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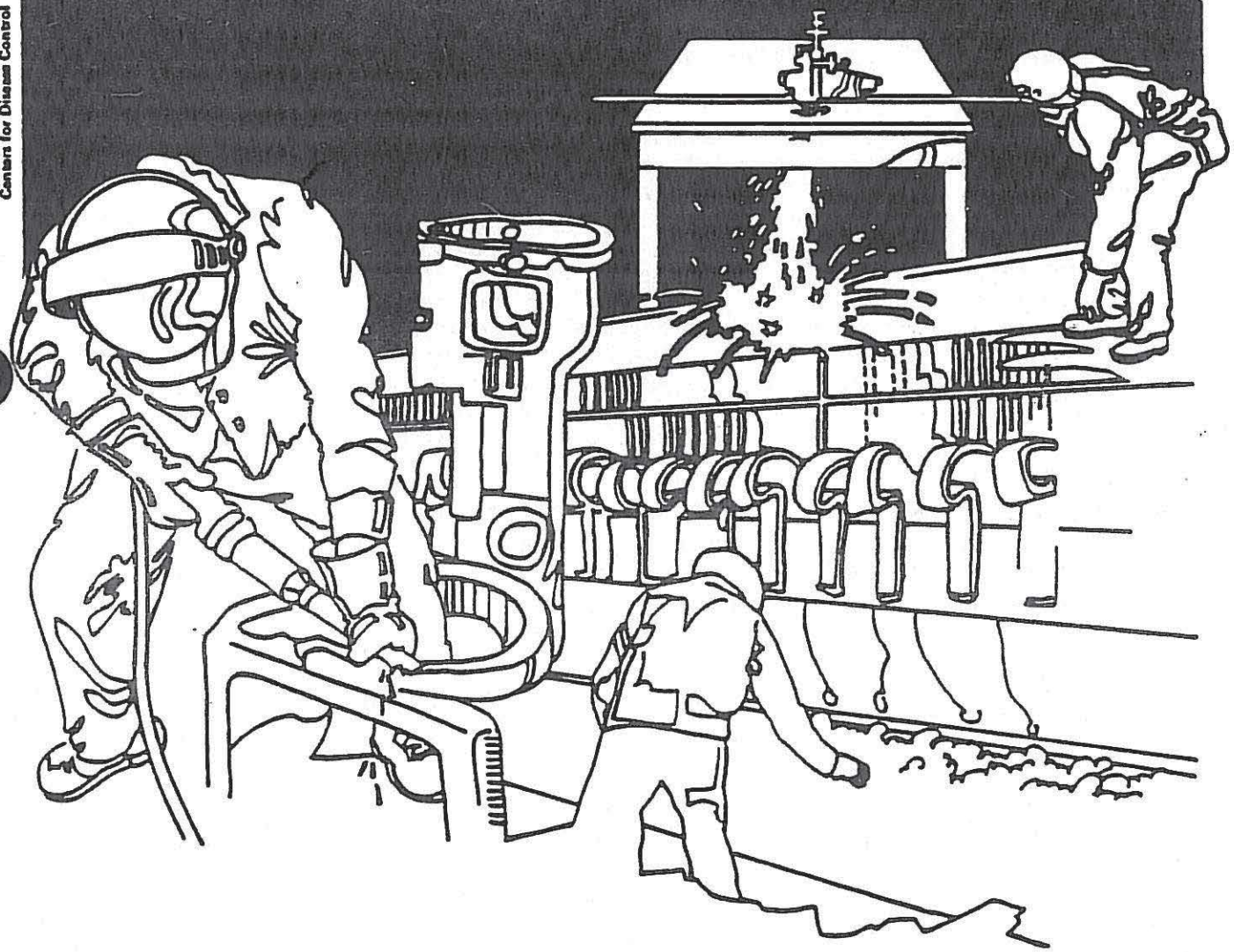

Health Hazard Evaluation Report

HETA 84-074-1476
GRUNDY INDUSTRIES, INC.
DENVER, COLORADO

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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JULY 1984
GRUNDY INDUSTRIES, INC.
DENVER, COLORADO

NIOSH INVESTIGATOR:
Anne T. Albers

I. SUMMARY

In November 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate a potential health hazard to asbestos during the manufacture of asphalt-based protective coatings made from asphalt and asbestos at Grundy Industries, Inc., Denver, Colorado.

On April 5, 1984 all employees were monitored for exposure to airborne asbestos. Five personal breathing zone air samples and five general area air samples were collected. The values ranged from 0.20 to 0.38 fibers greater than 5 microns in length per cubic centimeter (fibers/cc) with an arithmetic average of 0.29 fibers/cc. The values for the general area air samples ranged from 0.30 to 0.88 fibers/cc with an arithmetic average of 0.57 fibers/cc. All of the personal air samples exceeded the NIOSH recommendation that exposure to asbestos be controlled to the lowest feasible level due to its carcinogenicity. None of the personal air samples exceeded the current Occupational Safety and Health Administration (OSHA) standard of 2 fibers greater than 5 microns in length per cubic centimeter (2 fibers/cc > 5um in length) for chrysotile asbestos.

On the basis of data collected in this survey, we conclude that a health hazard from exposure to asbestos existed at Grundy Industries. Recommendations may be found in Section VIII of this report.

KEYWORDS: SIC 2952 (Paving and roofing materials/asphalt felts and coatings), asbestos, roofing compounds.

II. INTRODUCTION

In November 1983, NIOSH received a request from the owner and manager of Grundy Industries, Inc., Denver, Colorado, to determine if there was a health hazard from exposure to asbestos during the manufacture of asphalt-based protective coatings (asphalt/asbestos roofing compound). An industrial hygiene evaluation was conducted on April 5, 1984, to evaluate potential exposures to asbestos.

NIOSH conducted a health hazard evaluation at the facility in August of 1981.(1) The evaluation was conducted when the facility first started operation. All employees were monitored for asbestos exposure during an industrial hygiene survey. On the basis of the industrial hygiene sampling results, a health hazard from exposure to asbestos did not exist at that time. The personal air sample results ranged from 0.06 to 0.10 fibers greater than 5 microns in length per cubic centimeter (fibers/cc) with an arithmetic average of 0.07.

III. BACKGROUND

Grundy Industries produces an asphalt and asbestos roofing compound. Approximately 1.3 pounds of asbestos is added to each gallon of asphalt. The asphalt is stored in an underground reservoir and is pumped directly from the reservoir to the asphalt and asbestos mixing chamber. Bags of bulk asbestos are opened manually and placed on a conveyor line which feeds directly into the asphalt and asbestos mixing chamber. The system is closed except for where the asbestos is fed into the conveyor line. A semi-enclosed ventilation system for the conveyor belt and a local exhaust ventilation duct, located directly above the opening to the conveyor belt, is used to limit asbestos emissions at this point. After mixing has occurred, the roofing compound is poured into one and five gallon containers, capped, labeled, and stacked on pallets. The containers are then ready for transport to consumers. Five employees, including a supervisor, work at the facility.

IV. ENVIRONMENTAL METHODS AND MATERIALS

All workers were monitored for asbestos exposure. Personal and general area air samples for asbestos were collected on AA 37 millimeter (mm) filters using vacuum pumps operated at 1.5 liters per minute. The filters were counted using phase contrast microscopy, according to NIOSH P & CAM (Physical and Chemical Analytical Method) 239.(2). A bulk sample of asbestos was collected for identification of asbestos type.

V. EVALUATION CRITERIA

A. Environmental

As a guide to the evaluation of the hazard 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 time weighted average (TWA) exposures 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. Some substances also 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.

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 criteria. 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 three sources of environmental evaluation criteria used to assess the workroom concentration of asbestos were the (1) Occupational Safety and Health Administration (OSHA) standard (29 CFR 1910.1001); (2) the NIOSH criteria for recommended standard; and (3) the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for Chemical Substances in the Workroom Environment (TLV). Often, the NIOSH recommendations and ACGIH TLVs are lower than the corresponding OSHA standards. The NIOSH recommended standards are based primarily on concerns relating to the prevention of occupational disease. In contrast, the federal standards (OSHA) may be required to take into account the feasibility of controlling exposures.

In evaluating the exposure levels and the recommendations for reducing the levels found in this report, it should be noted that industry is legally required to meet only those levels specified by a federal standard (OSHA). The reader should recognize that evaluation criteria may change in the future as new information on the toxic effects of a physical agent or chemical substance become available.

NIOSH recommends that occupational exposure to asbestos be controlled to the lowest feasible limit (L.F.L.) due to its carcinogenicity. The NIOSH recommended standard (TWA) is set at the lowest level detectable by phase contrast microscopy. Phase contrast microscopy is the only practical analytical technique currently available to industry and official agencies which is valid and reproducible. The lowest level detectable by phase contrast microscopy is 0.1 fibers greater than 5 microns (um) in length per cubic centimeter (fibers/cc), on an 8-hour TWA basis. The current OSHA standard for asbestos for an 8-hour (TWA) exposure is 2 fibers/cc > 5um in length, and a ceiling concentration of 10 fibers/cc. The ACGIH TLV is 2 fibers/cc for chrysotile asbestos.

B. Toxicological

Asbestos[3,4] - Asbestos is a generic term applied to a number of hydrated silicate minerals, including chrysotile, amosite, crocidolite, tremolite, and anthophyllite. The uses of asbestos are numerous and include thermal and electrical insulation, fire blankets, safety garments, filler for plastics, and roofing materials. The most toxic route of entry is inhalation.

Studies have conclusively shown the association between asbestos exposure and cancer and asbestosis in humans. Lung cancers and asbestosis have occurred following exposure to chrysotile, crocidolite, amosite, and fibrous anthophyllite. Malignant mesotheliomas and lung and gastrointestinal cancers have been shown to be excessive in occupationally exposed persons. Malignant mesothelioma is a rare tumor of the lining of the cavity of the chest or of the abdomen. Asbestosis is a diffuse interstitial fibrosis of the lung. The first symptoms of asbestosis is usually increased breathlessness on exertion, sometimes associated with aching or transient sharp pain in the chest. The onset of symptoms is usually slow.

Data exists which indicates that the lower the exposure, the lower the risk of developing cancer. No evidence for a threshold or for a "safe" level of asbestos exposure exists.

The NIOSH recommended standard is intended to protect against asbestosis and to reduce to the lowest risk possible the probability of developing asbestos-induced cancers.

VI. RESULTS AND DISCUSSION

The bulk sample of asbestos was found to contain 80-90% chrysotile. Five personal breathing zone air samples and five general area air samples were collected for asbestos. The results are tabulated in Table 1. All of the personal air samples exceeded the NIOSH recommended levels. The values for the personal air samples ranged from 0.20 to 0.38 fibers/cc with an arithmetic average of 0.29 fibers/cc. The values for the general area air samples ranged from 0.30 to 0.88 fibers/cc with an arithmetic average of 0.57 fibers/cc. The highest level found (0.88 fibers/cc) was for a general area air sample taken next to the local exhaust ventilation duct which was located directly above the opening to the conveyor line.

This is an approximate three-fold increase in the personal air sampling results compared to the previous NIOSH evaluation results. The previous NIOSH evaluation results are summarized in the Introduction section of this report. The increase may be the result of housekeeping, maintenance, and work practices. The previous NIOSH evaluation was conducted when the facility began operating and did not find an exposure to asbestos above the NIOSH recommended TWA level. The company reported that there has been no process or engineering changes at the facility since the first NIOSH evaluation. Good housekeeping, regularly scheduled maintenance, and work practices are essential to maintaining low levels of airborne asbestos.

Employees were wearing single-use dust respirators for protection against asbestos. Single-use respirators will not provide adequate protection against the cancer causing potential of asbestos.(5)

Additionally, one employee with a full face beard was wearing a single-use dust respirator for protection against asbestos. Employees with facial hair (e.g. excessive facial stubble, sideburns, and beards) will not obtain a high degree of respiratory protection when compared to employees who are clean shaven. Employees should be clean shaven to the point that there is no possible interference with the sealing surfaces of the respirator.(6)

Employees were wearing disposable coveralls and head coverings over their street clothes. Special clothing (e.g. disposable coveralls, head covering, foot coverings), not to be worn outside the workplace, should be worn by all asbestos workers. Street clothes and personal effects should not be worn or carried in work areas.(7)

Employees were observed smoking in areas where asbestos was being processed and handled. The practice of smoking, eating, or drinking in work areas is inappropriate. Smoking can act in combination with chemical and physical agents in the workplace to produce or increase the severity of a wide range of adverse health effects. Placing food, drink, or other substances, which are potentially contaminated with toxic agents found in the workplace, in the mouth, may increase a worker's absorption of these agents. Smoking has other detrimental effects which are relevant to occupational health and safety.(8)

VII. CONCLUSIONS

A health hazard did exist from exposure to asbestos at the time of this evaluation. This conclusion is based on the industrial hygiene sampling results (personal air samples and general area air samples).

VIII. RECOMMENDATIONS

1. Substitution is the recommended method for controlling occupational exposures to toxic substances. Asbestos should be replaced, where technically feasible, by a substitute with the lowest possible toxicity. The use of a substitute would prevent the exposure of current employees and would also prevent exposure to roof workers in the future.

2. Application of engineering control methods (isolation, enclosure, and ventilation) should be used to control occupational exposure to asbestos if a substitute does not exist. A local exhaust ventilation system should be installed at the workstation where the bags are opened if the bags are to be opened manually and if no other engineering control methods are used (enclosure or isolation).

3. Stringent workplace practices (e.g. good housekeeping, regularly scheduled maintenance, and worker practices) should be followed when working with asbestos. The practice of wearing disposable coveralls and head coverings should be continued.

4. Respirators should be employed as a control measure only if the three previous recommendations do not control exposures below the NIOSH recommended levels.

5. Respirators should be used during non-routine operations (cleaning a spill at the bag opening workstation, cleaning or repairing exhaust ductwork, etc.) when the potential for exposure above the NIOSH recommended levels exists.

6. The use of respirators requires the institution of an effective respirator program. Respirators require quantitative fit testing, maintenance, cleaning, and training of employees in order to be effective.(9)

7. The type of respirator to be used depends on the concentration reasonably expected to be found and the results of quantitative respirator fitting tests. If the concentrations are high, only a properly fitted, supplied air respirator will provide the necessary protection. For lower concentrations a properly fitted, non-disposable half-face respirator with NIOSH approved filter for asbestos is appropriate. Multiplying the NIOSH recommended TWA by a protection factor assigned to a respirator gives the maximum concentration in which the respirator can be used. Quantitative respirator-fit test results should be used to properly select the type, make, and model of respirator for each worker who requires respiratory protection.(9)

8. Employees with facial hair which interferes with the seal of the respirator to the face should not work in an area which requires respiratory protection.

9. Employees should be apprised of all hazards related to asbestos exposure and should be informed of appropriate precautions to use to limit exposure, including general respirator training.

10. Smoking, eating, and drinking should be prohibited in work areas. Smoking, eating, and drinking should be restricted to a designated, clean location visited only after established decontamination procedures have been followed.

IX. REFERENCES

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. 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:

1. Grundy Industries, Inc.
2. NIOSH - Region VIII
3. U.S. Department of Labor/OSHA - Region VIII
4. Colorado Department of Health
5. State Designated Agency

TABLE I

PERSONAL AND GENERAL AREA
AIR CONCENTRATIONS OF ASBESTOS FIBERS

Grundy Industries, Inc.
Denver, Colorado
April 5, 1984

SAMPLE TYPE/JOB CLASSIFICATION/LOCATION	SAMPLING TIME	FIBERS/cc*
Personal/Labeler/Asbestos Line	8:13 AM - 4:05 PM	0.20
Personal/Stacks Buckets/Finish Line	8:16 AM - 4:05 PM	0.31
Personal/Caps Buckets/Finish Line	8:18 AM - 4:05 PM	0.30
Personal/Asbestos Mixer/Asbestos Line	8:21 AM - 4:05 PM	0.38
Personal/Superintendent/Throughout Facility	8:23 AM - 4:05 PM	0.24
General Area/ - /Asbestos Line	8:39 AM - 3:50 PM	0.88
General Area/ - /Hopper	8:45 AM - 3:50 PM	0.63
General Area/ - /Pour Area	8:48 AM - 3:50 PM	0.50
General Area/ - /Label Area	9:00 AM - 4:05 PM	0.30
General Area/ - /Hopper	9:05 AM - 3:50 PM	0.56

EVALUATION CRITERIA: OSHA = 2 fibers/cc
NIOSH = L.F.L. **
ACGIH TLVs = 2 fibers/cc

LABORATORY LIMIT OF DETECTION: 0.03 fibers per field or 4500 fibers per filter

* = fibers per cubic centimeter > 5um in length
** = Lowest Feasible Level. Asbestos has been shown to be a human carcinogen. Exposure should, therefore, be controlled to the lowest feasible level.

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