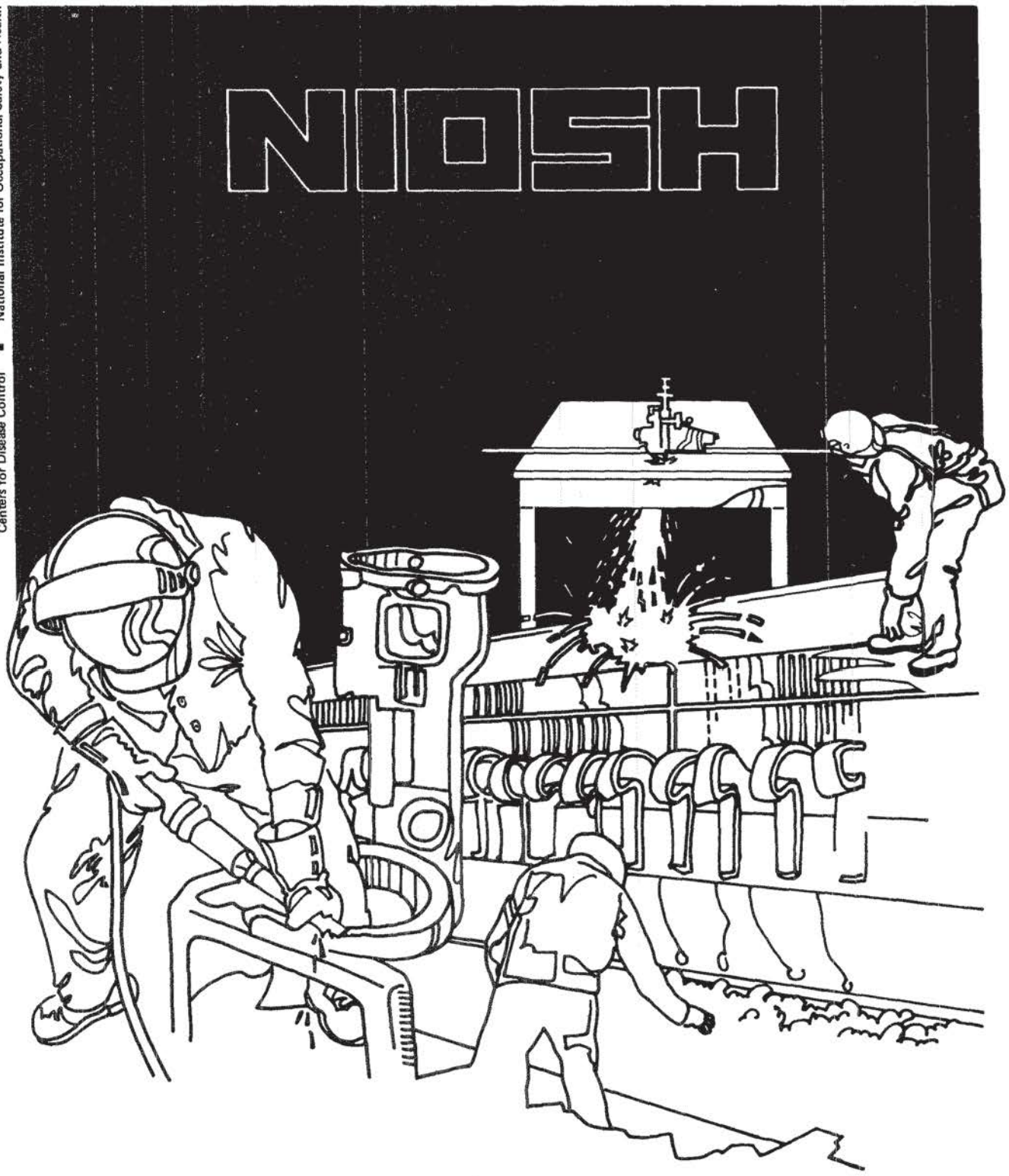

Health Hazard Evaluation Report

HHE 80-176-955
NEW ENGLAND TELEPHONE COMPANY
MANCHESTER, HAMPSHIRE

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 80-176-955
September 1981
New England Telephone Company
Manchester, New Hampshire

NIOSH INVESTIGATOR:
Kevin P. Mc Manus, I.H.

I. SUMMARY

During June, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Brotherhood of Electrical Workers (IBEW), Local #2320 for a health hazard evaluation of the office building located at 770 Elm Street, Manchester, New Hampshire, with particular concern for the Surface Order Error Correction (SOEC) department on the third floor. The request stated that at least 16 employees in that area were experiencing symptoms of skin rash, itching, eye irritation, and dry throat. Suspected causative agents mentioned were fibrous glass and sulfur.

Independent evaluations by private consultants could not identify a specific causative agent for employee complaints. However, a temporal relationship existed between the onset of symptoms and the construction of a computer room adjacent to the SOEC department.

NIOSH conducted an environmental evaluation on July 25, 1980. A broad range environmental screening using colorimetric detector tubes revealed no unusual exposure to any of the chemicals listed in Table 1. The only noteworthy responses appeared on the amine indicators. A qualitative analysis for amine compounds was negative. Wipe samples of the settled office dusts revealed particles of sodium, silica, chlorine, calcium, sulfur, iron, mineral wool, fibrous glass, cotton fibers, wood cellulose fibers, and chrysotile asbestos. However, direct reading total dust concentrations in air indicated low level exposure on the order of 0.15 mg/M^3.

Complete renovation of the building, and relocation of employees to another building to make room for a computer center, prohibited any meaningful follow-up sampling.

As a result of this investigation, NIOSH could not identify a causative agent responsible for employee complaints. However, NIOSH agrees with the private consultants that the onset of symptoms was related to the construction of the computer room. Whether the symptoms were caused by a product of construction, or whether they were caused by a contaminant in the ventilation system, could not be determined. Recommendations are made in the body of this report concerning the need to re-balance the ventilation system after any major renovations to the building.

KEYWORDS: SIC 4811, Dermatitis, Office Building,

II. INTRODUCTION/BACKGROUND

The New England Telephone Company (NET) building, Manchester, New Hampshire, is utilized as the Accounting/Computer Departments for New Hampshire and Maine. It is a three story closed building housing approximately 300 clerical workers. The building has undergone extensive remodeling which began in November of 1979 and concluded approximately February 1980. The remodeling was done so that computer facilities in the building could be expanded.

Around the first of January, 1980, [after completion of the computer room adjacent to the Surface Order Error Correction (SOEC) department], several employees began to experience certain dermatological problems, including rash and itching. These symptoms were accompanied in some cases with burning eyes and/or dry throat. At least five employees sought medical attention. Some cases were severe enough to require medications and extended periods away from work.

During the height of construction, dust was the major concern of employees (it is noteworthy that no skin rashes occurred during this time). On December 5, 1979, Bell Laboratories conducted an asbestos survey. On January 4, 1980, the results of that sampling was reported as being 0.01 f/cc.

In late February, 1980, an OSHA industrial hygienist performed another asbestos survey. OSHA reported that asbestos levels were below the limit of detection in the building. Lint, plant fibers, paper fibers, synthetic fibers and some mineral particulates were observed on the filters.

On May 5, 1980, a sample of the office dust was brought to the University of New Hampshire and analyzed by scanning electron microscopy (SEM) and x-ray diffraction. The results indicated the presence of silicon, iron, magnesium, sulfur, chlorine, aluminum, potassium, calcium, titanium and glass fibers. These results were interpreted by Peck Environmental Laboratories as resembling a material similar to coal flyash. The sulfur content was as high as 60%.

On May 6, 1980, the State of New Hampshire, Office of Occupational Health and Radiation conducted a walk-through evaluation of the building. Dust samples were collected, and nothing remarkable was reported.

On May 20, 1980, more dust samples were collected by an employee and analyzed by U.N.H. using SEM and x-ray diffraction. There were no traces of flyash, and nothing remarkable about the dust. Glass fibers were present at a concentration of below 1%.

On May 22, 1980, Occupational Health Services, Inc.[1] (OHS, Inc.) of Cambridge, Ma. conducted a site visit at the request of New England Telephone Company. Based on this site visit and "an epidemiological analysis of the case information" OHS, Inc. issued a report on July 1, 1980 implicating fibrous glass as the cause of employee symptoms.

III. EVALUATION DESIGN AND METHODS

On July 25, 1980, NIOSH conducted an environmental evaluation of the NET building which included:

- General discussions with OSHA, Company and employee representatives.
- Review of OSHA, Company, and private consultants sampling data.
- Observation of the work environment.
- General area air sampling for a broad range of chemicals (see below).
- Wipe samples from the surfaces of the building.

During the site visit, colorimetric detector tubes were used to screen the atmosphere for possible contaminants. A positive indication on any of these tubes would provide the basis for future sampling needs.

One general area sample was collected on Florisil^{R} media for amines. Analysis was performed by The New England Institute for Life Sciences using an experimental amine detection system.

The wipe samples were analyzed by both electron and optical microscopy.

IV. EVALUATION CRITERIA

The employees developed itching and a skin rash apparently due to exposure within the workplace. The characteristics of a dermatitis (skin rash) can sometimes indicate the nature of the exposure. Most occupational skin disease results from contact with chemical substances[3]. The majority of these problems are due to primary irritation of the skin by the substance. Approximately 80% of all cases of occupational contact dermatitis result from contact with primary irritants[3]. In the remainder of the cases, the dermatitis results from an allergic reaction by the exposed individual to a particular chemical. Thousands of different chemicals have the potential of causing a primary irritant reaction or an allergic reaction of the skin[4].

The appearance of the two types of dermatitis are similar, consisting of erythema (redness) with itching or burning and, possibly, various sized vesicles (small blisters) or papules (small bumps). The rash develops in the areas of the skin exposed to the chemical substance. The dermatitis usually resolves following cessation of exposure. With prolonged or repeated exposure, the skin develops chronic dermatitis -known as eczema- where it becomes dry, scaly, rough, and thickened. These changes resolve only gradually after exposure has ended. The differentation of primary irritant versus allergic dermatitis is usually made based on clinical history and pattern of persons affected in the workplace.

Portland cement was of concern to the NIOSH investigator since building construction had occurred just prior to the onset of symptoms. Exposure to the dust may produce cement dermatitis which is usually due to primary irritation from the alkaline, hygroscopic, and abrasive properties of cement[5].

Chronic irritation of the eyes and nose may occur from prolonged exposure. In some cases, cement workers have developed an allergic sensitivity to constituents of cement. It is not unusual for cement dermatitis to be prolonged and to involve covered areas of the body[5]. The current federal standard for portland cement is 50 Mppcf (Millions of particles per cubic foot of air, based on impinger samples counted by light field techniques).

Fibrous glass insulation, also used during the building renovations, is another source of primary irritation. Fibrous glass produces mechanical irritation on contact, which can be aggravated by scratching. NIOSH[6] recommends that worker exposure to fibrous glass be controlled so that no worker is exposed to an airborne concentration greater than 3 fibers per cubic centimeter of air. However, fibrous glass particles that have settled on the surfaces of a building may still be a source of contact dermatitis.

Improperly designed or balanced ventilation systems can allow air contaminants to accumulate and concentrate over time. Poor air circulation in the building is a common complaint of workers in office buildings. Building ventilation systems are designed to accomodate a specific office layout. Any modifications to the offices (partitions, walls, furniture, filing cabinets etc.) will alter the efficiency of the system, necessitating re-balancing of the ventilation system. Cigarette smoke is a common air contaminant in office buildings, and if allowed to accumulate can produce irritating effects[7].

V. RESULTS AND DISCUSSION

A. Environmental

Colorimetric detector tubes did not give a positive response for any chemical substances except ammonia and hydrazine. A complete list of detector tubes used is in Table 1. Both the ammonia and hydrazine tubes react to cigarette smoke.

The amine air sample analyzed by the New England Institute for Life Sciences did not produce any amine peaks. The sensitivity of this analytical method was in the parts per billion range. The results of this sample indicate that there are no amine compounds in the air that are compatible with the GC method. Some non-volatile amines would not have been detected using this method.

One wipe sample collected from a ventilation duct indicated the presence of fiberglass and cotton fibers in a matrix of particulates containing sodium, silica, sulfur, chlorine, potassium, and iron.

A wipe sample collected from a cabinet top contained primarily fibrous glass and wood cellulose fibers in a matrix of silica, sulfur, and iron compounds.

The elemental analyses performed on the remaining three wipe samples indicated calcium-sulfur plaster material as the major components. This is consistent with dusts that would be expected as a result of tearing down a wall.

B. Medical

Since most of the symptoms had cleared by the time of this investigation, NIOSH had to rely on employee statements and other records to make a determination.

The NIOSH investigator interviewed several SOEC employees and reviewed medical findings of private physicians (provided by the union) to determine the similarities between the cases. During the initial walk-through survey, a ratio of affected/non-affected employees was determined for each area of the building. Table 2 summarizes this information.

When the whole population of the building was considered, only 19 of approximately 300 employees were affected (reported symptoms of skin rash, itching etc.). However, when the sample size was limited to the SOEC area, 9 of 11 employees reported symptoms. Of the remaining 10 employees who reported symptoms, 6 worked in the areas adjacent to the SOEC area and all had occasion to pass through or review files in that area during the normal course of their work. The 4 other cases worked on different floors: 2 in the print room on the second floor, 1 at the copy machine on the second floor, and 1 worked in the mail room on the first floor.

The first symptoms were reported in January 1980, after the construction of the computer room had been completed. The last first reporting of symptoms was in May, 1980. The two employees in the print room have reported symptoms of burning eyes and skin irritation since the summer of 1979, and are seemingly unrelated to the problem on the third floor.

The affected employees initially felt itching on the face, neck, forearms, legs, or in general, an exposed part of the body. The itching was followed by red, blotchy rash. Most employees reported that the rash initially resolved upon leaving the building. Over time, the rashes became more severe and resolved much more slowly. Most employees could relate the onset of symptoms to some activity in the SOEC area, i.e., filing through dusty reference books, viewing microfiche, or performing other work in that area.

At least one employee had a more severe skin reaction which included a widespread papular, pustular eruption. This condition cleared after treatment by a dermatologist and removal from the building. Upon returning to work the condition reappeared after only two days. This employee showed a positive patch test to office dust and negative to control. The patch test was done by a private dermatologist.

VI. CONCLUSION

Although no contaminant has been positively identified, the results of this investigation suggest that the cause of employees' dermatitis was related to the construction of the computer room adjacent to the SOEC area. The employee complaints arose shortly after completion of the computer room. The area with the highest prevalence of symptoms was the area adjacent to the computer room. Finally, the employees symptoms disappeared after removal from the area.

The specific contaminant was most likely a product of construction, i.e., fibrous glass or portland cement dust. However, the possibility of an imbalance in the ventilation system, caused by the addition of the computer room, creating a stagnant air space in the SOEC area cannot be ruled out. If this were the case, one would have expected more general symptoms of discomfort such as headache and fatigue.

The clinical description of the dermatitis was consistent with exposure to a primary irritant, although at least one person showed evidence of allergic sensitivity.

This evaluation indicates that significant health effects were limited to skin irritation. Other than the one case of allergic sensitivity, there were no reports of systemic health effects.

VII. RECOMMENDATIONS

Since all the SOEC employees have been relocated to another building, and no new reports of symptoms have occurred in the building, NIOSH makes the following recommendations as guidance to prevent similar problems in the future.

--- Balancing of the ventilation system is essential after any modification to the building. Walls, partitions, doors and windows disrupt the systems design and can lead to stagnant air areas within the building.

--- Whenever construction is performed within the building, utmost care should be given to isolate the construction process from the employees in the building. This will eliminate the construction dusts as a potential source of contamination.

--- Upon completion of any inside construction, a thorough clean-up of materials and residues should be conducted prior to occupancy of the construction area.

VIII. AUTHORSHIP AND ACKNOWLEDGEMENTS

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X. DISTRIBUTION AND AVAILABILITY

Copies of this Determination Report are currently available, upon request, from NIOSH, Division of Technical Services, Information 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 22161. 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:

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U. S. Dept. Of Labor-OSHA Region 1

New Hampshire Health Department

USPHS-Region 1

NIOSH- Region 1

TABLE 1

Colorimetric Sampling Tubes Used at NET

Acetaldehyde
Acetone
Alcohol
Ammonia
Arsine
Carbon Dioxide
Carbon Tetrachloride
Chloroprene
Cyclohexane
Diethyl Ether
Dimethyl Formamide
Epichlorhydrin
Ethyl Benzene
Ethylene
Formic Acid
Hydrazine
Hydrogen Cyanide
Hydrogen Sulfide
Mercury Vapor
Methyl Acrylate
Methyl Methacrylate
Monostyrene
Ozone
Phosphine
Toluene
Trichloroethylene
Acetic Acid
Acrylonitrile
Alkylchloroformates
Aniline
Benzene
Carbon Monoxide
Chlorine
Cyanogen Choride
Diborane
Dimethyl Acetamide
Dimethyl Sulfide
Ethyl Acetate
Ethyl Glycol Acetate
Ethylene Oxide
Hexane
Hydrocarbons
Hydrogen Fluoride
Mercaptan
Methacrylonitrile
Methyl Bromide
Methylene Chloride
Nitrogen Oxides
Phosgene
Sulfur Dioxide
Trichloroethane

TABLE 2

Summary of Reported Symptoms by Relative Area (3rd Floor)

Affected/Total

Computer Room...2/10	SOEC...9/11	Disbursement...3/20
Tape Library...0/4	ELEVATOR SHAFT	Keypunch...2/17
Payroll...0/20		
Revenue...1/20	Storage...0	Revenue...0/20

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