U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 74-3-177

HARTMAN ELECTRIC MANUFACTURING COMPANY
MANSFIELD, OHIO

MARCH 1975

I. TOXICITY DETERMINATION

It has been determined that a high percentage of employees in Departments 01, 02, and 03 of the Hartman Electric Manufacturing Company have periodically experienced cutaneous irritation from occupational exposure to fibrous glass. This episodic exposure has resulted in self-limited bouts of itching and dermatitis. No serious health consequences from this exposure were observed and none are anticipated. This determination is based on interviews with exposed employees, limited cutaneous examinations, observations of work practices, environmental measurements, and on available information relevant to fibrous glass health hazards.

Measured concentrations for respirable and total airborne particulates obtained on April 9-10, 1974, were all found to be well below all suggested standards and the existing Federal Standard for fibrous glass dust.

II. DISTRIBUTION AND AVAILABILITY OF THE DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

a. Hartman Electric Manufacturing Company, Mansfield, Ohio
b. U.S. Department of Labor - Region V
c. NIOSH - Region V
d. Authorized Representative of Employees.

For the purposes of informing the approximately 50 "affected employees," the employer will promptly "post" the Determination Report in a prominent place where "affected employees" work for a period of 30 calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following written request by 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 National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding exposure of employees in Departments 01, 02, and 03 to fibrous glass reinforced plastic dust. The request was precipitated by employee concern regarding several cases of fibrous glass dermatitis and upper respiratory tract irritation.

IV. HEALTH HAZARD EVALUATION

A. Evaluation Progress

Hartman Electric Manufacturing Company in Mansfield, Ohio was visited on April 9-10, 1974, by NIOSH investigators, Mr. Henry Ramos and Dr. James Lucas. A brief preliminary meeting was held with management representatives to explain the nature of the visit and to obtain background information. Following this meeting, a survey of Departments 01, 02, and 03 was conducted.

B. Description of the Process - Conditions of Use

The Hartman Electric Manufacturing Company produces a wide range of electric relays for use in various industrial and aerospace applications. The work site is housed in an old industrial facility. The work areas were noted to be crowded, but housekeeping was considered as fairly good for a facility of that age. Lighting was judged to be only marginally acceptable.

Departments 01, 02, and 03 are contiguous and known as the Tool Room, Machine Shop and Punch Press areas, respectively. Relay components are mounted on a wide variety of metal and plastic circuit boards. Fibrous glass reinforced plastic circuit board materials are utilized in only a relatively small part of total relay production. Various resin matrices such as Melamine TM, Bakelite TM, and polyester resins are used depending upon product specifications. Production of these items is carried out on fully cured, purchased sheet stock and is only sporadic, i.e., approximately monthly and it is on these occasions when symptoms of itching or dermatitis occur. Fibrous glass spicules are generated by various operations including sawing, grinding, routing, punching, and drilling. This dust tends to accumulate on work and machine surfaces as it settles from the air.

C. Evaluation Methods

1. Employee Interviews

Employees were individually and privately asked non-directed questions followed by directed questions regarding their health and employment by the NIOSH physician who is a board certified dermatologist. Employee's responses were recorded for future tabulation.

2. Environmental Sampling

Personal respirable and total airborne particulate concentration sampling was carried out using MSA Model G pumps with a flow rate of 1.5 liters per minute. Pre-weighted polyvinyl chloride filters (.8 pore size) were utilized for the respirable samples. In addition a Gast Hi-Vol pump Model 1531 with a limiting oriface to maintain critical flow was utilized in general area sampling. Flow rates of approximately nine liters per minute were utilized with this pump in obtaining both respirable and total particulate samples. Two bulk samples, Superior 560A Honing oil and Trim Sol Cutting and Grinding fluid, were collected for the determination of pH and free acidity or alkalinity.

D. Evaluation Criteria

Basically, emphasis was placed largely upon employee interviews during the course of this investigation because of the very intermittent nature of the exposure. Fibrous glass re-inforced circuit board stock were not being machined at the time of the evaluation and, therefore, atmospheric sampling represented essentially a background level. In addition, the itching and dermatitis associated with fibrous glass exposure is usually the result of direct contact with settled particulate rather than airborne dust settling on the skin. Contact with contaminated work surfaces often leads to inadvertent transfer via the fingers to the face, eye lids, and other body areas. Clothing is also frequently contaminated by work surfaces and, since the spicules of glass may readily pierce cloth, dermatitis of the covered extremities is common place. Upon washing contaminated clothing glass spicules may be transferred to garments worn by other persons resulting in secondary cases.

Fibrous glass dust is classed as a nuisance or inert particulate in terms of its airborne hazard. While various standards for such substances have been proposed, these standards have generally been based primarily on worker comfort rather than on the existence of a specific occupational disease associated with excessive exposures. Numerous studies of the fibrous glass industry over the past 30 years have failed to demonstrate pulmonary or other adverse systemic effects despite substantial exposures for many years.

Generally, glass fibers capable of causing cutaneous irritation are too large to be respirable. Thus, there is little basis for recommending a standard more stringent than that for other inert or nuisance dusts. In any event various recommended standards do not necessarily represent absolute protection to all individuals since persons may be unusually susceptible or have pre-existing medical conditions which may be aggravated by nearly any level of exposure. Thus, suggested air standards can never be the sole basis for work place evaluations. Howevēr, it should be pointed out that the Federal Occupational Health Standard i.e. 5 and 15 mg/m^3 of air for respirable and total nuisance dust, does represent the legal minimum level for control.

E. Evaluation Results

1. Employee Interviews and Examinations

A total of 14 employees were interviewed. The majority(9) were women. The average age was 38 (range, 21-56) and the average duration of Hartman employment was 8 years (range, 4 months to 24 years). Most employees had spent the entirety of their employment in their present Department. Six employees were located in Department 02 (Machine Shop) and the remainder were equally divided between Departments 01 (Tool Room) and 03 (Punch Press). Twelve of the 14 employees related histories typical of fibrous glass dermatitis. Intense itching associated with an erythematous rash was the usual complaint. These bouts of pruritus coincided with the infrequent production of fibrous glass containing circuit boards although not every employee was affected every time these items were in production. Three of the twelve, all women, gave histories of allergy and probably are atopics. Only one active case of dermatitis was noted during the investigation. This individual was noted to have a nummular dermatitis on the volar surfaces of both forearms. This employee works in the Machine Shop and is exposed to Trim Sol Cutting and Grinding fluid. This fluid was found to have a pH of 8.2 and it was felt that his dermatitis was most likely the result of repeated exposure to this alkaline fluid. Alkaline fluids are poorly tolerated by the skin since they combine with the lipid surface film, solubilizing it and thus removing this protective barrier. Primary irritant dermatitis commonly follows such exposures. He also related typical post symptoms of fibrous glass dermatitis. The most common areas of fibrous glass involvement were the face, neck, finger webs, and arms. Wests' 211 protective cream and other skin emullents were used by some employees to lessen the severity of symptoms.

One employee had previously developed dermatitis following contact with Superior 560A Honing Oil. This oil was found to have a pH of 3.6 and was noted to be a straight mineral type oil. While the pH of the skin is normally acidic and the skin is therefore generally more tolerant of acidic substances than basic substances, a pH this low is certainly capable of causing primary irritation upon continued exposure..

One employee had noted frequent nose bleeds. However, following cauterization of the friable area of nasal mucosa by her physician, no further problem had ensued.

All employees were also questioned about eye, nose, throat, chest, and digestive tract symptoms. No consistent or relevant symptoms were elicited except in the case of one older employee who gave a three year history of chronic bronchitis. He was noted to be a heavy smoker of many years duration.

2. Environmental Sampling

Six personal sample measurements (three respirable, three total dust) were made in Department 01. The respirable dust samples ranged between 0.26 - 0.46 mg/M^3 and the total dust measured from nondetectable to 0.26 mg/M^3 . Similarly, five respirable and five personal total dust measurements were made in Department 02. The respirable samples ranged from nondetected to 0.64 mg/M^3 and the total dust ranged from 0.14 to 0.66 mg/M^3 . One personal respirable sample (0.17 mg/M) and one personal total dust sample (0.59 mg/M^3) were taken in Department 03. A single general area sample for total dust was taken in the 03 Department with a result of 0.60 mg/M^3. Single respirable and non-respirable general area samples taken with the Gast Hi-Vol pump in Department 01 were reported as 0.09 and 0.33 mg/M^3 , respectively. These results are far below the current OSHA or other proposed standards. In fact, only four of the 19 measurements were sufficiently high to reliably conclude, based on the known inherent error of the method, that any dust was in fact present.

V. CONCLUSION AND RECOMMENDATIONS

It is concluded that periodic exposure to fibrous glass has resulted in a high incidence of fibrous glass itch or dermatitis among employees of Departments 01, 02, and 03 of the Hartman Electric Manufacturing Company. In most instances these effects have been minor and transient in nature. Two instances of dermatitis associated with exposure to machining oil were also noted.

Fibrous glass dermatitis is one of the most commonly encountered cutaneous problems encountered in industry today. Virtually all workers are affected upon first exposure. In the usual industrial setting the discomfort is relatively mild and quickly abates as "hardening" from

continued exposure occurs. Unfortunately, due to the infrequent processing of such materials in this plant, "hardening" has no opportunity to occur. Thus, recurrent episodes can be expected to occur. Atopic persons, i.e., those with personal or strong family histories of allergies such as hay fever or asthma are especially prone to develop itching from fibrous glass or other irritants although all persons are susceptible to varying degrees. Persons with known atopic backgrounds probably should not be employed where such recurrent exposures are to be expected. Shirts and other clothing should be loose fitting and changed daily. Tight fitting clothing frequently "traps" glass fibers and aggravates the dermatitis. Air hoses and brooms should not be used in personal cleansing and ample amounts of cool water, preferably a shower, immediately following exposure are recommended. Protective creams, especially Wests' 211 creams, are usually of some value on days when exposure can be anticipated. To be effective this cream must be applied prior to exposure. All too often such creams are thought to be therapeutic and such is not the case. Frequent vacuum cleaning of the work area to prevent the accumulation of glass spicules is also recommended. Generally, the use of floor or personal fans for cooling should be avoided. Fans not only increase the duration of fibrous glass remaining airborne but also tend to reduce the efficiency of local machine ventilation systems. When possible the machining of fibrous glass containing materials should be restricted to the cooler weather when more clothing is normally worn and the likelihood of developing significant dermatitis is somewhat reduced.

The control of dermatitis associated with lubricants and cutting fluids also requires the dedicated effort of both employees and management. Sporadic cases become almost inevitable if breaks in technique occur allowing sufficient skin contact. The following suggestions should help minimize the problem:

1. As much protective clothing as is consistent with job safety should be worn. This includes rubber gloves, gauntlets, and aprons. Clothing should not be allowed to become saturated with oil and should be laundered after each day's wear.

2. When gloves cannot be worn, some protection is conveyed by the frequent application of barrier creams. Ply® No. 2 cream is useful in protecting against mineral oils and Silicote® ointment skin protectant is recommended for exposure to soluble cutting oils.

3. Proper removal of oils reaching the skin is very important since personal cleanliness is a must. Waterless hand cleaners are particularly valuable in removing insoluble lubricating type oils. Organic solvents should never be used in cleansing as they defat and irritate the skin.

4. Workers should be urged to report the initial signs of developing dermatitis. This allows prompt medical attention and a review of work habits often permitting rapid healing with little or no lost time.

VI. AUTHORSHIP AND ACKNOWLEDGMENT

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