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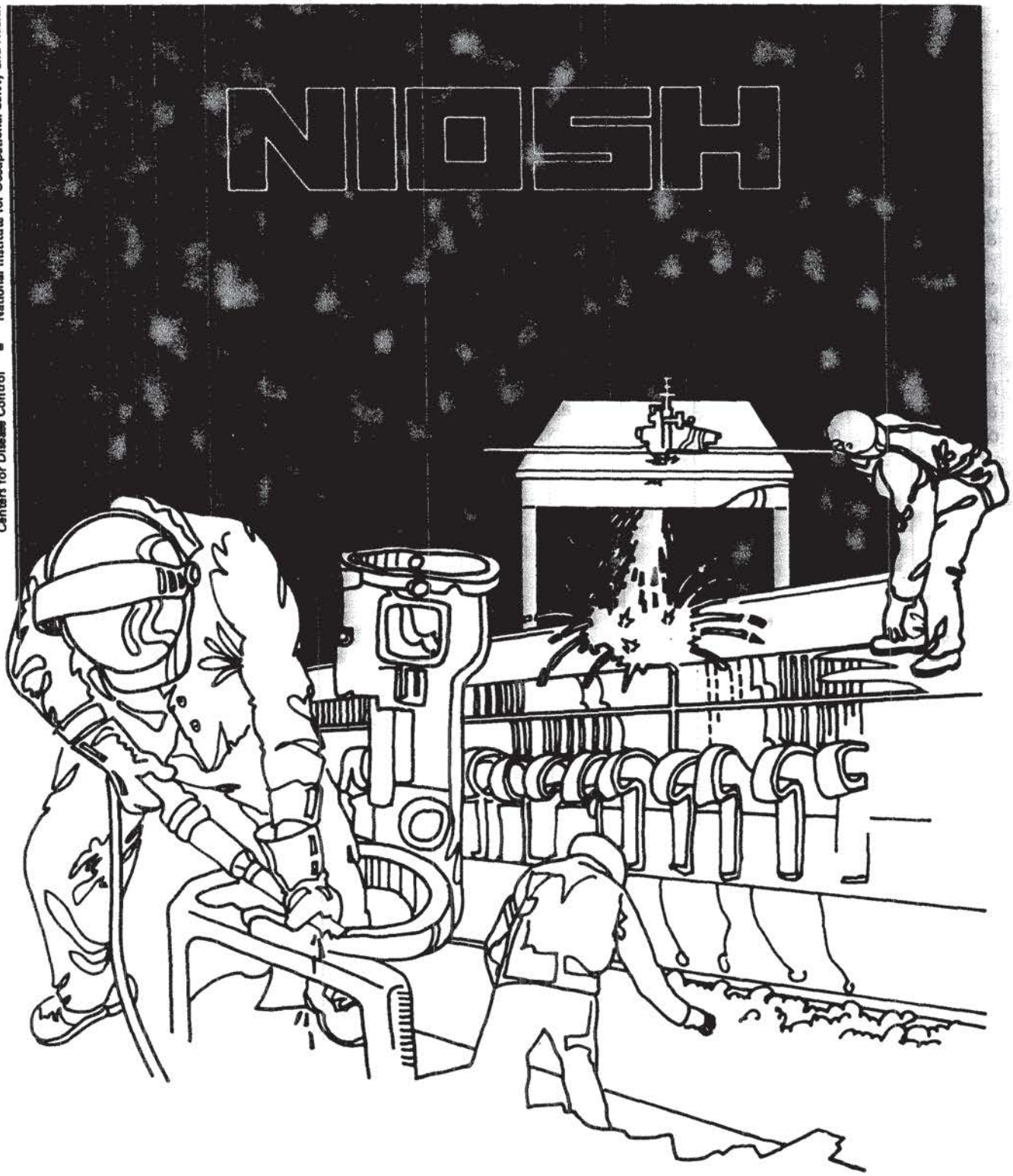

Health Hazard Evaluation Report

HETA 81-058-1037
BLUE CROSS OF NORTHEASTERN NEW YORK, INC.
SLINGERLANDS, NEW YORK

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.

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Blue Cross of Northeastern New York, Inc.
Slingerlands, New York

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I. SUMMARY

On October 30, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from Blue Cross of Northeastern New York, Inc., to evaluate an apparent cluster of contact dermatitis in 67 of 535 employees at the Slingerlands, New York office. The assistance of NIOSH was requested after investigations by the New York State Health Department and the Occupational Safety and Health Administration (OSHA) had failed to reveal the etiology of the dermatitis.

After an initial site visit in November 1980, NIOSH collected high-volume area air samples for particulates and measured relative humidity during December 1980 and February 1981. Wipe samples of work surfaces in several offices for identification of fibers and bulk samples of insulation materials used within the building were also obtained. NIOSH administered a health questionnaire to 62 affected employees and to 60 controls matched by department and sex. Employees were asked about symptoms, allergic histories, work locations, and environmental conditions. Affected employees were examined by local dermatologists and by the NIOSH consulting dermatologist.

Fibrous glass was detected in the area air samples, but in levels too low to quantify (the average limit of detection was 3,400 fibers per cubic meter of air). Eight of 10 wipe samples contained fibrous glass. Asbestos was not detected in any air samples; 3 of the 8 positive wipe samples contained amosite asbestos. The proportion of fibrous glass and asbestos in the wipe samples approximates the composition of a sprayed-on insulation used within the ceiling plenum, indicating that it is a likely source of the dust. Relative humidity averaged 18% during the site visits.

The appearance of the dermatitis was consistent with exposure to an irritant particle, such as fibrous glass or mineral wool. The information obtained from the questionnaires implicated the sprayed-on insulation used within the plenum as the likely causal factor. Individual factors, such as allergies, could not explain the development of the dermatitis.

Although there were no significant air levels of fibrous glass or asbestos, the detection of fibrous glass in 8 of 10 wipe samples and the findings of a primary particulate irritant dermatitis implicate fibrous glass as the cause of the problem in the building. The most likely source of the fibrous glass is the sprayed-on insulation material used within the ceiling plenum. Newly installed fibrous glass insulation in the soffit of the building and low relative humidity may have contributed to the problem. Recommendations are made in the body of the report, including not working in the ceiling plenum when office employees are present and increasing the relative humidity.

Keywords: SIC 6324 (Hospital and Medical Service Plans); closed office building, fibrous glass, mineral wool, asbestos, low humidity, dermatitis.

II. INTRODUCTION

In November 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from Blue Cross of Northeastern New York, Inc., concerning an apparent contact dermatitis among 67 of 535 employees at the Slingerlands office. Representatives of NIOSH visited the site on November 6, 1980, and met with representatives of Blue Cross/Blue Shield, the New York State Health Department, and the Occupational Safety and Health Administration (OSHA). Ten affected employees were interviewed and had skin examinations.

Environmental sampling for particulates, temperature and humidity, and medical interviews with 125 employees were done on December 3 and 4, 1980. Further environmental sampling took place during February 1981. On April 16, 1981, the NIOSH medical officer and consulting dermatologist visited the facility and examined approximately 15 affected persons.

On June 18, 1981, NIOSH sent a letter to Blue Cross/Blue Shield summarizing its findings and providing preliminary recommendations. As of November 1981, most of the recommendations have been implemented and the problem has been abated.

III. BACKGROUND

Blue Cross and Blue Shield co-occupy a ten year old free-standing, three story building in Slingerlands, New York. They are the original occupants of the building. The facility was constructed with windows that do not open; air is supplied by three separate air moving systems- one for each floor. The systems supply approximately 20% fresh air with 80% recirculated air, which is humidified to a nominal minimum relative humidity of 35%. The air systems were last balanced in the Spring of 1980. There have been no other recent changes to the air ventilation system.

Large office spaces are located on each floor where employees process insurance claims. This work involves handling papers and using a video display terminal (VDT). Most of the office space has tile floors, while the executive office areas are carpeted. The ceiling is suspended with the space above serving as a return air plenum. The structural ceiling within the plenum is covered with a sprayed-on insulation material. The top floor of the building has a soffit overhang. New six inch thick fibrous glass blanket insulation was installed in the soffit at the north-west corner of the building during June 1980. Additional fibrous glass insulation was installed in the remainder of the soffit along the west side of the building from September 18 to October 10, 1980. Otherwise, there has been no new construction at the facility during the past several years.

The three floors of the building are called the Ground, First, and Second floors, respectively. The Ground floor contains the Employee Lounge in the north-west corner; Medicare and the Mail Room along the west side; and Training and Development on the east. The First floor houses Major Medical in the north-west corner; Data Entry in the south-west corner; a computer area; and Personnel, Membership Services, Financial, and Bookkeeping along the east side. The Second (top) Floor contains the Executive Offices along

the north side; Blue Cross Claims and Blue Cross Data Entry along the west side; and Blue Shield Claims, Blue Shield Data Entry, and Accounting along the east side of the building.

Employee complaints of pruritis (itching) began during late July 1980 and increased gradually until September 1980. Most of the employees who initially reported having problems worked in the Major Medical office. They noted developing itching accompanied by a rash on the legs, inner forearms, neck, and, occasionally, upper abdomen. The rash consisted of discrete small red papules, sometimes with central white pustules. The severe itching usually improved within two days, while the rash took up to two weeks to resolve.

Through August, more employees in Major Medical were affected; in addition, employees in other areas of the building began reporting having similar rashes. Figure 1 shows the dates of onset of rashes reported by the employees from August to October 1980, also indicating the employee's work location at the time of onset. While the first reported cases came from persons in Major Medical on the First floor, later cases came from all three floors of the building. During September, the greatest number of cases were located on the Second floor in the Blue Cross Claims and Blue Cross Data Entry area.

During August, Blue Cross arranged to send affected employees to a dermatologist for evaluation. The dermatologist saw approximately 30 employees between late August and early October. He reported that the employees had a "contact dermatitis" of unknown etiology.

An environmental consulting firm was asked to evaluate the problem and visited the facility on August 25, 1980. The consultants collected 12 8-hour area air samples for asbestos. The samples were analyzed by NIOSH Method P&CAM 239. The greatest airborne concentration detected was 35,000 fibers per cubic meter of air. The NIOSH recommended standard for asbestos is 100,000 fibers per cubic meter of air, vide infra.

Blue Cross also requested the assistance of the New York State Department of Health. An entomologist from the Bureau of Disease Control, New York State Department of Health, visited the facility during August and September. He concluded that there was an infestation of Psocid - a primitive book louse - in the building which was likely responsible for the dermatitis. Based on his recommendation, the building was sprayed with Pyrethrum on September 13, 1980. Rashes continued to appear the following week and the building was sprayed a second time on September 20, 1980. The floors and working surfaces in the offices were cleaned after the spraying. The entomologist examined approximately 25 affected employees on September 23 and 24. He noted that the employees' rashes were similar to the earlier reported rashes, but possibly could be due to a new agent, since the Psocid had been eliminated.

As mentioned above, additional fibrous glass insulation was installed during September in the soffit along the west wall. The specific days of installation were September 18, 19, 22, 23, 26, and 27, and October 3 and 10. Since the number of cases of dermatitis increased during the weeks of September 15 and 21, it was considered possible that fibrous glass from the new insulation could be responsible for the continuing cases of dermatitis. Blue Cross then requested the assistance of the Occupational Safety and Health Administration (OSHA) in evaluating the problem.

OSHA initially visited the facility on October 3. Area air samples for fibrous glass and particle identification were obtained on October 10 and 16 in the Blue Cross Claims office, Blue Cross Data Entry, and Major Medical office. On October 10, four area samples were obtained using Millipore AA filters with collection volumes of 120 liters each. Fibrous glass was identified on the filters, but was present in levels too low to quantify (limit of detection was 35,000 fibers per cubic meter of air). Asbestos was also identified on the filters. The highest concentration of asbestos measured was 130,000 fibers per cubic meter of air. On October 16, area air sampling was repeated using sampling volumes of 640 to 680 liters. Four samples indicated no detectable levels of fibrous glass (limit of detection was 5,000 fibers per cubic meter of air). OSHA could not identify a specific agent responsible for the dermatitis and, during its closing conference on October 21, 1980, recommended that Blue Cross request a NIOSH health hazard evaluation.

IV. EVALUATION DESIGN AND METHODS

A. Environmental

The description and appearance of the dermatitis during the initial site visit indicated that the agent most likely was a discrete particle causing primary irritation of the skin. During the walk-through inspection, no toxic chemical or source of toxic vapors was identified. Therefore, subsequent environmental sampling was directed at assessing levels of airborne particulates. Temperature and humidity were measured since these factors can influence the amount of irritation caused by substances contacting the skin.

On December 3 and 4, 1980, wipe samples were obtained for identification of fibers from 10 horizontal surfaces in offices on the First and Second floors of the building. The insulation material installed in the overhang soffit could be seen through ventilation slots at the edge of the ceiling in the Blue Cross Claims office. A bulk sample of the material was obtained for analysis. A small piece of the sprayed-on insulation material used within the suspended ceiling was also obtained for analysis.

High volume area air samples were collected on Millipore AA filters using open-faced filter cassettes at approximately 5.5 liters of air per minute for fiber count and identification. Samples were obtained in Blue Cross Data Entry (sample volume was 655 liters of air), and in the Major Medical office (sample volume was 597 liters of air). Temperature and relative humidity were measured using a swing psychrometer in the Employees Lounge, Major Medical office, State Unit, and Blue Cross Claims office.

On February 11, 1981, sixteen additional high volume area air samples were collected in various locations throughout the building. Samples were collected on Millipore AA filters for total fiber count and identification. Sampling volumes averaged 1,321 liters of air (range was 328 to 1,870). Temperature and relative humidity were also measured.

For fiber identification of the wipe samples, a wedge from each filter was removed and particulate was washed from the wedge to a microscope slide using a refractive index liquid. Each slide was examined for fibers utilizing

polarized light microscopy and dispersion staining techniques. Area air samples were analyzed for total fiber count according to NIOSH Method P&CAM 239 utilizing Phase Contrast Microscopy. This method does not identify specific fiber types. The limit of detection is based on 0.03 fibers per microscope field. For the average collection volume of 1,321 liters of air, the limit of detection would be 3,400 fibers per cubic meter of air.

B. Medical

During the initial site visit on November 6, 1980, NIOSH met with representatives of Blue Cross, the New York State Department of Health, and OSHA to review the nature of the health complaints. Company medical records, worker's compensation records, and a log of reported cases were obtained. Ten affected employees were interviewed and had skin examinations of the legs, arms, neck, and abdomen.

The dermatologist engaged by the company was contacted to provide his impressions of the health effects. Since new cases developed subsequent to the initial NIOSH visit and some earlier cases had continuing problems, NIOSH maintained on-going contact with the dermatologist. During December, 1980, and February, 1981, the dermatologist obtained skin biopsies from three affected employees. After local review, these biopsies were forwarded to NIOSH for pathological examination.

During December 1980, NIOSH interviewed 65 affected persons and 60 controls selected randomly to match the affected persons by sex and department. Employees were asked about health symptoms, work locations, time spent using a VDT, type of clothing usually worn during August and September, smoking habits, atopic histories, and recent changes in the office environment. The exposed skin on the arms and neck of each respondent was examined. Three of the "affected" persons had clearly unrelated dermatologic problems and were eliminated from the comparison of cases and controls. Frequencies of responses were calculated; cases and controls were compared using odds ratios. Statistical testing was by Chi-square using an unmatched analysis.

A record of new and recurrent cases of dermatitis was maintained by the company. Some employees reported having continuing dermatologic problems, but very few new cases were reported from late December 1980 through March 1981. The reported dates of onset by week from August 1980 through April 1981 are shown in Figure 2. Seven employees reported experiencing new rashes during the week of March 30, 1981. At that time, NIOSH contacted the local dermatologic society and suggested that some of the employees be examined at a weekly society clinical conference. Six employees volunteered to attend the conference and were examined by the group of dermatologists. The results of the examinations were obtained by NIOSH.

Finally, the NIOSH medical officer and NIOSH consulting dermatologist visited the facility again on April 16, 1981. They interviewed and examined approximately 20 employees- some people with severe, on-going complaints and others with less severe, intermittent, and more typical complaints.

V. EVALUATION CRITERIA

A. Definitions

A fiber is considered to be a particle with a length-to-diameter ratio of 3 to 1 or greater(1). Mineral wool is a generic term that denotes any fibrous glassy material made from minerals (e.g., natural rock) or mineral products (e.g., slag or glass)(2). Fibrous glass is the name for a man-made fiber in which the fiber-forming substance is glass(1). Glasses are a class of materials made from mixtures of silicon dioxide with oxides of various metals and other elements, that solidify from the molten state without crystallization.

Asbestos is a term that applies to a number of naturally occurring, hydrated mineral silicates (natural rock) which separate into fibers(3). These fibers are crystalline in structure, unlike mineral wools, including fibrous glass. Types of asbestos include chrysotile, amosite, crocidolite, tremolite, and anthophyllite.

B. Environmental Criteria

The environmental criteria for airborne levels of particulates used in this report include the NIOSH recommended standards and the Federal occupational health standards as promulgated by the Occupational Safety and Health Administration, U.S. Department of Labor.

NIOSH recommends that occupational exposure to fibrous glass not exceed an airborne concentration of 3,000,000 fibers per cubic meter (fibers having a diameter equal to or less than 3.5 micrometers and a length equal to or greater than 10 micrometers) as a Time-Weighted Average(TWA) for a 10-hour workday, 40 hour workweek. The total fibrous glass concentration should not exceed 5 milligrams per cubic meter(mg/m^3) of air as a TWA. NIOSH also recommends that these limits apply to other man-made fibers such as mineral wool. The Federal occupational health standard for fibrous glass is the same as for nuisance dust. The current standard is 15 mg/m^3 total dust and 5 mg/m^3 dust of respirable size on a 8-hour TWA basis(29 CFR 1910.1000).

NIOSH has concluded that exposure to asbestos fibers causes cancer and asbestosis in man and recommends that the environmental standard should be set at the lowest level detectable by available analytical techniques(4). This level is defined as 100,000 fibers greater than 5 micrometers in length/m^3, on a 8-hour TWA basis, with peak concentrations not exceeding 500,000 fibers greater than 5 micrometers in length/m^3 based on a 15-minute sampling period. The Federal occupational health standard states that the airborne concentration of asbestos shall not exceed 2,000,000 fibers greater than 5 micrometers in length/m^3, on a 8-hour TWA basis, with a 15-minute ceiling concentration not exceeding 10,000,000 fibers over 5 micrometers in length/m^3 (29 CFR 1910.1001).

C. Potential Health Effects

Fibrous Glass - Few health effects in humans have been found after fibrous glass exposure. These exposures have been generally to fibrous glass with a diameter greater than 3.5 micrometers. The health effects that have been

observed include skin, eye, and upper respiratory tract irritation, a relatively low frequency of fibrotic changes in the lungs, and preliminary indication of a slight excess mortality risk due to non-malignant respiratory diseases(1).

Results of experimental studies on animals suggest that smaller fibers, less than 3.5 micrometers in diameter, may penetrate more deeply into the lungs than larger fibers. Since these smaller fibers have been manufactured only relatively recently, the chronic health effects of human exposure to small diameter fibrous glass is unknown. Until more definitive information is available about the potential of fibrous glass to cause pulmonary fibrosis, NIOSH has recommended an exposure limit for small diameter fibrous glass which should prevent long-term adversed health effects in humans. Thus the NIOSH recommended standard is two-fold - a concentration of small diameter fibers based on a visual count of the fibers which should prevent the development of fibrosis of the lungs, and a total concentration of fibers based on the weight of the collected sample, including both small and large diameter fibrous glass particles.

Dermatitis due to fibrous glass consists of itching and burning of the skin at the site of contact, followed by erythema (redness), localized swelling, and small, discrete papules, some of which may be capped with tiny pustules. It is likely caused by mechanical irritation; however, fabricated fibrous glass products are coated with chemical binders and lubricants which may cause primary chemical irritation(1). Experimental studies have indicated that sensitization does not seem to occur.

The potential of fibrous glass to cause dermatitis increases as the diameter of the fiber increases. Fibers greater than 5.3 micrometers in diameter were found to cause dermatitis, while fibers with diameters less than 4.5 micrometers did not(5). It should be noted that fibrous glass (and mineral wool) used for building insulation mostly consists of fibers with diameters greater than four micrometers.

The amount of dermatitis due to fibrous glass does not necessarily correlate with the air concentration of the fibers. The dermatitis is probably due more to skin contact with fibers which have settled on work surfaces, than to contact with airborne fibers. Particularly when a source is intermittent, the amount of dermatitis experienced would depend on housekeeping practices, as much as on the overall air concentration of the fibers.

Mineral Wool - No studies of those exposed only to rock wool or slag wool have been published in the literature(2). NIOSH has recently completed a retrospective cohort mortality study of rock and slag mineral wool production workers(6). Exposures were estimated to average 2,500,000 fibers per cubic meter before 1935 and 1,500,000 fibers per cubic meter since 1935. Employees with longer than 20 years of exposure or employees who survived at least 20 years from the time of first exposure (20 year latency) demonstrated an increased risk of dying of cancer of the digestive system and of non-malignant respiratory disease. The standardized mortality ratio for employees after a 20 year latency was 164 for cancer of the digestive system and 161 for non-malignant respiratory disease. Employees with less than 20 years from the time of first exposure did not demonstrate any specific excess risk of mortality. The specific levels of exposure of the workers in the

study could not be determined; therefore, a dose-response relationship could not be quantified. Because of the structural similarity of mineral wool and fibrous glass, until more specific information is available, the recommended standard for fibrous glass should also be applied to mineral wool(1).

Asbestos - The most serious potential consequence of asbestos exposure is the development of cancer. Human exposure to asbestos has been associated with an increased incidence of lung cancer, pleural and peritoneal mesothelioma, gastrointestinal cancer, and laryngeal cancer(2,4). Inhalation of asbestos fibers may also cause asbestosis, a diffuse interstitial fibrosis of the lungs. Asbestosis usually becomes evident 20 to 40 years after the first exposure to asbestos(4,7). This progressive lung fibrosis may result in respiratory impairment, disability, and death. No entirely safe environmental level for asbestos has been determined; however, the risk of disease decreases with decreasing levels of exposure. The NIOSH recommended standard is intended to prevent the development of asbestosis and materially reduce the risk of asbestos-induced cancer(4).

Pyrethrum - Pyrethrum is an insecticide which is applied as a powder. The chief effect from exposure is skin rash particularly on moist areas of the skin(8). The usual lesion is a mild erythematous dermatitis with vesicles, papules in moist areas, and intense pruritis. An allergic reaction may occur among some exposed persons, causing more severe dermatitis, hayfever-like symptoms, and possibly asthma.

Psocid - Psocid is a primitive book louse which is commonly found in buildings where paper is used. The animal lacks a developed mouth and is incapable of biting humans. No published reports could be found which indicat that Psocids are capable of causing dermatitis. Entomologists contacted by NIOSH stated that Psocids are not known to cause dermatitis in humans.

VI. RESULTS AND DISCUSSION

A. Environmental

Wipe samples for identification of fibers were obtained in 10 locations in the building. The locations and findings are shown in Table 1. Cellulose (paper dust) was identified on all of the wipe samples and the blank. Eight of 10 samples also contained fibrous glass. Three of the 8 samples contained both amosite asbestos and fibrous glass, including two with greater than 50% asbestos by visual inspection.

The bulk sample of the newly installed insulation blanket was identified as containing approximately 1% amosite asbestos, 95% mineral wool, and less than 1% cellulose. The bulk sample of the sprayed-on insulation contained approximately 50% amosite asbestos, 40% mineral wool, and less than 1% cellulose. It should be noted that the identification of "mineral wool" on these bulk samples is based primarily on the gross morphology of the fibers. Cleaner, more regular fibers likely would be labeled "fibrous glass". Thus the identification of "mineral wool" on the bulk samples, but "fibrous glass" on the wipe samples does not exclude the possibility that the latter derives from the former.

The area air samples for fiber identification and total fiber counts obtained in the Major Medical office and in Blue Cross Data Entry identified both cellulose and fibrous glass, but in levels too low to quantify. (The level of detection for quantitative analysis is 7,540 fibers/m^3.) Asbestos was not identified on the area air sample filters.

Repeat area air sampling for total fiber count during February 1981 did not detect any quantifiable levels of fibers in the air. Sixteen samples obtained in different locations in Blue Cross Claims, Blue Cross Data Entry, Special Claims, Blue Shield Claims, Blue Shield Data Entry, and Major Medical were all below the limits of detection. The limit of detection varies with the sample volume; the greatest lower limit of detection for the sixteen samples was 13,700 fibers/m^3.

On both occasions, the total fiber count on every sample was below the limit of detection. The highest limit of detection for all the samples was more than 200 times lower than the NIOSH recommended standard for the concentration of small diameter fibrous glass. These levels are too low to be able to determine a mass concentration of total fibrous glass (large and small diameter fibers). Thus, the total air concentration of fibrous glass and the fiber count were both negligible compared to the NIOSH recommended standard. Considering similar sampling results obtained earlier by OSHA, NIOSH concludes that there is no substantial continuing contamination of the air by fibrous glass.

No asbestos fibers were identified in the samples obtained during December, 1980. The air samples obtained during February, 1981, were analyzed only for total fiber count and did not identify specific fibers. Nevertheless, for each sample, the combined concentration of all fibers was below the limit of detection. The greatest limit of detection for total fibers in the samples is 10 times lower than the NIOSH recommended standard for asbestos alone. Based on these sampling results and similar results obtained earlier by an independent environmental consulting firm, NIOSH concludes that there is no substantial contamination of the air by asbestos.

While no air contamination by fibers was found, the results of the wipe samples indicate that fibrous glass is present on work surfaces on both the First and Second floors. It must be present in the air intermittently, in order to settle on the surfaces tested. The possible sources of the fibrous glass include the sprayed-on insulation within the plenum, the fibrous glass blankets installed in the soffit, and dislocated fibers from fibrous glass filters used within the ventilation system. The relative contribution of these sources can not be determined; however, the joint presence of amosite asbestos and fibrous glass on 3 of the 8 positive wipe samples indicates that the sprayed-on insulation within the ceiling plenum is capable of being dislodged and falling onto the work surfaces within the offices.

Temperature and humidity were assessed using a swing psychrometer during December 1980 and February 1981. Sampling in 10 locations on different floors during December revealed an average temperature of 76°F (range was 72°F to 79°F). The average relative humidity was 15%, with a range of 11% to 19%. During similar sampling in February, the average temperature was 71°F, while the average relative humidity was 19%. On both occasions, the temperature was within the accepted range for thermal comfort; however, the relative humidity was substantially below a level of 40% to 60% recommended

by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.(9). The ventilation system within the building is designed to maintain a minimum relative humidity of 35%. It is apparent from these measurements that the humidifiers within the system are not functioning adequately.

B. Medical

During the initial site visit, the NIOSH medical officer interviewed and examined the skin of 10 affected employees. They all reported experiencing a pruritic rash consisting of small red papules, some of which were capped by tiny pustules. Employees in the Blue Cross Data Entry area noted developing itching as early as June 1980. They did not report the itching, until rashes were reported by other employees almost two months later. Most of the employees referred to the lesions as "bites" because the New York State Department of Health entomologist had told them that the dermatitis was due to a Psocid infestation. On the other hand, four persons presented small samples of glassy fibers that they reported had been falling on their desks. They said that their itching and rashes seemed to be associated with the presence of the fibers.

Each individual generally had the rash in only a few circumscribed areas. The most common locations were the inner forearms, neck, or legs. Two persons had the rash on the upper abdomen. On the day of the visit, most of the lesions were secondary crusts (scabs) due to excoriation. The few primary lesions appeared as described above.

Copies of the worker's compensation forms and the company's log of reported cases were obtained by NIOSH. The worker's compensation forms indicated that the legs and forearms were the most common locations of the dermatitis. No special diagnostic procedures were performed; essentially all the employees were diagnosed as having a contact dermatitis of "unknown etiology". The log showed the reported date of onset and work location for each employee affected between August and October, 1980. This information is shown in Figure 1. The log indicates that the initial reported cases began in Major Medical on the First floor. Later, persons were affected from all three floors of the building. During the second half of September, most of the cases were located on the Second floor, especially in the Blue Cross Claims and Data Entry area.

The number of reported cases increased substantially during the last three weeks of September. During the initial meeting with representatives of Blue Cross, several factors were identified which were temporally associated with the increased reporting of cases: (1)The building was sprayed with Pyrethrum on September 13 and 20. Pyrethrum can cause an irritant dermatitis; (2)Blankets of fibrous glass insulation were installed in the soffit on the west side of the building on 8 days during late September and early October. It should be noted that the insulation was installed by opening the ceiling in the Blue Cross Claims and Blue Cross Data Entry area; (3)The company held a meeting with the employees to discuss the nature of the problem. Some employees noticed their individual problems subsequent to this meeting; and (4)The New York State Department of Health entomologist visited the facility on September 23 and 24 to examine employees. Several persons reported having dermatitis to the entomologist for the first time on those particular days. Since the spraying with Pyrethrum and the installation of fibrous glass

occurred after the health problems first developed, they can not be entirely responsible for the dermatitis. On the other hand, they may have contributed to the increase in cases observed during the latter part of September. Furthermore, the employee meetings and examinations may have increased awareness of the problem and, thus, increased reporting of rashes.

After the peak of cases during September, additional cases were reported sporadically through April, 1981. The onset of cases by week from August through April is shown in Figure 2. The cases in the Figure include both new and recurrent cases (a recurrent case is one in which the person was asymptomatic for an interval of time). The number of reported cases averaged less than 1 1/2 cases per week from October through April. In total, 92 employees reported experiencing the dermatitis.

While persons were affected throughout the building, the attack rates varied between departments. The approximate attack rates by office areas are shown in Table 2.* The areas with the highest attack rates were Blue Cross Data Entry, Blue Shield Data Entry, Major Medical, Personnel, Medicare, and Blue Cross Claims. While there is no clear pattern to the attack rates, it appears that employees working on the west side of the building were more affected. There was no consistent pattern to the desk locations of affected employees within the offices.

With considerable overlap, persons in different areas of the building were affected at different times. For example, all four persons affected in Medicare reported their onset of dermatitis on September 9 and 10, 1980. None were affected later during the peak of the problem. As mentioned above, the reported cases began in Major Medical and later came mostly from offices on the Second Floor. The average date of onset for the employees in Major Medical was August 29, while the employees in Blue Cross Claims reported an average date of onset of September 18 - 2 1/2 weeks later. The varying dates of onset, as well as the different attack rates, indicate that there probably was not a unique point source of contamination.

During December 1980, NIOSH randomly matched affected persons with controls by administrative department and sex. Sixty-five cases and 60 controls were interviewed. Three cases described very different rashes from the rest of the affected persons - two associated their rashes with direct contact with residual Pyrethrum powder. The other person developed a pruritic rash following poison ivy exposure. These three persons were excluded from the analysis. Respondents were asked about dermatitis and other health symptoms, hay fever, allergies, usual clothing worn, and environmental conditions at the time when persons were developing the dermatitis. Symptoms other than the dermatitis, such as gastrointestional disturbance or headache, were reported infrequently among both cases and controls; there was no difference between the groups. Cases and controls also did not differ in the prevalence of dry skin, hay fever, or other allergies. Respondents could not recall

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* The data in Table 2 were derived by integrating information from the log of affected employees, a list of employees by administrative department, and a list of employees by office location. Since the number of employees listed in each department varied slightly between the three lists, the data presented may not show the exactly correct number of employees in the various departments. The data presented should be a reliable estimate of the actual numbers.

clothing worn on specific days and, therefore, were asked about the type of clothing they generally wore during August and September. There were no significant differences among the women for wearing nylons, dresses versus pants, or short versus long sleeves. There was no difference among the men for wearing short versus long sleeves. Clothing worn on specific days may have influenced the development of the rash, but could not be reliably ascertained in a restrospective investigation. In sum, no individual characteristics were identified which could account for the distribution of the dermatitis among the employees.

Respondents were asked about environmental conditions and exposures, including the amount of time during an average day that they worked on a video display terminal (VDT). Most persons reported no known environmental factors temporally related to the onset of rashes. While many persons referred to the lesions as "bites", only four persons associated their rash with seeing "bugs". Fifteen persons associated the development of the itching and rashes with people removing panels from the suspended ceiling to work within the plenum. This work often involved rewiring the telephone system. Seven other persons reported itching after they had seen "glassy fibers" or dust in the air, which settled on their desks. The dust seemed to fall from openings in the ceiling. Most of the employees spent at least part of their day working on VDTs. The percentage of time spent on VDTs was compared between cases and controls; there was no significant difference using a Student's t-test. The use of the VDTs, per se, did not increase the risk of developing the dermatitis. No other environmental agents were regularly identified.

After the interviews in December, NIOSH maintained contact with the dermatologist who was seeing the affected employees. He reported that some persons had severe, continuing skin problems, while a few others cleared up initially and then developed recurrent rashes. He obtained skin biopsies from three persons. These biopsies were examined and then forwarded to NIOSH for review. Dermatopathologists associated with the National Institutes for Health reviewed the biopsy slides with the NIOSH consulting dermatologist. They reported that the three specimens had different pathological patterns. One had a folliculitis of unknown etiology, another had chronic inflammation with focal epidermal necrosis consistent with contact dermatitis, and the last specimen demonstrated signs consistent with a viral infection. They concluded that it was highly unlikely that one agent was responsible for the effects observed on the three specimens.

Shortly after the results of the biopsies were obtained, the company notified NIOSH that seven employees had reported developing new or recurrent cases the week of March 30, 1981. NIOSH recommended that the local dermatology society be contacted to examine affected employees at a weekly clinical conference. These conferences are held regularly by local dermatology societies to review interesting or difficult cases presenting to practitioners in the area. Blue Cross arranged for six volunteer employees to be examined at a conference. A representative of the society reported that the attending physicians felt that the employees generally had different skin problems. Three persons had folliculitis, one had acne vulgaris, one had pityriasis rosea, and the last had neurodermatitis. Most of the skin problems observed by the practitioners were not likely caused by an environmental agent.

The NIOSH medical officer and consulting dermatologist visited the facility on April 16, 1981, and examined approximately 20 employees, including some people with severe, on-going dermatitis and others with intermittent, and more typical, complaints. The NIOSH dermatologist concluded:

> Among the individuals with the most severe complaints of dermatitis, several of whom had been seen by the local dermatologic society, were some in whom the eruption had been modified by secondary folliculitis, or had progressed to a self-perpetuating nummular eczema/neurodermatitis, or was apparently not occupationally related, such as one individual with acne vulgaris, another with atopic dermatitis, and a third with multiple telangiectasias. Thus, those individuals with the worst complaints were not representative of the great majority of affected workers... I feel that the problem is an irritant particulate dermatitis probably caused by fiberglass or similar materials.(10)

VII. CONCLUSIONS

Environmental sampling by NIOSH on two occasions, by OSHA on two occasions, and by a private environmental consultant, indicates that there is no substantial exposure to airborne asbestos, fibrous glass, or other mineral wool fibers.

Based on environmental sampling, employee interviews, and skin examinations, NIOSH believes that most employees were affected by an intermittent exposure to a particulate irritant, most likely fibrous glass, or related compounds, at very low levels. Many of the more severe and continuing medical complaints are atypical with no consistent pattern and likely represent individual complications of the original problem or non-occupational problems. A physician should evaluate these cases and make an individual determination as to their specific diagnoses.

The most likely primary source of the particulate irritant is the sprayed-on insulation within the plenum above the suspended ceiling. This conclusion is based upon: (1)Eight of 10 wipe samples contained fibrous glass, even though no significant amounts were detected in area air samples. Three of the eight positive wipe samples also contained substantial amounts of amosite asbestos, reflecting the composition of the sprayed-on insulation; (2)The interviews of cases and controls implicated exposure to dust particles associated with work involving the ceiling; (3)The chronology of complaints indicated that many employees were affected during August and September before the fibrous glass insulation was installed in the soffit; (4)A cluster of new cases developed during March, 1981, on a Monday after work was done involving the ceiling; and (4)No other source of particulate matter was identified after discussions with the building's engineer, Blue Cross, and employees. NIOSH inspections of the facility did not reveal other potential environmental contaminants.

While the newly installed fibrous glass insulation was not primarily responsible for the health complaints, it is possible that the process of installing the fibrous glass blankets did exacerbate the problem in a few areas of the building. The prevalence of complaints increased substantially, especially in the Blue Cross Claims area, during the first week the fibrous glass was installed along the west side of the building. After that week,

installation was completed on weekends when employees were not present. The complaints decreased dramatically. OSHA concluded that the completed installation is adequately sealed and should not be a significant continuing source of fibrous glass. During our inspection, we observed open ends of the insulation blankets with fibrous glass exposed to the air flow slots in the ceiling at the outer edge of the Blue Cross Claims office. This exposed fibrous glass should be sealed to avoid any possible contamination of the ventilation system.

During the interviews in December, NIOSH identified two persons who had developed rashes apparently following exposure to Pyrethrum powder. NIOSH did not contact every employee, so others may have been affected as well. Since Pyrethrum is a known skin irritant, persons should avoid direct skin contact with the powder. Surfaces within the building should be cleaned meticulously following application of the insecticide.

The low humidity observed by NIOSH during the visits could also have exacerbated the effect of the irritant particles. Pruritis due to skin irritation is generally increased with low ambient humidity, regardless of the particular agent(9). The measured relative humidity in the building averaged 15% to 19%, substantially below a level of 40% recommended by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.(9). The ventilation system in the building is nominally capable of maintaining a minimum relative humidity of 35%. The humidification system is apparently not functioning adequately.

Finally, NIOSH noted that the most severe and persistent health complaints were by employees in the Blue Cross Data Entry area. Seven VDT units are clustered in this area. These machines generate heat and their viewing screens develop a small electrostatic charge (such as a home television set does). It may be possible that the micro-environment created by this cluster of VDT's could have exacerbated these employees' problems by causing the irritant particles in the air to pick-up an electrostatic charge and cling more to the persons' clothing. NIOSH could not demonstrate or confirm this possibility. Medical literature from Europe discusses a dermatitis among VDT users due to dust with an electrostatic charge; however, the description of the rash in those cases was entirely different(11,12). Furthermore, it should be recalled that the time spent using VDTs was not statistically different between cases and controls during the NIOSH interview; some of the employees in the BCDE area were those with the atypically severe problems, and other areas in the building with large numbers of VDT did not demonstrate an excessive prevalence of dermatitis. Therefore, NIOSH concludes that the VDT machines are not primarily responsible for the dermatitis. NIOSH can not rule out the possibility that the cluster of VDT units could have increased the electrostatic charge on irritant particles in the air and thereby have exacerbated the irritant effect of the particles.

VIII. RECOMMENDATIONS

1. The panels of the suspended ceiling should not be disturbed while non-maintenance employees are working in the area. Work requiring access to the plenum space should be done during evenings or weekends.

Following such work, the office area in the vicinity should be thoroughly cleaned, including wiping all surface tops with a damp cloth to pick-up fibrous particles.

2. Ceiling panels with open grills or holes and possibly the air flow slots at the edges of the ceilings should be covered with a light gauze or charcoal filter able to filter out fibrous particles without markedly affecting air flow.

3. The open ends of the fibrous glass blankets used to insulate the soffit on the west side of the building should be sealed.

4. General cleaning should include regular wiping of all horizontal surfaces to remove particles that have settled.

5. The relative humidity in the building should be maintained at a minimum of 30%. The humidity as measured by NIOSH was consistently below that indicated on the humidity gauge of the air ventilation system. The humidity gauge should be calibrated or an independent psychrometer should be used to determine the humidity.

6. Employees with severe or continuing dermatologic problems should be encouraged to see medical practioners for individual diagnosis and treatment.

IX. AUTHORSHIP AND ACKNOWLEDGEMENT

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

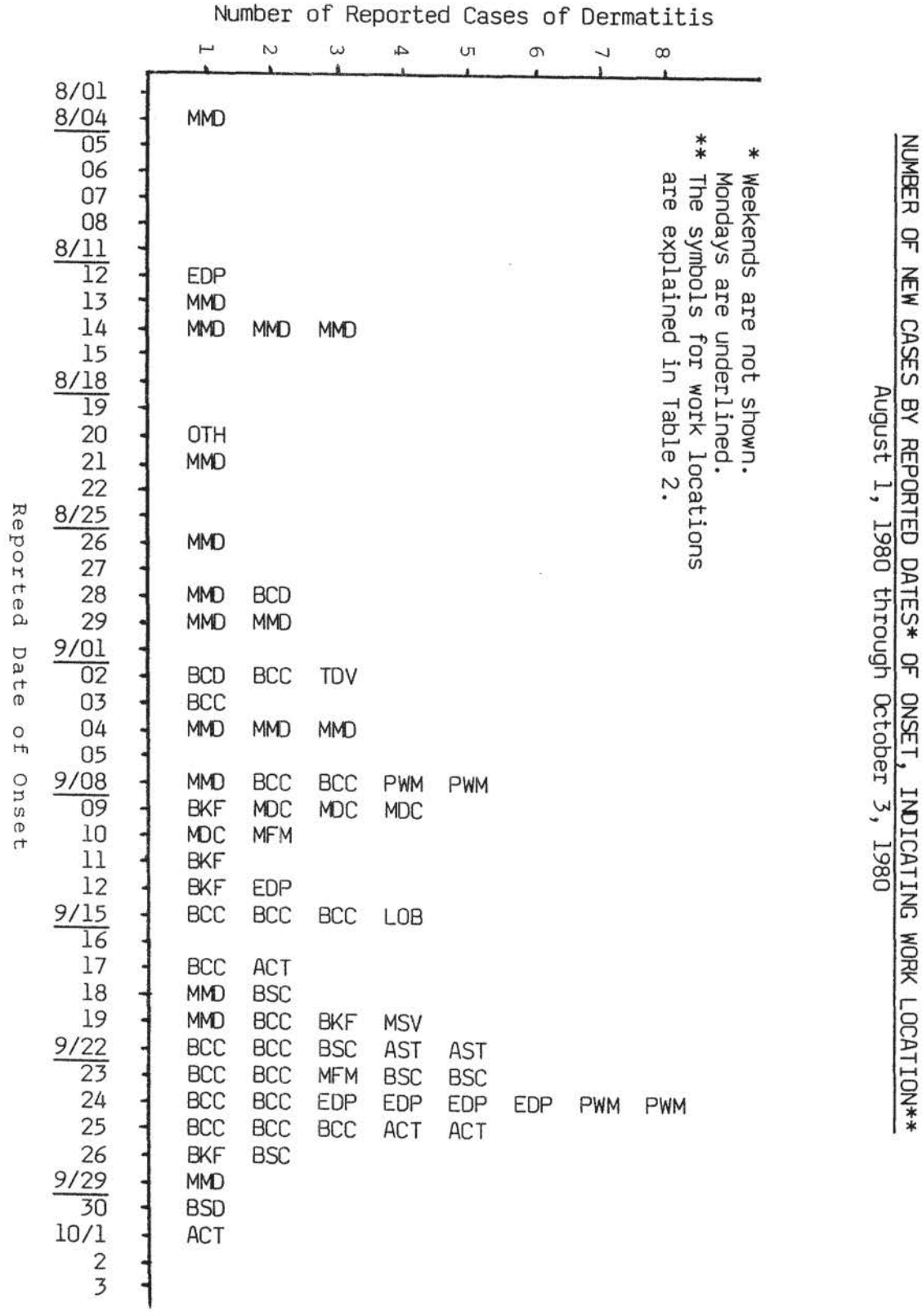
For the purpose of informing the "affected employees", the employer should post this report for at least 30 days in a prominent place(s) near where the employees work.

Copies of this report will be available from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio, 45226, for 90 days. Thereafter, copies will be available from the National Technical Information Service (NTIS), Springfield, Virginia. Information concerning its availability through NTIS can be obtained from the NIOSH publication office at the above Cincinnati address.

Copies of this report have been sent to:

Blue Cross of Northeastern New York, Inc.
New York State Department of Health
Occupational Safety and Health Administration, Region II

FIGURE 1


NUMBER OF NEW CASES BY REPORTED DATES* OF ONSET, INDICATING WORK LOCATION**
August 1, 1980 through October 3, 1980
Number of Reported Cases of Dermatitis
1 2 3 4 5 6 7 8
Reported Date of Onset
8/01
8/04
05
06
07
08
8/11
12
13
14
15
8/18
19
20
21
22
8/25
26
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9/01
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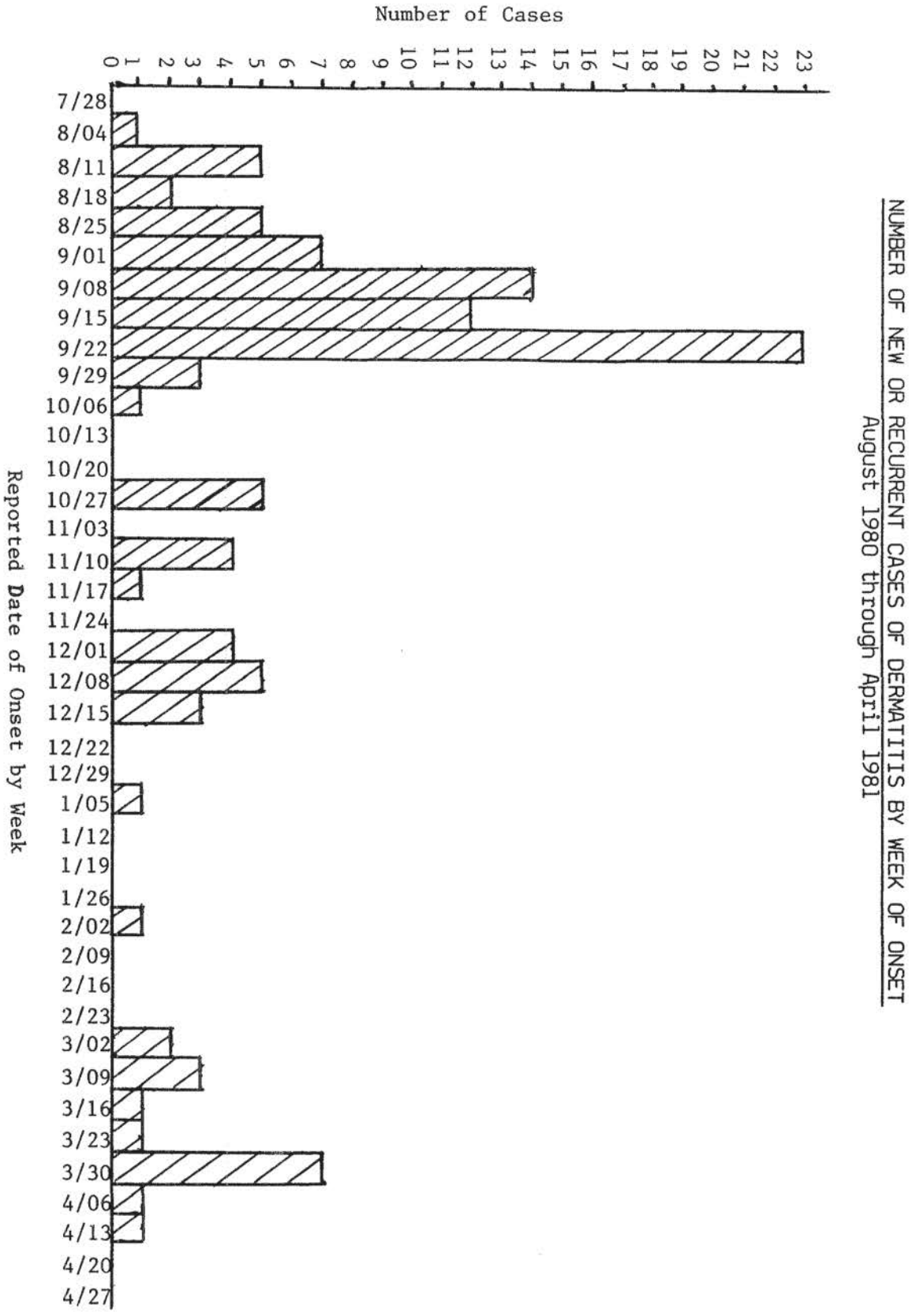
19
9/22
23
24
25
26
9/29
30
10/1
2
3
8/04 MMD
8/12 EDP
8/13 MMD
8/14 MMD MMD MMD
8/20 OTH
8/21 MMD
8/26 MMD
8/28 MMD BCD
8/29 MMD MMD
9/02 BCD BCC TDV
9/03 BCC
9/04 MMD MMD MMD
9/08 MMD BCC BCC PWM PWM
9/09 BKF MDC MDC MDC
9/10 MDC MFM
9/11 BKF
9/12 BKF EDP
9/15 BCC BCC BCC LOB
9/17 BCC ACT
9/18 MMD BSC
9/19 MMD BCC BKF MSV
9/22 BCC BCC BSC AST AST
9/23 BCC BCC MFM BSC BSC
9/24 BCC BCC EDP EDP EDP EDP PWM PWM
9/25 BCC BCC BCC ACT ACT
9/26 BKF BSC
9/29 MMD
9/30 BSD
10/1 ACT
* Weekends are not shown.
Mondays are underlined.
** The symbols for work locations
are explained in Table 2.

FIGURE 2



NUMBER OF NEW OR RECURRENT CASES OF DERMATITIS BY WEEK OF ONSET
August 1980 through April 1981

TABLE 1

RESULTS OF WIPE SAMPLES FROM HORIZONTAL WORK SURFACES
BLUE CROSS/BLUE SHIELD

LOCATION	DESCRIPTION	FIBER/PARTICLE IDENTIFICATION
Blue Cross Claims	File Cabinet	cellulose & fibrous glass
Blue Cross Claims	Desk by VDT, middle of room	cellulose & fibrous glass
Blue Cross Data Entry	Desk by VDT	cellulose
Blue Shield Claims	Top of orange cloth divider	cellulose & fibrous glass
Blue Shield Data Entry	Top of Desk	cellulose
Executive Office (Second floor)	By window	cellulose, fibrous glass & amosite asbestos*
Major Medical	Air conditioner by window	cellulose, fibrous glass & amosite asbestos
Peripheral Office (First Floor)	Desk by VDT	cellulose, fibrous glass & amosite asbestos*
Personnel Office	Top of air conditioner	cellulose & fibrous glass
Telephone Unit	Top of table by VDT	cellulose & fibrous glass

* These samples contained significant (greater than 50%) amounts of amosite asbestos.

TABLE 2

ATTACK RATES OF DERMATITIS BY DEPARTMENT LOCATION
August 1980 through April 1981

NAME OF DEPARTMENT	SYMBOL	FLOOR	LOCATION	NUMBER OF EMPLOYEES	NUMBER AFFECTED	ATTACK RATE(%)
Blue Cross Data Entry	BCD	2	West	10	6	60
Blue Shield Data Entry	BSD	2	Southeast	4	2	50
Major Medical	MMD	1	Northwest	48	18	38
Personnel & Work Management	PWM	1	Southeast	13	5	38
Medicare	MDC	G	West	13	4	31
Blue Cross Claims	BCC	2	West	88	21	24
Bookkeeping & Financial	BKF	1	Northeast	22	5	23
"E.D.P."	EDP	1	Southwest	36	8	22
Microfilm	MFM	G	Southwest	9	2	22
Cashiers and Receptionists	LOB	L	---	5	1	20
Acturial-Statistical & State Unit	AST	1	East	12	2	17
Blue Shield Claims	BSC	2	Southeast	53	7	13
Accounting	ACT	2	Northeast	57	5	9
Training & Development	TDV	G	Center	14	1	7
Telephone Units	TEL	1	North	40	2	5
Other Departments	OTH	-	---	33	1	1
ALL DEPARTMENTS				560	92	16%