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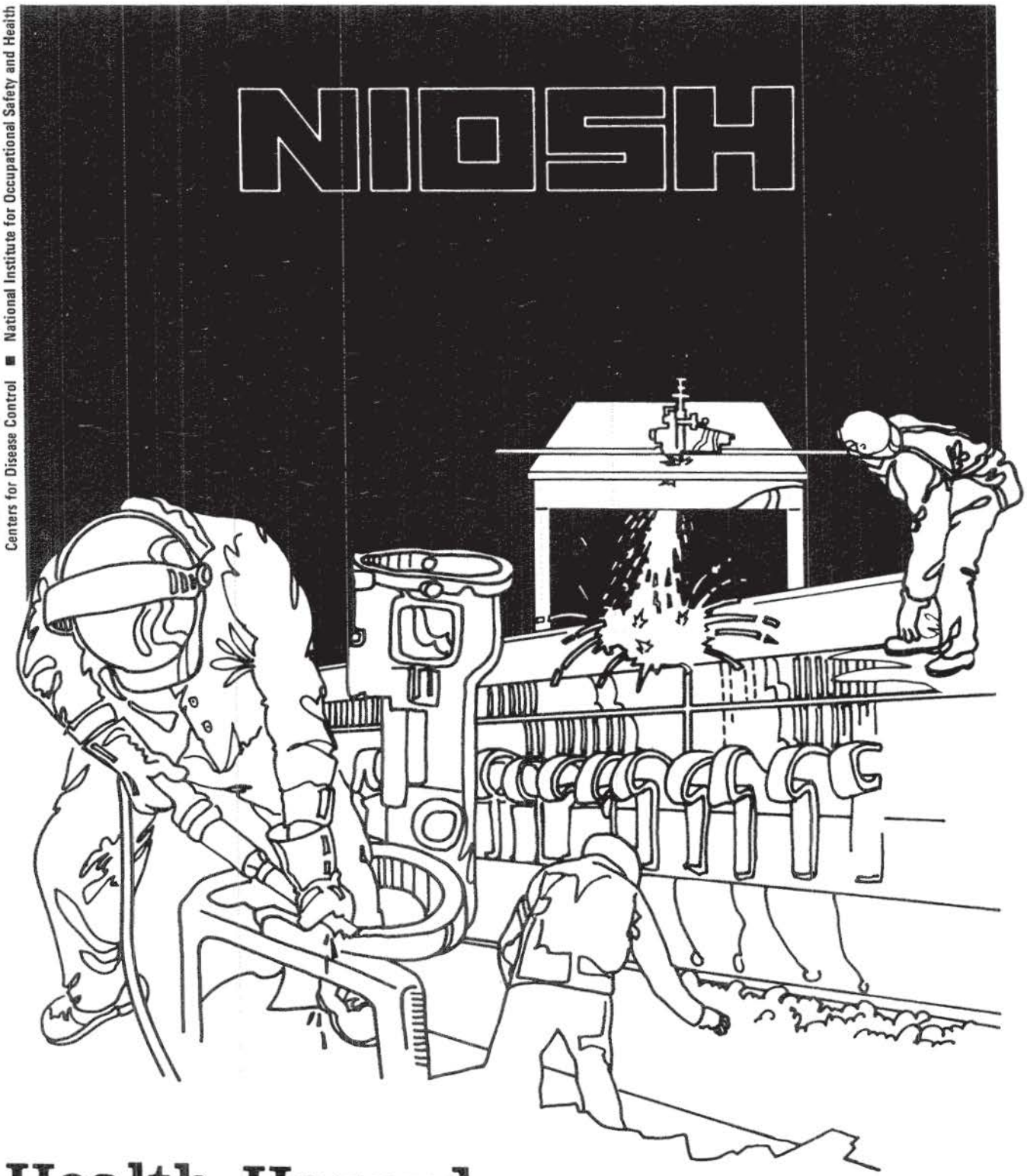

Health Hazard Evaluation Report

HETA 81-023-807
BEAUFORT AIR-SEA
EQUIPMENT COMPANY
SEATTLE, WASHINGTON

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 81-023-807
January 1981
Beaufort Air-Sea Equipment Company
Seattle, Washington

INVESTIGATOR:
Arvin G. Apol, I.H.

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a request from the management of Beaufort Air-Sea Equipment Inc. to determine if a potential health hazard existed to toluene and "rubber solvent" present in the contact adhesive used to assemble rubber life rafts.

An initial survey was conducted on September 10, 1980 and an environmental/medical survey was conducted on October 8 and 9, 1980. Personal samples were collected for toluene and rubber solvent vapors. The medical evaluation consisted of the administration of a short pre-and post-shift questionnaire regarding irritative and systemic symptons.

Analysis of the environmental data indicated there was no overexposure to toluene or rubber solvent. The combined exposure to these two substances was from 16 to 46% of the NIOSH time weighted average (TWA) recommended exposure levels and from 7 to 20% of the OSHA and WISHA standards. The post-shift questionnaire revealed one employee had a post shift headache, however, the worker also had pre-shift throat irritation and sinus difficulty. The other 3 exposed employees had no headache, nausea, lightheadedness, dizziness or irritation of the eyes, nose or throat during the shift.

On the basis of this investigation, NIOSH determined that a hazardous exposure to toluene and rubber solvent did not exist during the assembly of rubber life rafts.

Recommendations have been included in this report to ensure that the airborne concentrations of these substances remain at or below those measured.

KEYWORDS: SIC 3732 (boat building & repairing) toluene, rubber solvent, refined petroleum solvents, rubber life rafts.

II. INTRODUCTION

In September, NIOSH received a request from the management of Beaufort Air-Sea Equipment Inc. to determine if a potential health hazard existed to toluene and rubber solvent during the assembly of rubber life rafts. An initial survey was conducted on September 10, 1980 and an environmental/medical survey was conducted on October 8 and 9, 1980. A written report, including environmental results and recommendations, was submitted to the company on December 11, 1980.

III. BACKGROUND

Beaufort Air-Sea Equipment assembles rubber life rafts. Pre-cut rubber parts are glued together with a contact adhesive which contains toluene and rubber solvent. Toluene is also used to clean the area where the adhesive is to be applied and for loosening the adhesive if a joint has to be re-glued. There were four employees in the assembly area. A wall exhaust fan at the rear of the room draws air through the room from open windows located at the front of the room.

IV. EVALUATION DESIGN AND METHODS

A. Environmental

Breathing zone samples were collected for toluene and rubber solvent vapor on charcoal tubes at a flow rate of 25 to 60 cc/min. The samples were analyzed by gas chromatography using NIOSH method P&CAM #127.
The limit of detection for toluene was 0.01 mg/sample and for rubber solvent it was 0.1 mg/sample.

B. Medical

The medical evaluation consisted of a short pre-and post-shift questionnaire regarding headache, nausea, lightheadedness, dizziness, and irritation of the eyes, nose and throat.

V. EVALUATION CRITERIA

A. Environmental

SUBSTANCE	NIOSH RECOMMENDED STANDARD 10 HOUR TWA*	CURRENT OSHA & WISHA STANDARD 8 HOUR TWA
Rubber solvent	100 ppm (1)	None - estimated value based on composition, would be about 400 ppm
Toluene	100 ppm (2)	200 ppm

*TWA - Time weighted average

B. Toxicology

Rubber solvent (1) - Rubber solvent is a refined petroleum solvent with a boiling range of 45-125°C and is composed of organic compounds whose carbon chain lengths range from C5 to C8. In general, rubber solvent has 70-90% paraffins, 11-22% naphthenes and 9-22% aromatics. The primary health effects consist of narcosis, dizziness, headache, and irritation of skin and mucous membranes of the upper respiratory tract.

Toluene - Toluene may cause mild eye irritation. Other symptoms include headache, nausea, dizziness and impairment of coordination and reaction time. Mild fatigue may begin at 50 ppm.

VI. RESULTS AND DISCUSSION

The summary of the results is listed below. Individual results are listed in the attached table.

SUMMARY OF EMPLOYEE EXPOSURE TO
TOLUENE AND RUBBER SOLVENT

EMPLOYEE	JOB	DATE	% of NIOSH Recommended Criterion	% of WISHA Standard
A	Top of raft	10/8/80	16%	7%
B	Floors	10/8/80	28%	12%
C	Trimming & sheeting	10/8/80	45%	20%
D	Overlaps & valves	10/8/80	39%	17%
A	Arches	10/9/80	33%	15%
B	Floors	10/9/80	31%	14%
C	Sheeting	10/9/80	18%	7%
C	Glue mixing (10 min.)	10/9/80	83%	33%
D	Overlaps	10/9/80	46%	20%

Note: When 2 substances are present that have similar health effects, they are considered additive and a combined permissible exposure level is calculated for each sample.

The eight hour time weighted average (TWA) employee exposures to toluene and rubber solvent ranged from 16 to 46% (mean 32%) of the more stringent NIOSH recommended allowable exposure level, and from 7% to 20% (mean 14%) of the Washington State standard. Most workers, will not experience adverse health effects at these concentrations, however, an occasional individual may have a headache or feel dizzy or lightheaded.

The employees' exposures vary from day to day. It does not appear that one job has a higher exposure than another. The situation that will increase the exposures are an increase in the workload and an increase in the number of employees conducting assembly operations. When this occurs, additional monitoring should be conducted to ensure that the vapor concentrations remain below the NIOSH recommended criteria.

The pre-and post-shift questionnaires indicated that on one day one person developed a slight headache during the shift, but had a scratchy throat and slight "sinus problems" before the shift. Because of the presence of these symptoms pre-shift, the headache may not have been related to the solvent vapor exposure. Two of the four employees were observed to have dry hands, which could have been due to defatting of the skin caused by direct solvent contact. (Hand lotion might relieve this condition.) None of the workers experienced any nausea, lightheadedness, dizziness, or irritation of the eyes, nose or throat.

VII. RECOMMENDATIONS

In order to keep the solvent airborne concentration as low as possible, and to prevent skin problems, the following recommendations are listed:

1. The wall fan on the back wall should be kept on at all times the solvent and adhesives are in use.

2. The door next to the wall fan has to be kept closed. When it is open, the exhausted air re-enters the room through the door.

3. Whenever the wall fan is on, the windows in the front of the building must be kept open. This permits the fresh air to enter the front and pass through the work area before being exhausted by the fan. This diluting action prevents the solvent concentration from building up in the work-area.

4. The containers of adhesive, solvents, and solvent-soaked rags should be kept in covered containers when not in use.

5. Hand lotions should be provided for the employee to apply after work.

6. Water soluble (solvent insoluble) barrier creams could be considered. However, these may present a problem of quality control, since perspiration will dissolve them and could leave a slight residue on a glue joint.

VIII. REFERENCES

1. National Institute for Occupational Safety and Health Criteria for Recommended Standards. Occupational Exposure to Refined Petroleum Solvents. NIOSH Pub. No. 77-192.
2. National Institute for Occupational Safety and Health Criteria for Recommended Standards. Occupational Exposure to Toluene. NIOSH Pub. No. 73-11023.

IX. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this complete 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 ninety (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. Beaufort Air-Sea Equipment Inc.

2. U.S. Department of Labor, Occupational Safety and Health Administration, Region X, Seattle Washington.

3. Washington Industrial Safety and Health Agency, Washington Department of Labor. Olympia, Washington.

For the purpose of informing the four affected employees, the employer shall promptly post this Determination report in a prominent place(s) near the work area of the affected employees for a period of thirty (30) calendar days.

X. ACKNOWLEDGEMENTS

Report prepared and survey conducted by:

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Originating Office:

Hazard Evaluation and Technical
Assistance Branch
DSHCFS/NIOSH

TOLUENE AND RUBBER SOLVENT AIR CONCENTRATIONS
BEAUFORT AIR SEA EQUIPMENT INC.
Seattle, Washington
HHE 81-023

EMPLOYEE	JOB	DATE	SAMPLE NUMBER	SAMPLE TIME (min.)	SAMPLE VOLUME (liters)	TOLUENE Sample* ppm	TOLUENE TWA** ppm	RUBBER SOLVENT Sample ppm	RUBBER SOLVENT TWA ppm	COMBINED SOLVENT EXPOSURE*** % of NIOSH Recommended criteria	COMBINED SOLVENT EXPOSURE*** % OF WISHA Standards
A	Top of raft	10/7/80	1	219(am)	11.00	11	11	6	5	16%	7%
	Top of raft	10/8/80	5	165(pm)	8.13	10		3			
B	Floors	10/8/80	2	224(am)	3.25	20	20	7	8	28%	12%
B	Floors	10/8/80	6	167(pm)	2.33	21		9			
C	Trimming	10/8/80	3	216(am)	9.74	38	33	15	12	45%	20%
C	Sheeting	10/8/80	7	166(pm)	7.64	26		8			
D	Overlaps	10/8/80	4	217(am)	8.11	28	27	13	12	39%	17%
D	Overlaps and valves	10/8/80	8	165(pm)	5.90	26		11			
A	Arches	10/9/80	13	218(am)	10.31	25	25	8	8	33%	15%
A	Arches	10/9/80	17	167(pm)	7.95	25		8			
B	Floors	10/9/80	11	219(am)	8.91	23	23	8	8	31%	14%
B	Floors	10/9/80	15	164(pm)	6.73	23		9			
C	Sheeting	10/9/80	12	215(am)	10.53	10	10	8	8	18%	7%
C	Didn't work after lunch										
D	Overlaps	10/9/80	14	218(am)	10.81	35	35	8	11	46%	20%
D	Overlaps	10/9/80	18	170(pm)	7.24	35		15			
C	Mixing Glue	10/6/80	19	10	7.0	49	-	34	-	83%	33%

* ppm - parts of vapor per million parts of air.
** TWA - time-weighted average
*** When 2 substances are present that have similar health effects, they are considered additive and a combined permissible exposure level is calculated for each sample

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