

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 77-24-366

KAISER MARINE FACILITY
VALLEJO, CALIFORNIA

MARCH 1977

I. TOXICITY DETERMINATION

Based upon the work practices observed and the conditions at the job site at the time of the NIOSH investigation on January 5, 1977, it has been determined that welding fumes probably do not represent a health hazard to the approximately 11 machinists who have potential exposures. This determination is based upon the best judgment of the NIOSH investigator since the welding job which precipitated the official request had been completed prior to NIOSH's visit and could not be duplicated.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

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

- a) Kaiser Marine (Kaiser Steel Corporation)
- b) Authorized Representative of Employees
- c) Cal/OSHA
- d) U.S. Department of Labor - Region IX
- e) NIOSH - Region IX

For the purposes of informing the approximately 11 "affected" employees, the employer shall "post" the Determination Report for a period of 30 calendar days in a prominent place(s) near where exposed employees work.

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 employee representative concerning the possibility of a health hazard due to welding fumes from arc welding on zinc-plated or painted steel in confined areas.

IV. HEALTH HAZARD EVALUATION

A. Plant process - Conditions of use

The Kaiser Marine facility is part of the Kaiser Steel Corporation which employs about 200 workers who are represented by 15 separate unions. This hazard evaluation was requested by a representative of a local of the International Association of Machinists which represents approximately 11 mechanics. The Kaiser facility is involved in construction of sea-going vessels of all types. The alleged health hazard involved welding fumes generated while welders worked inside the "columns" of a hugh Oil Exploratory Drilling Rig. Welding on paint-coated steel and zinc-plated (galvanized) steel was supposedly being conducted without adequate ventilation and safeguards.

B. Evaluation Methods

Since the Drilling Rig was almost complete, welding had ceased in the columns. Therefore, it was impossible to document the mechanics' exposure to welding fumes when they had entered the columns. It was decided during the opening conference that the best possible course of action was to tour the columns and note the safeguards against excess build-up of welding fumes, the type of metal welded, and whether any conditions could result in excess welding fume concentrations in the work area. Also, it was agreed that the presence of complaints by workers would be noted.

C. Evaluation Criteria

a. Environmental

Welding fumes cannot be classified simply as a single substance since the composition of the fumes will vary with the process. The American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Value (TLV) for welding fumes is 5 mg/m^3 determined as a time-weighted average. The TLV is for total particulate only and may be superceded by the TLV's for individual more toxic substances if generated in the welding fume. In general, most welding, even with minimal ventilation will not produce exposures inside the welding helmet above 5 mg/m^3 (1).

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ACGIH: Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment for 1976, pp. 44-45.

At Kaiser Marine, the main type of welding is shielded carbon arc welding. Some of the Common health hazards which may be associated with arc welding under adverse conditions are:

- a) Ozone
- b) Oxides of Nitrogen
- c) Fumes of gases from the electrode coatings or fluxes
- d) Fumes of any coatings (zinc, lead, cadmium, etc.) used on the metal being welded.

b. Medical Criteria

The best indication of excess welding fume exposure is the presence of signs and symptoms among the welders. These signs and symptoms will vary with the particular contaminant. Ozone and the oxides of nitrogen are upper respiratory tract irritants. Zinc oxide overexposure may result in transient flu-like symptoms. Inhalation of high concentrations of other metallic fumes is more serious and may result in the appearance of the signs or symptoms of the well-defined syndromes of the particular metal fume hazard.

D. Evaluation Results and Discussion

As noted previously, welding in the columns had terminated and it was impossible to determine the mechanics' actual exposures to welding fumes. A walk-thru survey of the Drilling Rig was done on January 5, 1977. The following areas of the platform were surveyed: Mudhouse, Drill Deck, Crew's Quarters (first and second levels), Switchgear Room, Engine Room, Sack Room, and Emergency Compressor Room. Welding was being done in these areas but no significant build-up of welding fumes was observed. Many of these areas had openings to the outside and large exhaust fans. With natural ventilation from the prevailing winds, fumes were minimal in these areas.

Column A-1 was also surveyed and is one of four identical columns. The column is divided into 35-foot sections and has a diameter of 30 feet. Mechanical ventilation was provided to draw air from the bottom of the column and out the top. Additionally, portable exhaust fans which removed fumes to the outside were provided to welders. These controls seemed adequate to take care of welding fume build-up in the column.

The majority of welding was done on carbon steel with standard welding rods. The only welding on galvanized steel was at the base of each ladder in each section of the column. Thus, welding on galvanized steel was extremely minimal. No welding on paint-coated steel was done in any of the columns.

The presence of signs or symptoms of welding fume exposure was apparently nonexistent among the 11 mechanics now employed at Kaiser according to the business representative of the machinist's union. The four employees who had initiated the request were no longer employed at the company and their health effects could not be substantiated. Also, no complaints of adverse effects have been reported to the company by the approximately 80 welders.

E. Conclusions

Based on the work practices observed and the type of welding being done, it was determined that welding fumes probably do not represent a health hazard. The conditions of welding in the column, however, could not be duplicated and conclusions were based on visual observations. Also, mechanics do not weld but rotate in and out of areas where welding is done. Therefore, without monitoring mechanics during actual exposures, environmental levels could not be determined.

V. RECOMMENDATIONS

In spite of the fact that a health hazard could not be found, welding fumes can be a potential hazard. Therefore, management should continue its current program of ventilation controls when welding is being done and should obtain a copy of a NIOSH Criteria Document on welding which is to be published this year. This document will contain NIOSH's recommended standard and work practices for welding operations.

VI. AUTHORSHIP AND ACKNOWLEDGEMENTS

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