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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 73-116-0085

WESTERN FOUNDRY COMPANY
TIGARD, OREGON
SEPTEMBER 1973

I. TOXICITY DETERMINATION

It has been determined that no potential toxic effects exist from exposure to air concentrations furfuryl alcohol and formaldehyde found in the working environment under normal operating conditions, the day the determination was made. Toxic effects consisting of eye irritation and tearing were present when environmental conditions were produced to simulate a day when the sand used would be at an elevated temperature. Due to the possible skin and eye contact with the liquid substances used in the process, it is strongly recommended that protective clothing (non-permeable aprons and gloves) and safety glasses be used by the workers.

This determination is based on the environmental levels, employee response, visual observations and employee interviews. A 50 minute simultaneous exposure to 2.2 ppm of furfuryl alcohol and 0.07 ppm of formaldehyde and a 15 minute simultaneous exposure to 10.8 ppm of furfuryl alcohol and 0.08 ppm of formaldehyde produced no immediate effects, such as eye irritation, eye tearing and throat irritation as found under normal operating conditions the day of this determination.

Eye irritation and tearing was experienced by the employee and the NIOSH representative during a 15 minute simultaneous exposure to 15.8 ppm of furfuryl alcohol and 0.33 ppm of formaldehyde. These environmental conditions were produced to simulate a day when the sand used would be at an elevated temperature. This response went away immediately after the exposure stopped.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- a) Western Foundry Company, Tigard, Oregon
- b) Authorized Representative of Employees
- c) U.S. Department of Labor - Region X
- d) NIOSH - Region X

For the purpose of informing the approximately three "affected employees", the employer will promptly "post" the Determination Report in a prominent place(s) near the affected employees work for a period of thirty calendar days.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by 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 National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees regarding exposure to substances used in the air-set cure process of core making, at the Western Foundry Company, Tigard, Oregon.

IV. HEALTH HAZARD EVALUATION

A. Plant Process and Conditions of Use

Western Foundry Company produces iron castings. The request involves the air-set cure core making area. One person works on this process each shift (two shifts), in addition to a clean-up man on the second shift. The substances involved in the process are a mixture of paraformaldehyde and furfuryl alcohol, a mixture of phosphoric and sulfuric acids and sand. These materials are all mechanically mixed together as needed and the final mixture is fed into the pattern and the core made. It takes about 10 to 15 minutes to make a large core and about 45 minutes for it to cure.

The materials are used at room temperature except in the cold weather when the sand is heated. Since the sand is not uniformly heated, some portions become too warm and when mixed with the other substances, more vapors are released.

B. Evaluation Design

Environmental sampling and employee interviews were conducted on August 7, 1973. Breathing zone and area samples were collected during the core making operation only and during the core making plus the curing time operations. For purposes of our sampling, the sand was heated for two mixes to simulate conditions that could occur during cold weather periods.

C. Evaluation Methods

1. Furfuryl Alcohol

Employee exposure to furfuryl alcohol was measured via personal air sampling equipment and charcoal air sampling tubes. The charcoal was analyzed by the gas chromatographic method.

2. Formaldehyde

Employee exposure to formaldehyde was measured via personal air sampling equipment and midget fritted bubblers containing 1% sodium bisulfite. The collected samples were analyzed by the chromotropic acid method.

3. Medical Evaluation

The medical evaluations were conducted by personal interviews with employees exposed. Pertinent questions were asked immediately after the exposures to solicit any immediate effects.

D. Evaluation Criteria

1. Federal Standards - The substances used or found in the work place with potentially toxic properties are listed below with their respective exposure standards as promulgated by the U.S. Department of Labor (Federal Register, Volume 37, 1910.93, October 18, 1972).

| <u>Substance</u> | <u>8-hour time weighted average</u> |
|------------------|---|
| Formaldehyde | 3 ppm* 5** 10*** (maximum duration of 30 mins.) |
| Furfuryl Alcohol | 50 |

2. Threshold limit values for chemical substances and physical agents in the workroom environment with intended changes for 1972. By the American Conference of Governmental Hygienist.

| <u>Substance</u> | <u>Threshold Limit Value</u> |
|------------------|--|
| C* Formaldehyde | 2 ppm |
| Furfuryl alcohol | notice of intended changed from 50 ppm to 5 ppm |

*Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm Hg pressure

**Acceptable ceiling concentration

***Acceptable maximum peak above the acceptable ceiling concentration for an eight hour shift

E. Evaluation Results

1. Formaldehyde and Furfuryl Alcohol Air Sampling

Formaldehyde and furfuryl alcohol breathing zone air samples were collected during normal conditions operating that day and during simulated conditions that could occur on cold days.

The furfuryl alcohol concentrations measured were 2.2 ppm during normal conditions that day and collected over a complete core production cycle (one hour); 8.6 ppm under normal conditions and during the core preparation time only (15 min.); 10.8 ppm during the core preparation when the sand was heated to a warm condition (15 min.); and 15.8 ppm during the core preparation when the sand was hot (15 min.). The formaldehyde concentrations measured were 0.07 ppm during normal conditions over a complete core production cycle; 0.08 ppm during a complete cycle when the sand was warm and 0.33 ppm during the core preparation only when the sand was hot.

2. Employee Interviews

The employee working during the testing period stated he felt no discomfort or eye or throat irritations when operating under normal conditions or when the sand was warm. When the sand was hot, his eyes began to water, he turned his head several times and then went to the other side of the pattern. The NIOSH representative standing right beside him experienced similar eye irritations and a desire to leave the immediate area. The front of the employees shirt was wet with the liquid materials in the core sand mixture. As he is making the core, he leans against the pattern and comes in contact with the materials. The skin area under the wetted portion of the shirt showed no signs of irritation and the employee stated he has had no redness of skin or irritation prior to this time.

V. AUTHORSHIP AND ACKNOWLEDGMENTS

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