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

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 73-99-108

HARRIS STRUCTURAL STEEL COMPANY
PISCATAWAY, NEW JERSEY
FEBRUARY 1974

I. TOXICITY DETERMINATION

It has been determined that the exposure of the spray painter(s) to lead during spray painting is potentially toxic at the concentrations measured during this evaluation.

It has also been determined that the exposure of spray painters to chromium and iron oxide and the exposure of grinder-cleaners, the crane operator and the milling machine operator to lead, chromium, and iron oxide at the concentrations found during the evaluation would not be expected to result in toxic effects to the exposed workers.

These determinations are based upon environmental measurements in the workplace, employee interviews and available literature concerning toxicity of substances in this evaluation.

II. DISTRIBUTION AND AVAILABILITY OF DETERMIMATION 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) Harris Structural Steel Company, Piscataway, New Jersey
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region II
d) NIOSH - Region II

For the purposes of informing the approximately six "affected employees" the employer shall promptly "post" the Determination Report in a prominent place(s) near where exposed employees work for a period of 30 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 received such a request from an authorized representative of employees regarding exposure to Carbo Zinc inorganic zinc coating used to paint steel girders and beams.

The request alleged that painters, crane operators, welders and machine operators had experienced headaches, throat irritation, eye irritation, and skin rash from exposure to paint vapors or the liquid paint.

IV. HEALTH HAZARD EVALUATION

A. Plant Process - Conditions of Use

At the time of the NIOSH visit on September 18-19, 1973 the Carbo Zinc II Coating specified in the request was not being used. In the area where painting is accomplished, bridge girders were being painted with lead silico chromate paint. The paint was applied with an airless spray gun after the girder had been laid on its side. The girder was then turned over, and the paint was applied to the other side. One worker per shift spray paint girders and beams with a normal work rate of two girders painted per shift. In addition to the spray painter, two workers clean and grind a girder which is placed alongside the girder being painted. There is a crane operator who works directly above the painting area during part of the shift. A milling machine operator works some distance, about 200 feet, from the painting area.

B. Evaluation Design

The spray painter, grinder-cleaners, crane operator, and milling machine operator were the workers observed to be exposed potentially with primary exposure to the painter and grinder-cleaners. It was decided to determine workers exposures to lead, chromium, and iron oxide by obtaining breathing zone samples for these workers.

The original request concerned a zinc pigmented spray paint which was applied to bridge girders as a rust preventative. The requester was contacted a few days prior to the NIOSH visit, and it was confirmed that the Zinc Carbo II coating was being used at that time. However, when the investigators arrived at the plant an order for girders requiring the zinc paint had been completed, and no new orders had been received by the company specifying the zinc coating. The requestor and company were asked to notify the project officer if use of the zinc pigment paint was resumed.

C. Evaluation Methods

Five breathing zone air samples were obtained for subsequent metal analysis with a cellulose membrane filter contained in a close-faced three piece cassette field monitor. The flow rate was controlled at one liter per minute during the sampling cycle. The amount of lead, chromium, and iron was determined using atomic absorbtion spectrophotometric techniques by the Division of Laboratories and Criteria Development, NIOSH, Cincinnati, Ohio.

D. Evaluation Criteria

1. Toxic Effects of Substances Investigated

Lead (inorganic)[1,2,3]

Lead dusts of all except the most insoluble compounds are readily absorbed on inhalation and to a lesser extent after ingestion. Lead poisoning may be acute or chronic. The symptoms of acute lead poisoning may include a burning sensation in the mouth, abdominal pain, nausea, vomiting, constipation and rarely diarrhea. Most cases of lead poisoning in industry are usually of a chronic nature. Chronic lead poisoning is slow in onset and the early signs and symptoms are not well defined. No single symptom is specific for lead poisoning. Early in the course of illness a general ill-feeling, fatigue, exhaustion, irritability loss of weight and appetite, or vague abdominal discomfort may be noted. These symptoms may be followed by more severe abdominal pain, constipation and sleep disturbances. Occasionally workers may notice a blue discoloration of the gums. Weakness, which may progress to paralysis involves chiefly the extensor muscles of the wrists, (wrist drop) and less often of the ankles, is noticeable in more serious cases. In advanced stages of chronic lead poisoning, organs such as the liver and kidney may be affected. Since symptoms of lead poisoning are usually vague, if exposed workers experience early symptoms of lead poisoning, they should see their physician for evaluation.

Iron (as Iron Oxide)[4]

Iron and iron salts are generally considered to be of low orders of toxicity and are essential constitutents of the human body. Excessive ingestion seldom results in toxicity, since absorption from the gastrointestinal tract is limited to body needs. It is believed the sustained exposure to pure iron oxide dust produces an essentially benign pneumoconiosis.[5] This condition results in few, if any, symptoms and causes no disability. X-ray changes in the lungs after long-term exposure may present problems in differential diagnosis although these changes are not associated with any physical disability.

Chromium[6,7]

Information concerning exposure to chromium compounds is rather limited since the data available usually includes mixed exposure to chromates and chromic acid mist. Chromium compounds may cause local irritation of mucous membranes and skin and can produce harmful effects if swallowed or inhaled. Although not believed to be absorbed through intact skin, cutaneous ulcers (chrome holes) commonly occur. Dermatitis has been associated with worker exposure to chromic salts and also reported in the chromate producing industry.

2. Environmental Standards of Substances Investigated

Environmental standards intended to protect the health of workers and have been recommended by several sources. For this study the recommended standards from three sources are presented:

a. Federal Standards - the standard enforced by the Department of Labor as found in the Federal Register, Vol. 37, Section 1910.93, October 18, 1972.

b. Threshold Limit Value (TLV) - developed by the TLV Committee[8] of the American Conference of Governmental Industrial Hygienists, 1973.

c. Recommended standard as developed in the applicable NIOSH Criteria Document

Substance	Federal Standard	TLV(ACGIH)	NIOSH Criteria Document
Lead	0.20 mg/M^3*	0.20 mg/M^3	0.15 mg/M^3
Chromic or chromous salts, as chromium	0.50 mg/M^3	0.50 mg/M^3	N.A.
Iron oxide	10 mg/M^3	10 mg/M^3	N.A.

* 8 hour time-weighted average level, milligrams (mg) of substance per cubic meter M^3

N.A. Criteria Document is not available for this substance.

The environmental health standards recommended above are established at levels designed to protect workers occupationally exposed to individual substances on an 8-hour per day, 40 hour per week basis over a normal working lifetime.

E. Evaluation Results and Discussion

The results for samples which were obtained in the breathing zones of workers are contained in Table 1. The exposure of the spray painter to lead is judged to be great enough to cause adverse health effects, if unprotected, while exposure to chromium and iron is at safe levels. The exposure of the other workers (grinder-cleaners, crane operator, milling machine operator) are well below the levels which have been established to protect workers' health. The chromium air concentrations are compared to the standards for chromous and chromic compounds since the analytical method used determined total chromium. The airborne paint pigment might contain hexavalent chromium and would more appropriately be evaluated by samples obtained for hexavalent chromium analysis. However, the multiple determinations necessary to evaluate lead and iron as well as chromium precluded the hexavalent chromium analysis.

The lead silico chromate paint pigment contains free silica as a major ingredient. Free silica concentrations were not measured since the necessary equipment was not available during the visit. Company policy at the present time requires that a respirator be worn by the painter while spray painting to prevent lead oxide inhalation. An approved respirator should be worn which will protect the painter from chromium trioxide and free silica exposure as well as lead.

Workers were interviewed regarding their exposures to substances in the work place and no symptoms were reported which indicated over exposure to lead, chromium, or iron dust. However, most workers with exposure to zinc based paint on previous occasions reported a history of eye and nose irritation from vapor contact and skin irritation, rash, or peeling from liquid contact. A few workers reported nausea, headaches, or dizziness when zinc pigmented paint was used. All symptoms associated with the zinc pigmented paint were based upon past workers' experience since it was not in use during the NIOSH investigation.

Recommendations are made below to prevent adverse health effects to workers due to lead exposure.

1. Workers performing spray painting with lead paint should have a blood sampling and analysis made available annually or urine sampling and analysis made available semi-annually for lead determination.

2. An approved respirator should be used by spray painters while painting with lead silico chromate paint (Bureau of Mines Schedule 21B).

3. Workers should wash hands and face thoroughly before eating. Food beverages, or tobacco should never be permitted in the work area.

4. Workers should be provided clean work clothes on a daily basis. They should thoroughly shower after work before changing back into street clothes. Facilities, equipment and supplies for accomplishing this should be provided by the company.

5. Should the use of Carbo Zinc II paint be reintroduced and health effects evidenced in the worker population, it is recommended that a new request for NIOSH Health Hazard Evaluation be submitted.

REFERENCES

1. Markel, Harry L., Health Hazard Evaluation Report 71-19, Hazard Evaluation Services Branch, Division of Technical Services, NIOSH, DHEW, Cincinnati, Ohio, June 1972.

2. Lead and Its Inorganic Compounds, Hygienic Guide Series, AIHA, Detroit, Michigan, January 1964.

3. Criteria for a recommended standard...Occupational Exposure to Inorganic Lead, NIOSH, PHS, DHEW, HSM 73-11010, 1972.

4. Gunter, B. J. and S. Shama, Health Hazard Evaluation Report 72-49, Hazard Evaluation Services Branch, Division of Technical Services, NIOSH, DHEW, Cincinnati, Ohio, June 1973.

5. Kleinfeld, Morris, M.D., J. Occup. Med., Vol. 11, No. 9, September 1969.

6. Chemical Safety Data Sheet SD-46, Manufacturing Chemists Association, Washington, D.C. Adopted 1952.

7. Documentation of the Threshold Limit Values, ACGIH, 3rd. Ed. 1971, p. 56, Cincinnati, Ohio.

8. Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1973, ACGIH, Cincinnati, Ohio.

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TABLE 1

WORKER EXPOSURES TO LEAD, CHROMIUM AND IRON

September 19, 1973

Job	Lead mg/M^3	Chromium as Cr mg/M^3	Iron as Fe_2O_3 mg/M^3
Spray Painter	0.25	0.04	0.3
Grinder Cleaner 1	0.05	0.01	3.5
Grinder Cleaner 2	0.06	0.01	2.8
Milling Machine Operator	0.01	0.01	0.4
Crane Operator	0.05	0.01	1.4
Federal Standard	0.20	0.50	10.0