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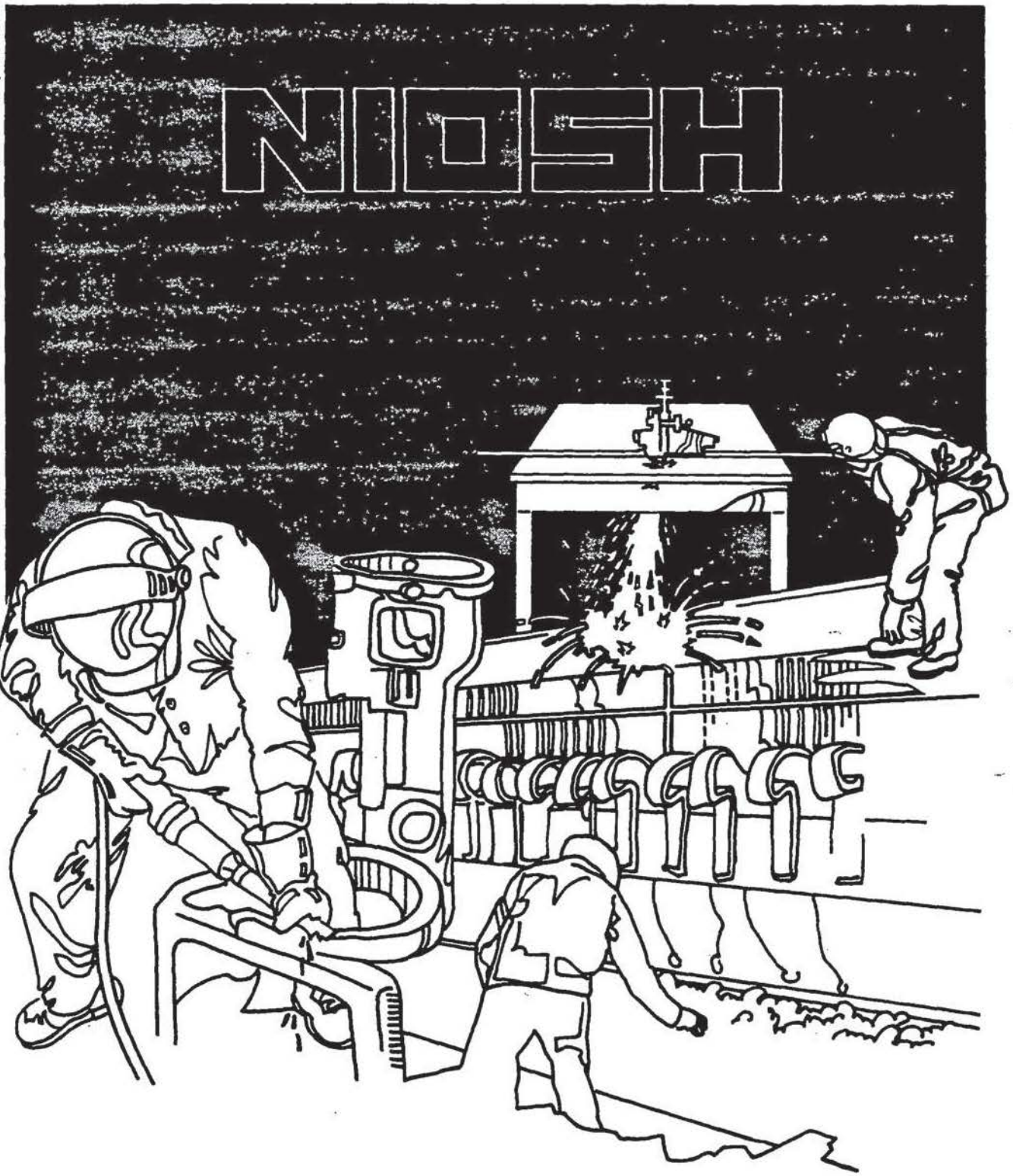

Health Hazard Evaluation Report

HETA 83-409-1450
KING KWIK MINIT MARKET, INC.
CINCINNATI, OHIO

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.

HETA 83-409-1450
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KING KWIK MINIT MARKET, INC.
CINCINNATI, OHIO

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I. SUMMARY

On August 30, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from King Kwik Minit Markets Inc. to identify the cause of the itching reported by data processing workers which occurs while working in the computer room. The problem began May 23, 1983 after a brief, inadvertent shut down of the air conditioning system serving this area.

On September 7 and October 13, 1983, NIOSH investigators conducted an environmental and medical/epidemiologic study. The environmental evaluation involved air sampling, wipe samples, settle samples, air filter extraction, and surface vacuum samples for fibrous glass. A historical account of the problem was also obtained. The medical/epidemiologic study included physician administered questionnaires, examination of skin lesions, and application of transparent tape to either skin lesions or to normal exposed skin of workers in an effort to pick up and identify fibers present on the skin.

The environmental survey revealed negligible use of chemicals in the area and no recent modification or changes of the room or equipment. No glass fibers were detected on any of the air or surface samples. These samples were collected to determine if glass fibers were being released from high-density, fibrous-glass lined duct work serving the area. No other exposed fibrous glass material was identified. Medical interviews elicited complaints of itching; examination revealed small, red maculopapular (slightly raised) lesions. Glass fibers were identified on three tape samples taken from employee's exposed skin and on one sample taken from a computer printout.

This outbreak is consistent with fibrous glass dermatitis. The 100% attack rate is consistent with a non-allergic process, and the relief of symptoms at home and on weekends suggests workplace contamination. Absence of insects, the appearance of lesions, and the failure of insecticide spraying to yield relief rules out insect bites.

Based on the results of this investigation, NIOSH concludes that a health hazard from significant exposure to fibrous glass in the Computer Room does not currently exist. Efforts to identify other causative agents in the area which could be associated with the reported itching and skin lesions were unsuccessful. The continuation of symptoms reported by workers has no currently discernable environmental basis associated with the Computer Room. A recommendation is made to thoroughly clean the computer room and to take added precautions during the maintenance of fibrous glass duct work.

KEYWORDS: SIC 5411 (Grocery Stores), 7374 (Data Processing Services), Office environmental, fibrous glass, itching, dermatitis

II. INTRODUCTION

On August 30, 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from the management of King Kwik Minit Markets Incorporated to conduct a Health Hazard Evaluation at their corporate headquarters located in Cincinnati, Ohio. The concern involved the occurrence of itching and its occasional occurrence with a localized rash among data processing computer room workers. NIOSH investigators conducted an initial site visit September 7, 1983. A follow-up site visit to collect additional environmental samples from the computer room was conducted October 13, 1983.

III. BACKGROUND

King Kwik is the sole occupant of a remodeled and enlarged three story office building. The area of concern is the data processing computer room. This area has a dedicated 100% recirculating air handling system. Relative humidity is maintained at approximately 50% and resistance electric heaters maintain room temperature during cold weather. The air handling system utilizes an unlined high density fibrous glass duct system (ie ductwork made of fibrous glass panels) with flexible metal lined air ducts connected to the ceiling supply vents. The fibrous glass duct work has a reinforced aluminum foil outer covering. On the interior of the metal ducts are exposed fibrous glass panels. A suspended acoustic ceiling conceals the duct work, walls are vinyl covered, tile flooring is present, and the windows are hermetically sealed. Outside air is not introduced to the room during working hours due to the effect increased humidity has on the function of the computer and the problems of regulating humidity levels with a continuous influx of outside air. Polyester air filters were present in all of the supply air openings. The 25 by 29 foot room (7.6 x 8.8 meters) houses the main frame computer, a disc drive, a tape drive, and printer. The room had been occupied by four data entry personnel and the computer operator up until early July. In mid August the last person working in the room was moved out into the programming room due to itching. No chemical usage was reported in the room other than for incidental cleaning agents, antistatic compounds, and miscellaneous office supplies.

The problem began May 23, 1983 following the startup of the computer room's air conditioning system after an inadvertent shut-down while preparing to service one of the building's other air conditioning units. No work on or modification of the system was performed and the total time the unit was off approximated 30 to 45 minutes. The system usually runs 24 hours a day, seven days a week and was turned back on when workers realized the wrong system had been shut off. The company

has invested considerable effort in trying to identify any changes which may have affected the computer room. No material changes exclusive to the computer room, the equipment, or its support systems were reported. Changes in business forms and paper suppliers did not result in any handling of these materials which was limited to the computer room.

The question of paper mites or some other infestation was explored; however, given the absence of relief from the itching following the use of insect repellants and the fact that the problem remains limited to the computer room in spite of traffic flow into and out of the room as well as removal of items from the area, which would have spread any insect infestation, infestation does not seem plausible.

IV. METHODS AND MATERIALS

The survey conducted by NIOSH investigators September 9, 1983 consisted of a walk-through survey, the collection of environmental samples and the administration of questionnaires. The follow-up survey conducted October 13, 1983 was limited to further environmental sampling.

A. Environmental

The walk-through survey consisted of a visual inspection of the computer room and a tour of the rest of the building. Visits were made to rooms above, below, and surrounding the computer room. Ceiling tiles were removed to inspect these areas as well as the ventilation systems and ductwork. This was done both in the computer room and in another part of the building with a different air-handling system. Where it was possible, the duct work was opened to permit internal inspection. A visit to the roof and the location of the outside - air intake for the computer room was performed.

Dual air samples were obtained for fibrous glass and particulates both inside the computer room and at a reference location (Conference Room B). Samples were collected on mixed cellulose ester filters in open-face cassettes at a flow rate of approximately nine and one-half liters per minute over a four hour period (approximately 2.4 cubic meters). At each of the two sampling locations the filters were situated at a desk or table at approximately the breathing zone height of a seated person. Open-face cassettes were set out face up to permit particles to settle out onto the filter in the same general location as the air samples. All air samples were collected September 9, 1983.

Subsequent to the initial survey, concern was raised about possible residual surface contamination. (See Section V Results) Surface deposits of fibrous and particulate matter were evaluated by vacuuming relatively undisturbed horizontal room and equipment surfaces with a small high flow pump, collecting material on a mixed cellulose ester filter as the open-face cassette is passed very close to the surface. The composite total area vacuumed was approximately 11 square feet (1 square meter). Additionally, wipe samples (actual wiping of surfaces using a filter for collection of material) were also obtained. The composite surface area of wiped surfaces approximated four square feet or one-third square meter. These samples were collected in the computer room and also in the two offices currently occupied by the workers.

Seventeen filters of the 25 collected were submitted for fibrous glass identification and mineral characterization. This broke down into the following types of samples:

- 2 air samples (one from each location in the building i.e. computer room and Conference Room B, volume greater than 2.4 cubic meters)

- 3 settled samples (open cassettes, table height, face up, 2 from computer room, - (1 by printer), 1 from Conference Room B)

- 4 vacuum samples (3 from computer room, 1 from programming room; vacuumed surfaces included window ledges and the tops of computer-printer equipment)

- 4 wipe samples (3 from computer room, 1 from programming room-same type surfaces as previous samples but unvacuumed)

The remaining four filters were blanks.

These filters were prepared for electron microscopic analysis (EM) via the Zumwalde-Dement procedure outlined in NIOSH Publication 77-204.[1] Each preparation was scanned at 2700 x magnification to insure even distribution and a satisfactory preparation. Energy dispersive analysis of x-rays of arbitrarily selected particles in ten randomly selected grid openings was performed at 10,000 x magnification.

A filter used in one of the computer room air supply vents was also obtained. The polyester filter was prepared for EM analysis by ultrasonicating a portion of the filter in ethyl alcohol. Aliquots of the resulting solution were evaporated onto a carbon-coated copper grid. The entire grid was scanned at 2700 x magnification to detect the presence of fibrous glass. Particle analysis was performed in the same manner as for the filters.

B. Medical

Eight employees were given a physician-administered questionnaire and any skin lesions were examined. In addition, transparent tape was applied either to skin lesions or to normal exposed skin of workers to attempt to pick up fibers adherent to the skin. If no skin lesions were present, tape was applied to the volar (inside) surface of the elbow or wrist of one arm. Tape was also used on computer room windowsills and computer printout paper. Microscopic examination for fibrous glass fibers was done.

V. RESULTS

A. Environmental

No glass fibers were detected on any of the environmental samples. Two fibers were observed on one of the blank filters. No fibers were observed in the solution obtained from the air filter.

All of the filters contained aluminum silicate and calcite. Aluminum silicate is a common component of soils and clay. Calcite, or calcium carbonate, is one of the most stable, common, and widely dispersed materials in nature.[2] Other minerals identified as present in varying numbers of samples were calcium sulfate-used in paper as a size filler and surface coating, and in plaster, paints, and wallboard,; amorphous quartz; iron containing particles; calcium and potassium sulfates and phosphates; sodium sulfate and phosphate; magnesium containing particles; and copper and titanium containing particles. These particles were generally amorphous (noncrystalline) and constituted less than 20 percent (and more often less than 5 percent) of the mineral content in samples where the respective minerals were identified as present. No insects or insect parts were identified on any of the filters.

Relative humidity in the computer room during both surveys was about 45 per cent as determined by the use of a psychrometer.

B. Medical

Histories of the rash and itching given by the employees indicated that the symptoms started at a discrete time on May 23, 1983, when the air-conditioning equipment in another part of the building was replaced. The attack rate was 100% with all seven computer-room

workers being affected within two hours after entering the computer room following the air-conditioning work. Symptoms have persisted over the five months following the work. The itching starts at any time of the day, usually occurs on exposed skin, and is associated with small red maculopapular (slightly raised) lesions. On clinical examination, one individual had confluent lesions which appeared more urticarial in appearance. Attempts at cleaning the room and spraying the room with insecticide were ineffective at altering the symptoms. Usage of an electrostatic air cleaner seemed to decrease the itching for only a few days. Computer room workers have found that symptoms will continue at home unless they change clothes and take a shower. Questioning also revealed that two of approximately 23 workers in the accounting department were also affected with itching. The one accounting worker available reported that her symptoms were confined to her hands and arms. These two accounting workers were unique in that only they handled the computer printouts which were received from the computer room.

Microscopic examination of the tape samples was done to identify fibrous glass fibers. These fibers were visible as long, regular fibers which were nonrefringent under polarized light. A positive control sample was taken from the interior of one of the air-conditioning ducts. A total of eight workers were sampled (seven from the computer room and one from the accounting department). Three of these workers had skin lesions, five did not. Examination of the tape samples revealed fibrous glass fibers from the skin of three workers, all from the computer room, two of whom were symptomatic and had skin lesions at the sampling site. In addition, the computer printout paper was found to have fibrous glass on its surface. No tape sampling was conducted for surfaces or workers in areas unassociated with the computer room.

VI. DISCUSSION AND CONCLUSIONS

This outbreak is consistent with fibrous glass dermatitis. This is a condition caused by the mechanical irritation of fibrous glass fibers on the skin. The 100% attack rate is consistent with a non-allergic process. The relief of symptoms at home and on weekends is consistent with a workplace contamination. Absence of insects, the appearance of lesions, and the failure of insecticide spraying to yield relief rules out insect bites. The urticarial appearance of one worker's lesions might be explained by a secondary acquired contact dermatitis to the resin which is often used as an adhesive on fibrous glass fibers.

The environmental data obtained during the conduct of this investigation does not provide any identifiable source of fibrous glass exposure in the room, nor do these data provide any evidence of residual fibers present in the room. No historical account was offered which could provide a plausible explanation of the sudden onset and persistence of the problem. No physical or mechanical changes had been made to the room or its components (including ventilation). The suspected source of glass fibers-the unlined high density fibrous glass duct work-does not appear to be a source of fibers since air sampling did not reveal any airborne fibers, even with the system running. Additionally, the filter located inside the ceiling supply vent did not produce any fibrous glass fibers. The absence of any reported modifications, or traumatization of the fibrous glass duct work at or immediately prior to the May 23, 1983 onset of the problem further contradicts the hypothesis of free fibrous glass particles being released from the duct work.

Consultation with past and present paper suppliers did not provide any information about skin irritation or itching associated with handling of the paper. Additionally, the current supplier of the paper being used stated that they were unaware of any problems associated with the use of the approximately 1200 boxes of computer paper they supplied on a weekly basis to greater Cincinnati area businesses.

Vacuuming of a computer paper stack near the printer and the small hood above the printer paper discharge did not produce any glass fibers. This indicates that the paper, consistent with supplier claims, does not contain fibrous glass since one would expect to see these fibers released by mechanical action as the paper came out of the printer if 1)they were present and 2)were easily dislodged from the paper.

In summary fibrous glass is presumed to be the agent responsible for the outbreak of itching in the computer room. This is indicated by the presence of fibrous glass on the skin of affected workers. The itching experienced by two workers in the accounting department might be explained by the presence of fibrous glass on the computer printouts which carried fibers from the computer room. The source of fibrous glass to which workers may be exposed remains unidentified. Additionally, except for the identification of fibrous glass on four tape samples (three from the skin of workers and one from a computer printout), data collected during the course of this investigation do not suggest any detectable exposure to fibrous glass nor does it confirm the presence of free, residual glass fibers in the computer room.

VII. RECOMMENDATIONS

1. A thorough cleaning of the computer room and any upholstered furniture is suggested to remove dirt, paper dust, and any undetected low levels of irritant fibers. A vacuum cleaner equipped with a high efficiency filter may be necessary.

2. Any future repair of or work with fibrous glass duct or other materials in this area should be kept to a minimum. A thorough cleaning of the area to remove fibrous glass debris and fibers during and after the work should be undertaken.

3. An approach permitting the introduction of outside air during working hours may be to dehumidify outside air before introduction into the computer room. Regular maintenance of this system would be necessary to prevent the unit from introducing contaminants associated with normal operation (i.e. proper drainage of any condensate pans or collectors to avoid microbial growth).

VIII. REFERENCES

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IX. AUTHORSHIP AND ACKNOWLEDGEMENTS

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