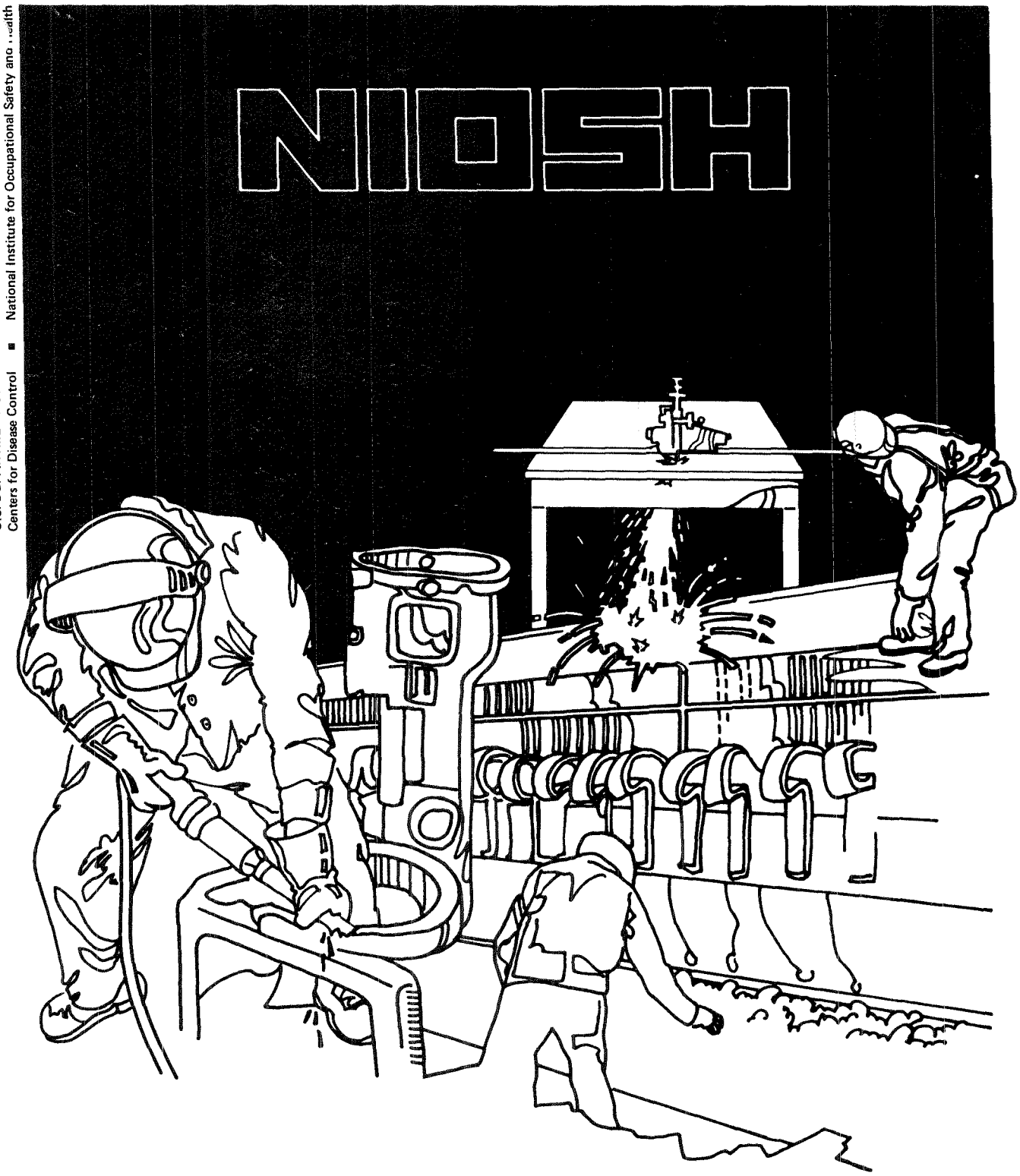
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES ■ Public Hea...
Centers for Disease Control ■ National Institute for Occupational Safety and ...ealth

NIOSH



Health Hazard Evaluation Report

HHE 80-026-904
UNITED STATES STEEL
TUBING SPECIALTIES CENTER
GARY, INDIANA

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.

HE 80-026-904
JUNE 1981
UNITED STATES STEEL, TUBING SPECIALTIES CENTER
GARY, INDIANA

NIOSH INVESTIGATOR:
William J. Daniels

I. SUMMARY

In November, 1979, the National Institute for Occupational Safety and Health (NIOSH) received a request from the United Steel Workers, Local 2697, for a health hazard evaluation at the United States Steel, Tubing Specialties, Gary, Indiana. The requestor was concerned with possible respiratory and skin problems in the areas where V-5257 pipe coating was used in spray coating operations.

NIOSH investigators conducted an initial survey in January 1980, followed by environmental surveys in February and October of 1980. Personal samples were collected to determine employee exposures to benzene, xylene, and coal tar naptha. Confidential interviews were conducted with 4 machine operators.

Analysis of the environmental data indicated that contaminant levels were below the environmental criteria. Time weighted average (TWA) exposures to benzene ranged from 0.02 to 0.47 parts of benzene per million parts of air (ppm) with a mean value of 0.19 ppm (NIOSH recommended standard is 1 ppm ceiling - 60 minute). TWA exposures to xylene ranged from 1.2 to 1.8 ppm with a mean value of 1.5 ppm (NIOSH recommended standard is 100 ppm for a 10 hour TWA). TWA exposures to coal tar naptha ranged from 7 to 18 ppm with a mean value of 13 ppm (Occupational Safety and Health Administration standard is 100 ppm for an 8 hour TWA). No work related health problems were reported during the employee interviews.

Subsequent to the initial environmental survey, the company began use of a non-aromatic, water-based pipe coating at one of the spray operations. Company officials indicated that this change was to be implemented at the remaining operation in the near future.

On the basis of data obtained in this investigation, NIOSH determined that a hazard from exposure to benzene, xylene, and coal tar naptha did not exist at the time of this survey. Recommendations for evaluating the toxicity of the new pipe coating are incorporated in Section VIII.

KEY WORDS: SIC 3317 (Steel Pipe and Tubes), benzene, xylene, coal tar naptha, V-5257

II. INTRODUCTION

On October 3, 1979 NIOSH received a request from an authorized representative of the United Steel Workers of America, Local No. 2697, for a health hazard evaluation at the United States Steel, Tubing Specialties, Gary, Indiana. The requestor was concerned with possible breathing and skin problems in the area where V-5257 pipe coating was used without local exhaust ventilation, in spray operations.

NIOSH investigators responded to the request by conducting an initial survey on January 15, 1980. An opening conference was held with representatives of management and the local union, followed by a walk-through inspection of the areas where operations were conducted. Confidential interviews were conducted with four employees. Environmental surveys were performed on February 12, and October 28, 1980. Personal samples were collected to assess employee exposures to aromatic hydrocarbon solvents contained in the spray coating.

III. BACKGROUND

A. General Description of Plant Operations and Workforce

Established in 1926, the plant manufactures seamless steel tubing with an estimated production of 13,000 tons per month. Approximately 10% to 15% of the tubing receives application of V-5257 pipe coating to protect the metal from oxidation. The plant workforce consists of 1,350 production and 250 administrative personnel, of which 9 production and 3 administrative employees are involved directly with the 2 spray coating operations. Each of three work shifts utilizes two machine operators, one hook-up operator, and one supervisor. One spray machine is located outside of the packing area and the other is located in the northwest corner of the No. 1 finish area.

B. Process Description

The process involves placing a batch of steel tubing on a rack which feeds a conveyor system. Once on the conveyor, the tubing is cleaned by wire brushes, stenciled with appropriate product information, spray coated (within a spray cabinet containing a 6 jet, airless, "O-ring" sprayer), and subsequently removed from the area.

Subsequent to the initial environmental survey, the company began use of a non-aromatic, water-based pipe coating at one of the two spray coating operations. Company officials indicated that the remaining spray coating machine was scheduled to begin using the new product in the near future, pending the arrival of equipment needed for modification of the operation.

C. Personal Protection

Personal protective equipment being used consisted of hardhats, safety glasses with side shields, safety boots, and protective gloves. Chemical cartridge respirators were available but not utilized by the employees.

IV. MATERIALS AND METHODS

During each of the two environmental survey visits, personal samples were collected near the breathing zone of each machine operator. Since the process

remained relatively constant during the surveys, samples were collected to reflect full shift rather than ceiling exposures. The samples were collected using battery powered sampling pumps operating at a flow rate of 0.1 liters per minute (lpm), with the exception of sample #5 which was collected at a flow rate of 0.2 lpm (Refer to table in Section VI for information pertinent to sample collection). The pumps were attached via tygon tubing to charcoal tubes used as the collecting media. The samples were analyzed by gas chromatography for benzene, xylene, and coal tar naptha according to NIOSH Method P&CAM 127, with minor modifications.[1] A bulk sample of the pipe coating was collected for use in the analysis.

During the course of the evaluation, NIOSH investigators conducted confidential interviews with four machine operators from 2 of the 3 shifts. Information was collected on the employees work and medical histories, and the presence of any work related health problems.

V. Evaluation Criteria

A number of sources recommend airborne levels of substances representing conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. Because of a wide variation in individual susceptability, however, a small percentage of workers may experience effects at levels at or below these limits; a smaller percentage may be more seriously affected by aggravation of a pre-existing condition or by a hypersensitivity reaction.[2] The following table lists the environmental limits for the substances evaluated in this survey. The NIOSH recommended standards, where applicable, will be used as the evaluation criteria in this report.

Summary of Environmental Limits*

Substance	NIOSH Recommended Standard[3]	OSHA Standard[4]
Benzene	1 ppm (60-minute ceiling)	10 ppm (8-hour TWA) 25 ppm (10-minute ceiling) 50 ppm maximum peak
Xylene	100 ppm (10-hour TWA) 200 ppm (10-minute ceiling)	100 ppm (8-hour TWA)
Coal Tar Naptha	none	100 ppm (8-hour TWA)

*All air concentrations are 8-10 hour TWA's unless designated "ceiling" or "maximum peak". NIOSH recommended ceiling values should not be exceeded, as determined by sampling for the time specified. OSHA ceiling values shall not be exceeded except for the time period specified, and up to a concentration not to exceed the acceptable maximum peak value.

A. Benzene

Exposure to benzene liquid or vapor may produce skin, eye, and upper respiratory tract irritation. Acute exposure to benzene results in central nervous system depression. Headache, dizziness, nausea, convulsions, coma, and death may result. Chronic exposure to benzene is well documented to cause blood changes, including aplastic anemia, leukopenia, and thrombocytopenia.[5] Because it causes progressive malignant disease of the blood-forming organs,

NIOSH recommends that benzene be considered a human carcinogen. Since it is not yet possible to establish a safe level for a carcinogen, NIOSH recommends restricting exposure to the lowest levels that can be reliably measured in the workplace.[6]

B. Xylene

Repeated skin contact with liquid xylene may cause drying and defatting of the skin which may lead to dermatitis. Inhalation of xylene vapor may cause irritation of the eyes, nose, and throat. Acute exposure may cause central nervous system depression and minor reversible effects upon the liver and kidneys. High concentrations of vapor may cause dizziness, staggering, drowsiness, and unconciousness.[5]

C. Coal Tar Naptha

Coal tar naphtha is a mixture of aromatic hydrocarbons, principally toluene, xylene, and cumene. Benzene also is present in appreciable amounts in those coal tar naphthas with low boiling points. In addition to the effects noted for benzene and xylene, coal tar naptha may cause skin "chapping", and photo-sensitivity may develop after repeated contact with the liquid. If confined against skin by clothing, the naphthas may cause skin burn.[5]

VI. RESULTS

The following table lists the results of the environmental samples.

RESULTS OF PERSONAL SAMPLES FOR BENZENE, XYLENE, AND COAL TAR NAPTHA
(Expressed as Time Weighted Averages for the Sample Duration)

Sample Number	Sample Date	Operator Location*	Sample Time (minutes)	Benzene (ppm)	Xylene (ppm)	Coal Tar Naptha (ppm)
1	2/12/80	center	385	0.16	1.2	12
2	2/12/80	side	382	0.47	1.8	18
3	2/13/80	side	319	0.16	1.8	15
4	2/13/80	center	340	0.16	1.2	7
5	10/28/80	side	360	0.02	NA**	NA

* "Side" designates the operation located in the northwest corner of #1 Finish.
"Center" designates the operation located in the center of #1 Finish.
**NA - Specific analysis not conducted for the sample.

Analysis of the environmental data indicated that the levels of the contaminants are below the environmental criteria used in this study. Levels of benzene ranged from 0.02 to 0.47 ppm, with a mean value of 0.19 ppm (NIOSH recommended standard is 1 ppm). Airborne levels of xylene ranged from 1.2 to 1.8 ppm, with a mean value of 1.5 ppm (NIOSH recommended standard is 100 ppm). Airborne levels of coal tar naptha ranged from 7 to 18 ppm, with a mean value of 13 ppm (OSHA standard is 100 ppm).

Of 4 employees interviewed, there were no indications of work related health problems. Review of the "Log and Summary of Occupational Injuries and Illnesses" (OSHA Form 200) revealed one instance in which a spray operator became ill after using a cleaning solvent. The illness was determined to be unrelated to the V-5257 pipe coating.

VII. DISCUSSION AND CONCLUSIONS

Results of the employee interviews did not indicate the presence of any work related health problems. Due to rapid job turnover (average length of service less than 2 years), the effects of long term exposure to these substances would not be evident.

Based on the environmental results, employee exposures were within the environmental criteria used in this report. However, since benzene is known to be a human carcinogen, it is recommended that every effort be made to restrict exposure to the lowest possible level, with emphasis on prohibiting the occupational use of benzene in open type operations. The company's product substitution plans are consistent with this rationale and should eliminate the potential for benzene exposure.

VIII. RECOMMENDATIONS

It is recommended that the company evaluate the toxicity of the new pipe coating. This should include identification of components in the product that could present a health hazard. If determined that a reasonable potential for such a hazard exists, environmental monitoring should be conducted to evaluate the extent of exposure and the possible necessity for the implementation of control measures.

IX. REFERENCES

1. NIOSH Manual of Analytical Methods, National Institute for Occupational Safety and Health, DHEW, October 1978.

2. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1980, American Conference of Governmental Industrial Hygienists, 1980.

3. Summary of NIOSH Recommendations for Occupational Health Standards, National Institute for Occupational Safety and Health, DHEW, October 1978.

4. General Industry Standards: Occupational Safety and Health Administration, Safety and Health Standards (29 CFR 1910) revised January 1976.

5. Occupational Diseases, A Guide to their Recognition, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 77-181, June 1977.

6. NIOSH Revised Recommendation for an Occcupational Exposure Standard to Benzene, National Institute for Occupational Safety and Health, DHEW, August 25, 1976.

X. AUTHORSHIP AND ACKNOWLEDGEMENTS

Report Prepared By:	William J. Daniels Industrial Hygienist NIOSH - Region V Chicago, Illinois
Environmental Evaluation:	Thomas F. Bloom, C.I.H. Division of Surveillance Hazard Evaluations & Field Studies Industry-Wide Studies Branch Cincinnati, Ohio
Originating Office:	Division of Surveillance Hazard Evaluations & Field Studies Hazard Evaluation and Technical Assistance Branch Cincinnati, Ohio
Analytical Laboratory Services:	Utah Biomedical Test Laboratory Salt Lake City, Utah

XI. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information 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), 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 the following:

A. United Steel Workers of America, Local No. 2697

B. United States Steel Corporation, Tubing Specialties, Gary, Indiana

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

D. NIOSH Regional Offices/Divisions

For the purpose 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.

DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
CENTERS FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
ROBERT A. TAFT LABORATORIES
4676 COLUMBIA PARKWAY, CINCINNATI, OHIO 45226

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE. $300

Third Class Mail

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF HHS
HHS 396