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 86-222-1726
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.

HETA 86-222-1726
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GRUNDY INDUSTRIES, INC.
DENVER, COLORADO

NIOSH INVESTIGATOR:
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I. SUMMARY

In March 1986, the National Institute for Occupational Safety and Health (NIOSH) received a request from management of Grundy Industries Denver, Colorado to evaluate a potential health hazard to asbestos during the manufacture of roofing compounds (protective coatings) made from a mixture of asbestos and asphalt.

On May 14, 1986 all four employees were monitored for exposure to airborne asbestos. General room air samples were also collected throughout the workplace. Four breathing zone samples and two general room air samples were collected for asbestos fiber determination. The values ranged from 0.08 to 0.06 fibers per cubic centimeter (fibers/cc) measuring fibers greater than five microns in length. The arithmetic average was 0.07 fibers/cc. All asbestos fiber counts were below the NIOSH recommended level of 0.10 fibers/cc. However, levels should be maintained as low as possible due to the carcinogenicity of asbestos. The odor of asphalt was very strong in this facility. Therefore, four general room samples were analyzed for the following Poly Nuclear Aromatics (PNAs): Acenaphthylene, acenapthene, fluorine, phenanthrene, Anthracene, fluoranthene, pyrene, benz (a) anthracene, chrysene, benzo (b) fluoranthene, benzo (k) fluoranthene, benzo (e) pyrene, benzo (a) pyrene, indeno(123 -cd) pyrene, dibenzo (a,h) anthracene, benzo (ghi) perylene and naphthalene. Eleven of the seventeen PNAs were below the laboratory limits of detection. The other six were at or very close to the detection limits. The PNAs did not pose a health hazard.

On the basis of environmental data collected during this survey, it was concluded that a health hazard did not exist either from asbestos or PNA exposure at Grundy Industries. Recommendations may be found in this report that will assist in further lowering of asbestos exposures.

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

II. INTRODUCTION

In March 1986, 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 May 14, 1986, to evaluate potential exposures to asbestos.

NIOSH has conducted previous studies at this facility in August of 1981, and April of 1984, a health hazard from overexposure to asbestos was found in 1984 but not in 1981.

III. BACKGROUND

Grundy Industries produces an asphalt and asbestos roofing compound. Approximately 1.3 pounds of asbestos are 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-closed ventilation system for 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. Four employees, including a supervisor work at the facility.

IV. ENVIRONMENTAL METHODS AND MATERIALS

All workers were monitored for asbestos exposure. Samples were collected on 25 millimeter filters using pumps operated at 1.5 liters per minute. Asbestos samples were analyzed according to NIOSH 7400 set B method utilizing phase contrast microscopy. The four general room air samples collected for PNA determination were collected on ORBO 43 sampling tubes using vacuum pumps operated at 100 cubic centimeters per minute. These samples were analyzed according to NIOSH method 5515.

V. EVALUATION CRITERIA

A. As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assesment 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 (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 solely 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 legally required 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.

	NIOSH	OSHA
Asbestos	0.1*	0.2*
Asphalt fumes	5.0 mg/M^3	

* = fibers per cc greater than 5 microns in length. (June 1986)

B. Toxicological

Asbestos

Asbestos is a generic term applied to a number of hydrated silicate minerals, including chrysotile, amosite, crocidolite, tremolite, and anthophyllite. The use 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 workers. Malignant mesothelioma is a rare tumor of the lining of the cavity of the chest or of the abdomen. The first symptoms of asbestosis are increased breathlessness on exertion, accompanied by aching and transient sharp pains in the chest. The onset of symptoms is usually slow.

Data exist which indicate that the lower the exposure, the lower the risk of developing cancer. There is no evidence of a threshold or for a "safe" level of asbestos exposure.

The NIOSH recommended level of 0.1 fibers/cc is intended to protect against asbestosis and to reduce to the lowest risk possible the probability of developing an asbestos-induced cancer.

Asphalt

Asphalt fumes are defined as the cloud of small particles created by condensation from the gaseous state after volatilization of asphalt. Approximately 96% of the asphalt used in this country is used in paving and roofing operations. "Occupational exposure" to asphalt fumes is defined as exposure in the workplace at a concentration of one-half or more of the recommended occupational exposure limit of 5 mg/M^3. If exposure to other chemicals also occurs, as is the case when asphalt is mixed with a solvent, emulsified, or used concurrently with other materials such as tar, pitch, or asbestos, provisions of any applicable standard for the other chemicals shall also be followed.

The principal adverse effects on health from exposure to asphalt fumes are irritation of the serous membranes of the conjuctive and the mucous membranes of the respiratory tract. Hot asphalt can cause burns of the skin. In animals, there is evidence that asphalt left on the skin for long periods of time may result in local carcinomas, but there have been no reports of such effects on human skin that can be attributed to asphalt alone.

VI. RESULTS AND DISCUSSION

As in the previous studies conducted at Grundy by NIOSH in 1981 and 1984, the bulk sample was found to be 80-90% chrysotile. The four breathing zone and 2 general room air samples for asbestos were all below the NIOSH recommended level of 0.1 fibers/cc. The highest concentration was 0.08 fibers/cc and the lowest was 0.06 fibers/cc with an arithmetic average of 0.07 fibers/cc.

The four general room air samples collected for (PNAs) were mostly below the detection limits and the ones that had measurable amounts were at or very near the detection limits.

All of the NIOSH recommendations provided in the 1984 survey had been implemented.

VII. CONCLUSIONS

A health hazard did not exist from asbestos or the asphalt fumes at the time of this survey. This conclusion is based on the results of the industrial hygiene sampling results.

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 with the lowest possible toxicity, would prevent the exposure of current employees and would also prevent exposure to roof workers in the future.

2. 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.

3. 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.

4. The use of repirators requires the institution of an effective repirator program. Respirators require quantitive fit testing, maintenance, cleaning, and training of employees in order to be effective.

5. 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.

6. 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.

7. 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.

8. Smoking, eating, and drinking should be prohibited in work areas.

IX. REFERENCES

1. National Institute for Occupational Safety and Health. Criteria for a recommended standard - occupational exposure to asbestos. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1977. (DHEW (NIOSH) Publication No. 77-169).

2. International Labour Office. Encyclopedia of Occupational Health and Safety. Geneva: International Labour Office, 1983.

3. National Institute for Occupational Safety and Health, Criteria for a recommended Standard Occupational exposure to Asphalt Fumes, Cincinnati, Ohio; 1978. (DHEW (NIOSH) Publication No. 78-106).

X. AUTHORSHIP AND ACKNOWLEDGMENTS

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IX. 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. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado State Health Department.
5. State Designated Agency.

For the purpose of informing affected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

Table 1

Breathing Zone and General Room Air Concentrations
of Asbestos at
Grundy Industries, Inc.
Denver, Colorado
May 14, 1986

Sample #	Job	Location	Sampling Time	Fibers/cc **
01	Laborer	Asbestos Conveyor	7:30a - 2:00p	0.07
02	General Area	Asbestos Conveyor	7:25a - 1:45p	0.08
03	General Area	Asbestos Conveyor	7:25a - 1:45p	0.08
04	Laborer	All Areas	7:35a - 1:54p	0.06
05	Plant Manager	All Areas	7:40a - 1:50p	0.06
06	Laborer	All Areas	7:50a - 1:54p	0.06

Evaluation Criteria 0.10
Laboratory Limit of Detection 0.03 fibers/field

OSHA Standard 0.20

** = greater than 5u in length