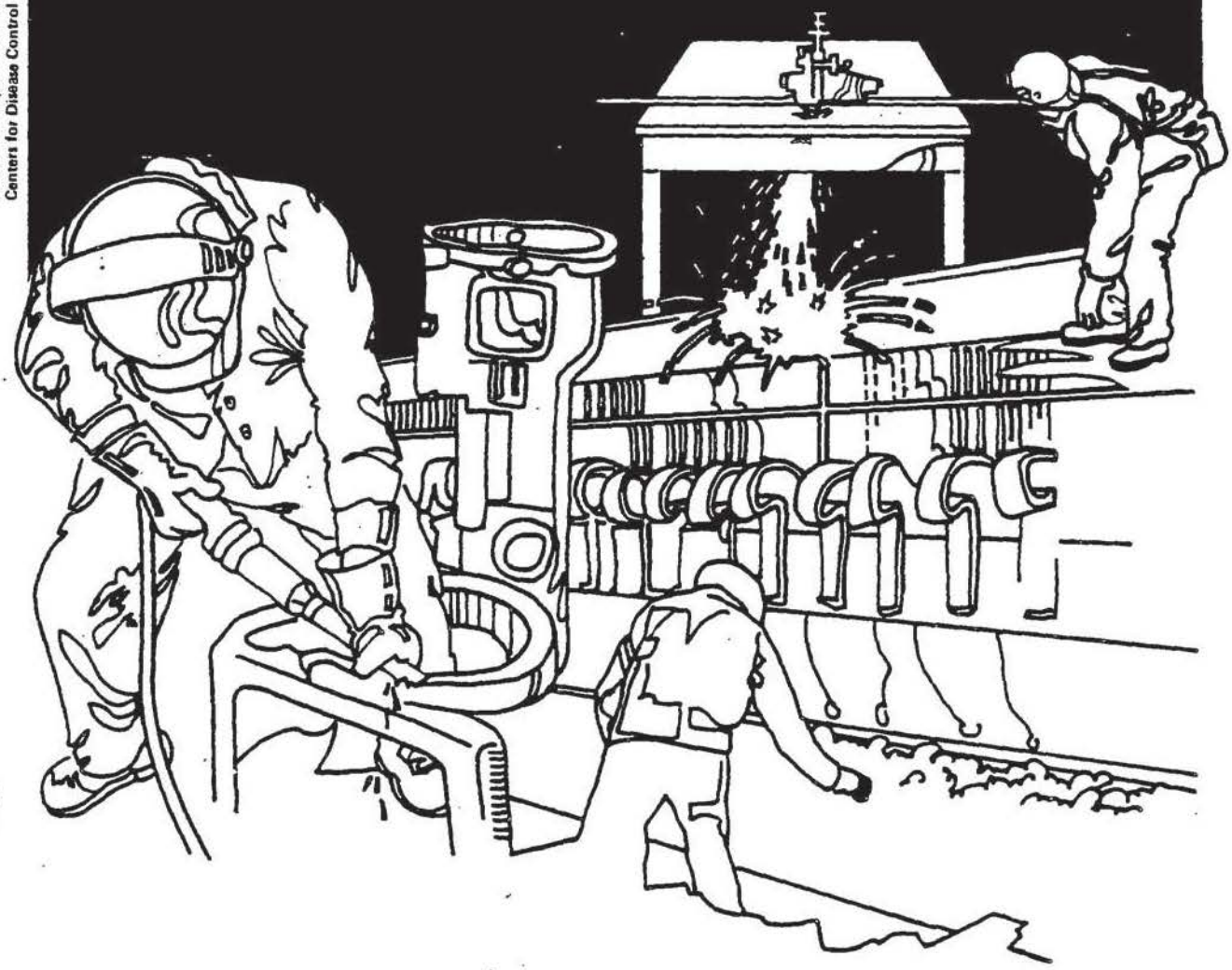
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
Centers for Disease Control ■ National Institute for Occupational Safety and Health

NIOSH



Health Hazard Evaluation Report

HETA 84-050-1595
PPG INDUSTRIES
MT. ZION, ILLINOIS

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.

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

HETA 84-050-1595
MAY 1985
PPG INDUSTRIES
MT. ZION, ILLINOIS

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I. SUMMARY

In November 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate occupational exposures to two interleaving materials (Lucor™ and wood flour) used during the off-bearing of flat glass at PPG Industries, Mt. Zion, Illinois. Interleaving materials are used in the glass making industry to prevent window glass from adhering to each other during packing and unpacking.

In January 1984, NIOSH investigators conducted an initial survey. The survey consisted of an opening conference with representatives of management and the union, a walk-through evaluation of the facility, non-directed employee questionnaires were administered to thirteen employees and information about the composition of the interleaving materials being used was obtained. Lucor™ is a 50 - 50 mixture of Lucite® beads and adipic acid. Management indicated during the initial survey that they intented to discontinue using wood flour. In September 1984, an environmental survey was conducted during which personal breathing zone air samples were collected to assess employee exposure to airborne particulates and adipic acid.

Results of medical questionnaires administered to thirteen employees working in the area of the request revealed six of these employees noted eye and throat irritation, while three also noted skin irritation. Results of personal breathing zone and general area air sampling for adipic acid indicated levels below the analytical limit of detection. Semi-quantitative data for total and respirable dusts samples collected showed levels below 2 milligram per cubic meter (mg/M^3) for all samples collected.

On the basis of the information obtained it has been determined that a health hazard from exposure to the interleaving material Lucor™ did not exist at the time of this evaluation. Due to the discontinued use of wood flour as an interleaving material within one month of the initial survey, it cannot be determined if a hazard from exposure to wood flour or a combination of Lucor™ and wood flour existed in the past. Recommendations for reducing employee exposures to dusts during clean-up operations are contained in the body of this report.

Keywords: SIC 3211, flat glass, interleaving compounds, adipic acid, Lucite®, Lucor™

II. INTRODUCTION

On November 3, 1983, NIOSH received a request for a health hazard evaluation to be conducted at PPG Industries, Mt. Zion, Illinois. The request concerned employee exposures to two interleaving materials (Lucor™ and wood flour) being used in off-bearing of flat glass products.

On January 19, 1984, NIOSH investigators visited the Mt. Zion facility to conduct an initial survey. This survey consisted of an opening conference with representatives of management and the union. Discussions centered on the use of the interleaving materials (Lucor™ and wood flour) and management indicated they intended to discontinue using wood flour within the next few weeks. A walk-through evaluation of the facility was conducted and non-directed employee questionnaires were administered to thirteen employees working as off-bearers.

On September 26-27, 1984, an environmental survey was conducted during which general area and personal breathing zone air samples were collected for adipic acid, total dust and respirable dusts.

III. BACKGROUND

A. Plant Production and Workforce

PPG Industries manufactures flat glass at its Mt. Zion facility. Because of the nature of the glass making process the facility runs continuously, three shifts per day, seven days a week. The facility employs about 120 administrative, 320 production, and 48 maintenance personnel, and produces approximately 600 tons of glass per day. In the wareroom (area of the request) there are 19 supervisors and 198 production workers. Employee duties in the wareroom include inspection, cutting, packing, and shipping of flat glass.

B. Process Description and Employee Duties

Flat glass is produced as one continuous sheet and is brought to the wareroom via conveyor. As the glass enters the wareroom it is automatically etched crosswise, then lengthwise, and snapped along the etch marks. The glass products (window glass) are sized and sent to the appropriate conveyor line and automatically sprinkled with either wood flour, Lucor™, or a combination of the two. The interleaving materials are electrostatically charged to help attract them to the glass. The interleaving materials also act as anti-staining agents and help to reduce the surface adhesion between the sheets of glass. Broken glass, along with interleaving powders, fall through floor openings to the basement. Finished products are sent to off-bearing stations.

Employees working as off-bearers pickup, stack and package the flat glass products. Occasionally employees from the labor yard enter the basement to sweep up broken glass and interleaving powders. Dry sweeping is the method used for cleaning the wareroom basement.

Lucor™ is a mixture of Lucite® beads and adipic acid. Wood flour was purchased as ground maple. One pound of interleaving compound is applied to 15,000 square feet of glass (approximately 42 mg/ft^2 of glass). At the time of the initial survey, Lucor™ was used separately in most areas while wood flour was mixed with Lucor™ and applied to glass at one of five off-bearing lines. Shortly after the initial survey, management discontinued the use of wood flour due to problems during humid conditions.

C. Engineering, Administrative, and Personal Protective Controls

All personnel working in off-bearing jobs are required to wear wrist, arm, and leg protection against cuts from glass and are also required to wear safety glasses with side shields and safety boots with metatarsal guards.

IV. EVALUATION DESIGN AND METHOD

During the initial survey of January 1984, confidential questionnaires were administered to thirteen employees working in the wareroom as off-bearers. Information was solicited regarding the employee's work history and the presence of any general or work related health problems.

Personal breathing zone air samples for adipic acid were collected for five employees working as off-bearers, and general area air samples were collected in two areas located near the off-bearing stations. Personal samples for respirable dust were collected on three off-bearers while personal samples for total dust were collected on three off-bearers and a general area sample was collected near the center of the wareroom. All air samples were collected using battery powered sampling pumps connected via Tygon® tubing to the collection media.

Total and respirable particulate samples were collected on FWSB 37 mm filters. The gross weight of the filters was reported (filter weight plus particulate weight) and average of blank samples subtracted to obtain the estimated particulate weight. Therefore, these results should be considered to be semi-quantitative data. Adipic acid samples were collected in impingers containing deionized water. Samples were analyzed by ion chromatography. A bulk sample of the interleaving material (Lucor™) was collected in a vial and analyzed for adipic acid.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a

working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor/Occupational Safety and Health Administration (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is required by the Occupational Safety and Health Act of 1970 (29 USC 651, et seq.) to meet those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8 to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high, short-term exposures.

1. Wood Dusts[1,2,3]

The principal health effects reported from exposure to wood dusts are dermatitis, respiratory disease, and nasal cancer. Nasal cancer, however, has been reported only in wood workers in the furniture industry using certain types of hardwood. Allergenic woods, such as certain members of the birch, pine, dogwood, beech, mahogany, mulberry, and myrtle families, may cause asthma and contact dermatitis in sensitized individuals. Recent investigations have found impairment of

nasal mucocilliary clearance from wood dust, and one study noted that mucostasis increased in direct proportion to the dust concentration (63% at 25.5 mg/M^3 and 11% at 2.2 mg/M^3). Since some researchers argue that impaired mucocilliary function may play a role in the development of nasal cancer due to prolonged retention of wood dust in the nasal cavity, the American Confercence of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 1 mg/M^3 for hardwood dusts, and a TLV of 5 mg/M^3 for soft wood dusts. Currently, no OSHA standard exists specifically for occupational exposure to wood dust.

2. Lucor™ Powder Interleaving

This powder interleaving material was refered to as Lucor™ and/or ploytech by the employees in the wareroom. The material safety data sheet provided by PPG industries indicates that Lucor™ is a mixture of adipic acid (50% by weight) and Lucite® beads (50% by weight). Lucite® is the polymer of the acrylic monomer methyl methacrylate. The methyl methacrylate monomer is a slight irritant which causes readily reversible changes that dissappear after cessation of exposure, however, there are no known problems associated with the polymer (Lucite®). Generally high molecular weight polymers, such as Lucite®, are chemically inert substances and physiological and toxicological effects are slight or totally absent.[4,5] Adipic acid is a fine white crystal or powder which has shown low toxicity in limited animal experiments. It is also used as a general food additive[6]. The NIOSH Registry of Toxic Effects of Chemical Substances indicates that adipic acid has been shown to produce eye irritation in laboratory experiments involving rabbits.

Currently there are no workplace environmental standards for employee exposures to adipic acid. The ACGIH-TLV for total dust and respirable dust is 10 milligrams per cubic meter (mg/M^3) and 5 mg/M^3, respectively. The current OSHA standard for occupational exposure to nuisance particulates is 15 mg/M^3 for total dust and 5 mg/M^3 for respirable dust.

VI. RESULTS AND DISCUSSION

The results of the medical questionnaires administered to thirteen employees working in the wareroom area of the facility showed that six noted eye and throat irritation, while three also noted skin irritation. Six employees were smokers and seven workers were non-smokers, three of whom had never smoked. All three employees who had never smoked indicated that they did not have any work related health problems.

The environmental survey of September 1984, indicated that exposures to adipic acid contained in the Lucor™ interleaving material were below

the analyitical limit of detection of 2 micrograms per sample. Results of sampling for particulates showed all samples to be below the ACGIH-TLVs and OSHA-PELs for both total and respirable nuisance dusts, see table of results. Analysis of a bulk sample of Lucor™ indicated this product contained 47% adipic acid and was in close agreement with the material safety data sheet provided by the company.

Management indicated that the two interleaving materials (Lucor™ and wood flour) were not mixed and were only applied to glass products separately. However, during the initial walk through survey employees working at one of five off-bearing lines indicated that the two materials were used as a mixture at that line, in an effort to get rid of wood flour on hand and were mixed on the premises.

VII. CONCLUSION

On the basis of the information obtained in this evaluation it has been determined that a hazard did not exist from employee exposures to the interleaving material Lucor™. Environmental sampling for adipic acid was below the analytical limit of detection (2 micrograms per sample) and sampling for total and respirable nuisance particulates were below the applicable environmental criteria for nuisance dusts.

Occasional employee complaints of eye irritations are believed to be the result of Lucite® beads, a component of the interleaving compound Lucor™, getting into the eyes and causing an acute irritation similiar to that of a grain of sand getting into the eye.

During the initial survey management stated that they intended to discontinue using wood flour within the next few weeks. Discussions with both management and union representatives during the environmental survey indicate that this was indeed the case. Therefore, this investigation could not determine if a health hazard from employee exposures to wood dusts existed in the past.

VIII. RECOMMENDATIONS

The following recommendations are made to assure that employee exposures to interleaving materials are kept to a minimum.

1. Clean-up operations in the basement of the wareroom involves dry sweeping which could re-suspend Lucor™ dusts and thus contribute to employee exposures during clean-up operations. The use of a heavy duty industrial type vacuum should be investigated to reduce employee exposures during clean-up operations.

2. Good housekeeping is of prime importance in the prevention of injuries from broken glass and keeping dust levels to a minimum. Housekeeping should be performed on a routine basis throughout the wareroom and basement to keep dusts levels to a minimum and reduce employee exposures to the components of the interleaving compound (Lucor™).

3. All employees working as off-bearers should be given the choice of wearing safety glasses or goggles to help prevent eye irritations from Lucor™ components entering the eyes

4. If in the future the interleaving materials (Lucor™ and wood flour) are mixed at the plant, the Safety and Industrial Hygiene Departments should coordinate with plant operations to make certain that these operations are being done properly and that employees are being adequately protected.

5. If wood flour is used in the future, either seperately or mixed with Lucor™, appropriate environmental monitoring should be conducted and employees informed of the results.

IX. REFERENCES

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IX. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Services (NTIS), Port Royal Road, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH publications office at the Cincinnati address. Copies of this report have been sent to the following:

A. PPG Industries, Mt. Zion, Illinois.

B. Aluminum, Brick, and Glass Workers Union, Local #193

C. U.S. Department of Labor, OSHA - Region V

D. NIOSH, Region V

For the purposes of informing the affected employees, copies of the report should be posted in a prominent place accessible to the employees, for a period of 30 calendar days.

Personal Breathing Zone/General Area Air Concentrations
of Total and Respirable Dust

PPG Industries
Mt. Zion, Illinois

September 26, 1984

Location/Job	mg/sample	sample time (minutes)	sample volume (liters)	mg/M^3
		TOTAL DUST		
Race B / Offbearing	0.72	362	543	1.3
Race A2/ Offbearing	0.42	388	582	0.7
Race A1/ Offbearing	0.38	387	580	0.7
Area, middle of wareroom	NQ	355	532	---
		RESPIRABLE DUST		
Race B / Offbearing	NQ	370	629	---
Race A2/ Offbearing	0.32	407	692	0.5
Race A1/ Offbearing	NQ	393	668	---
Blank	----	-0-	-0-	---
Blank	----	-0-	-0-	---

Abbreviations:
NQ - not quantifiable
mg/M^3 - milligrams per cubic meter of air

Environmental Criteria:

OSHA-PEL	Total Dust	15 mg/M^3
	Respirable fraction	5 mg/M^3
ACGIH-TLV	Total Dust	10 mg/M^3
	Respirable fraction	5 mg/M^3