U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Health Service
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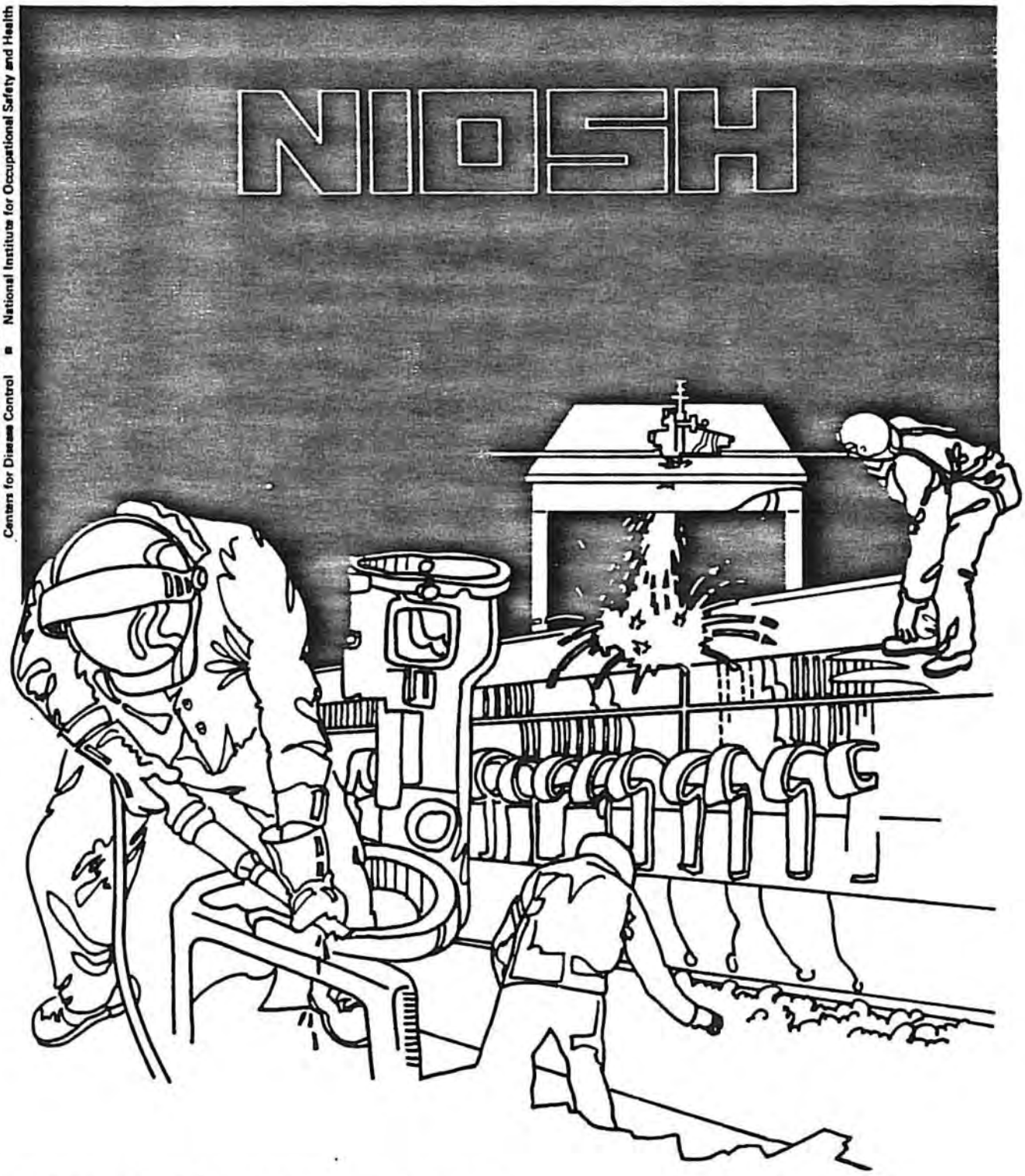

Health Hazard Evaluation Report

HETA 82-253-1301
WEST VIRGINIA UNIVERSITY
MEDICAL CENTER
MORGANTOWN, WEST VIRGINIA

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.

GHETA 82-253-1301
APRIL 1983
West Virginia University Medical Center
Morgantown, West Virginia

NIOSH INVESTIGATOR
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I. SUMMARY

A request for a health hazard evaluation was received by the National Institute for Occupational Safety and Health (NIOSH) on May 13, 1982, from the West Virginia University Health and Safety Office. The request concerned Medical Center employee exposure to asphalt fumes during a re-roofing project at the University Medical Center in Morgantown, W. Va.

Environmental sampling was conducted on May 18, 1982 to evaluate asphalt fumes and some of its fractions. Only area samples were collected. None of the area samples exceeded the Occupational Safety and Health Administration (OSHA) and American Conference of Governmental Industrial Hygienist's (ACGIH) standard of 5 mg/m^3 for asphalt fumes. Only one sample out of five had any measureable aromatic hydrocarbon levels. These were: fluoranthene (0.00023 mg/m^3), pyrene (0.00134 mg/m^3) and chrysene (0.00053 mg/m^3). While these were detected, there is no specific recommended standard for aromatic hydrocarbons.

On the basis of the sample analysis, NIOSH has determined that a significant asphalt fume health hazard did not exist for the employees of the University Medical Center. Recommendations for minimizing contamination of indoor work areas during future re-roofing projects are found in Section VII of this report.

KEY WORDS: SIC 1761 (roofing and sheet metal work), asphalt fumes, chrysene, pyrene, fluoranthene, benzo(a)pyrene, benz(a)anthracene.

II. INTRODUCTION

On May 13, 1982, NIOSH received a request from the West Virginia University Health and Safety Office to evaluate asphalt fumes in the northern portion of the Medical Center where asphalt was being applied to the roofs. Some employees had complained about the odor and wondered about possible health affects associated with the inhalation of vapors from the roofing compounds. The survey was conducted on May 18, 1982.

III. BACKGROUND

West Virginia University Medical Center is situated atop a hill in northeastern Morgantown, West Virginia. The Medical Center houses, under one roof, the schools of medicine, denistry, nursing, and pharmacy, as well as a 440 bed teaching hospital and administrative offices. The health hazard evaluation request covered a workforce of approximately 200-400 people. At the time of the request, the contractor had the asphalt cauldron located on the north side of the facility near one of the fresh air intakes, allowing for the indoor dissemination of asphalt odors.

IV. EVALUATION DESIGN

At first, it appeared that all areas of the northern part of the Medical Center may have to be monitored in order to determine the extent of exposure. However, based upon information from the Safety Office as well as from the physical plant maintenance supervisor, it was clear that all complaints were from areas supplied by air handler systems No. 9 and No. 11, both supplied by the north side fresh air intake.

Environemntal samples were taken from a research lab (room 186) and office (room 129) supplied by ventilation system No. 11. On system nine, the electronics lab was sampled. Another sample was taken at the fresh air intake and one at the contractor's asphalt cauldron. The latter was located approximately 50-80 feet from the fresh air intake.

All five environmental samples were area samples and were collected per NIOSH's [1] physical and chemical analysis method 217. This method utilizes 37 mm glass fiber filters and a 37 mm silver membrane with a pore size of 0.8 m (micron). A back-up porous polymer tube was used in line with the above filters and cassette configuration. A Dupont P-2500 constant flow pump, calibrated at 1.5 liters per minute (lpm) was used. The sampling and analytical methodologies are presented in Table I.

V. EVALUATION CRITERIA

A. Environmental

Environmental standards and criteria considered applicable to this evaluation are shown below. These criteria and standards were

established at levels to protect the health of workers occupationally exposed to a substance on an 8 or 10 hour day, 40 hour per week basis over a normal working life time. NIOSH maintains that the worker be protected by the standard or recommended levels that afford him the greatest degree of protection.

The primary sources of environmental evaluation criteria considered in this report are:

a) NIOSH criteria documents with recommended standards for occupational exposures,[2]

b) Current American Conference of Governmental Industrial Hygienists (ACGIH) 1982 Threshold Limit Values (TLV's)(R) with supporting documentation,[3]

c) Occupational Safety and Health Administration standards (OSHA), 29 CFR 1910, Nov. 1978.[4] (Currently being amended per Federal Register Volume 47, No. 104, May 1982.)

Substance	NIOSH(a)	ACGIH(b)	OSHA(c)
Asphalt fumes	5 mg/m^3(C)	5 mg/m^3	0.2 mg/m^3

NOTE: For asphalt fumes, the "C" (ceiling) designation denotes that this concentration is not to be exceeded during any 15 minute sampling period.

B. Health Effects

The principal adverse effect on health from asphalt fume exposure is irritation of the surface membranes of the eyes and respiratory tract.[2]

Direct contact with hot asphalt can cause burns of the skin. Asphalt contains small amounts of polycyclic aromatic hydrocarbons, which are known carcinogens.[2] In animals, asphalt left on the skin for long periods of time may result in local carcinomas,[2] but there have been no reports of such effects on human skin that can be attributed to asphalt alone. Available information is not sufficient to conclude that occupational exposure to asphalt fumes causes cancer in humans.

VI. RESULTS

Five area samples were collected and analyzed. (Table II) Gravimetrically, particulate exposures ranged from 0.10 to 1.5 mg/m^3. Aromatic hydrocarbons ranged from undetectable to 0.00134 mg/m^3. The

particulate portion of the sample is collected on the filter and the aromatic hydrocarbon compounds are those collected on the porous polymer tube. The aromatic compounds analyzed for were: fluoranthene, pyrene, chrysene, benzo(a) pyrene and benzo(a) anthracene.

Only in the sample taken near the cauldron, where asphalt particulates measured 1.5 mg/m^3, were any aromatic hydrocarbon levels detected.

VII. DISCUSSION

Asphalt products[2] in the United States are recovered from crude oil petroleum by fractional distillation. Its chemical composition varies depending on the source of the crude oil used to manufacture them, the refining process and physical specifications of the finished product. The major constituents of asphalt are asphaltenes, resins and oils made up of saturated and unsaturated hydrocarbons. Petroleum[5] asphalt is not considered highly toxic. However, asphalt is sometimes "cut" with coal tar pitch. It then presents a greater potential health hazard due to the presence of significant amounts of carcinogenic polycyclic aromatic hydrocarbons.[5,6,7,8] Although available information and credible toxicologic evidence has not clearly demonstrated that a direct carcinogen hazard is associated with asphalt fumes, it has demonstrated this relationship for the polycyclic aromatic hydrocarbons, benzo(a) anthracene and benzo(a) pyrene.[2,5,8] Neither of these were detected in the environmental sampling at the Medical Center.

The roofing contractor at the West Virginia University Medical Center was not using a petroleum asphalt that was "cut" with toxic substances.

During the survey, winds were carrying the asphalt fumes toward the Medical Center fresh air intake. This resulted in somewhat dissipated fumes being distributed to the interior of the building where they were further diluted.

On the basis of the low levels and transient nature of the exposure, it is concluded that the Medical Center personnel were not at risk for serious health effects.

However, depending on individual susceptibility, asphalt fumes have resulted in headaches, coughing and hoarseness.[2] Most of the Medical Center employee complaints related to headaches and dry throats, which are consistent with their exposure to asphalt fumes.

VIII. RECOMMENDATION

On future roofing contracts, specify designated areas for location of the cauldron to minimize contamination of fresh air intake with asphalt fumes.

IX. REFERENCES

1. NIOSH Manual of Analytical Methods, Second Edition, Vol 1, April 1977. DHEW Pub. No. 77-157A.

2. Occupational Exposure to Asphalt Fumes, U.S. Dept of Health, Education and Welfare, Publication No. 78-106, Sept 1977.

3. ACGIH, Threshold Limit Values (TLV's)(R), 1982.

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7. Wallcave L., Garcia H.; Feldman R., Lyinsky W., Shubik P. : Skin Tumorgenesis in mice by petroleum asphalts and coal tar pitches of known polynuclear aromatic hydrocarbon content. Toxicology Applied Pharmacology 18:41-52, 1971.

8. Doull John, Klaassen Curtis, Amdur Mary. Toxicology: The Basic Science of Poisons, 2nd Edition, MacMillan Publishing Co., 1980.

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Secretary

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.

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

Copies of this report have been sent to:

Roger Pugh
Dave Skidmore
NIOSH Regional Office III

TABLE I

Analytical & Sampling Methodologies

West Virginia University Medical Center
Morgantown, West Virginia

May 18, 1982

Compound Sampled	Sampling Media	Analytical Method
Asphalt Fumes (particulate)	Glass fiber/silver membrane filter with porous polymer tube	P&CAM 217
Asphalt Fumes Fluoranthene Pyrene, Chrysene (B(a)A, B(a)P	Glass fiber/silver membrane filter with porous	Reverse Phase High Performance Liquid/Chromatography

TABLE II

Environmental Data

West Virginia University Medical Center
Morgantown, West Virginia

Sample #	Location	Flow Rate*	Particulate	Fluoranthene	Pyrene	Chrysene
1	Room 186	2.0	0.17mg/m^3	---	---	---
2	Fresh Air Intakes	2.0	0.10mg/m^3	---	---	---
3	Electronics Lab	2.0	---	---	---	---
4	Room 129	2.0	0.17mg/m^3	---	---	---
5	Asphalt Cauldron	2.0	1.5mg/m^3	.00023mg/m^3	.00134mg/m^3	.00053mg/m^3

*Flow rate in liters per minute.

NOTE: ---denotes below the limit of detection.