

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. 76-66 and 76-95-346

R.D. WERNER COMPANY, INC.
GREENVILLE, PENNSYLVANIA

DECEMBER 1976

I. TOXICITY DETERMINATION

The following determinations have been made based upon environmental air samples collected on June 24-25 and August 17-18, 1976, confidential employee interviews, evaluation of ventilation systems, evaluation of work procedures and available toxicity information.

1. Employees exposures in the Rement Department to phenol, formaldehyde, cyanide, fluorides, hydrochloric acid, phosgene, acrolein and styrene did not constitute a health hazard at the time of this evaluation.
2. Exposures to asbestos on the aluminum extrusion process did not pose a health hazard at the concentrations measured during this survey.
3. The caustic soda cleaning operation did not constitute a health hazard.
4. Workers exposure to mineral spirits in the parts cleaning area did not pose a health hazard.
5. The punch press operators were not exposed to toxic levels of lubricant.
6. The worker on the double-header saw may be exposed to an excess concentration of oil mist. The exposure to oil mist on the remaining saws did not pose a health hazard.

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) R.D. Werner Company, Greenville, Pennsylvania
- b) Authorized representatives of employees
- c) U.S. Department of Labor - Region III
- d) NIOSH - Region III

For the purpose of informing the approximately 30 "affected workers" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place 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), authorized the Secretary of Health, Education and Welfare, following a written request by an 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 two requests from authorized representatives of employees. The first request, received on May 12, was in regard to employees exposures in the Remelt Department. The request stated that employees were experiencing eye and throat irritation and breathing problems. These conditions were reported to be variable and depended on the type of scrap being melted and weather conditions. The second request dealt with employees exposures to oils and cleaning solvents in various other locations in the plant. This request was submitted on July 8 because the union felt that potential hazards may be present in these areas.

IV. HEALTH HAZARD EVALUATION

A. Conditions of Use

The R.D. Werner Company manufactures aluminum ladders, climbing equipment and custom extrusion products. The plant also contains a Remelt Department where scrap aluminum is melted and cast into logs.

1. Remelt Department

In the Remelt Department, scrap aluminum, variable quantities of which are coated with paint, oils and possibly a limited amount of plastics, is melted. Two furnaces are located in the Remelt Department, one closed and one open well. A holding furnace is located between the two melt furnaces. The furnaces are heated with natural gas and have a turnover time of approximately seven hours. The closed furnace is vented out the roof. The open furnace has no local ventilation. It should be noted that the furnaces are housed in a large area (40 ft. ceiling) so natural dilution of any contaminants should occur. Doors and windows are open on both sides of the building which houses the furnaces.

Approximately 40% of the material which goes into the furnaces is scrap metal. Part of this scrap comes from the company as a result of their manufacturing processes. This scrap material may have cutting oils on its surfaces from the saw blade and other tools used during manufacturing. The remaining scrap is supplied by another company. Until approximately six months ago, a considerable quantity of this scrap was coated with or contained plastics. Since that time, no scrap containing plastics has been accepted. The scrap is, however, often coated with acrylic paints.

Cover fluxes and degassing agents are added during various stages of the remelt operation. The exact composition of these materials is proprietary information. The compositions of the fluxes and degassing agent as well as the compositions of the cutting oils and paints were made available to NIOSH investigators. Environmental sampling was conducted based on that information and included the main components of these substances, components known to be strong irritants and known and suspected decomposition products of these substances.

Approximately four employees per shift work in the immediate area around the furnaces.

2. Fabrication Areas

The plant contains an aluminum extrusion process. During the process, the hot extruded aluminum is handled and moved about by means of asbestos pads approximately five inches square. The pads are used until they are very worn and frayed and concern was expressed by employees in regard to exposure to asbestos fibers.

A caustic soda tank is located in a small room separated from the fabrication area. The tank is used for cleaning dies and is provided with local ventilation. Employees turn the ventilation off when working at the tank because they feel it only increases their exposure to the vapors. Typically, only one employee is involved in this operation.

In another room a tank is set up for cleaning parts using mineral spirits. This operation is conducted sporadically and usually for relatively short periods of time. The room is equipped with a large wall exhaust fan. The fan is not in operation while employees are in the room cleaning parts. The employees feel the use of the fan increases their exposure to the mineral spirits because it pulls the vapors toward their breathing zone due to the location of the fan in reference to their work.

Several punch presses are located in the fabrication area. The punch presses use a lubricant, the composition of which is considered proprietary by the supplier. The information was made available to the NIOSH investigators and appropriate environmental samples were collected.

Several saws also are located in the fabrication area. An oil is used on the saws and as a result, oil mist is produced in the immediate area.

B. Evaluation Progress

An initial survey was conducted in the Remelt Department on June 24 and 25, 1976. A limited number of environmental samples were collected and interviews were conducted with the employees working in the immediate area. A follow-up survey was conducted on August 17 and 18, 1976. Additional environmental samples were collected in the Remelt Department. Environmental samples were also collected in various sections of the fabrication department. Medical interviews were also conducted with employees in these sections.

C. Evaluation Methods

A. Environmental

All samples collected in the Remelt Department were area samples. Samples for phenol and cyanide were collected in impingers containing sodium hydroxide. The phenol samples were analyzed by gas chromatography and the cyanide samples by specific ion electrode. Impinger samples for formaldehyde and other aldehydes were collected in sodium bisulfate and analyzed by gas chromatography. Acrolein samples were collected in impingers containing ethanol and then placed in dry ice. The samples were later analyzed colorimetrically. Impinger samples also were collected for hydrochloric acid in sodium acetate and analyzed by a turbidimetric method. Fluoride samples were taken using an HA filter in series with an impinger containing sodium acetate. The samples were then analyzed using a specific ion electrode. Samples for styrene were collected on charcoal tubes and analyzed by gas chromatography. Detector tubes were used to sample for the presence of phosgene. The range of the detector tubes is 0.05 ppm - 1.2 ppm.

Employees exposure to asbestos was determined by utilizing AA filters which were analyzed by optical microscopy.

Exposure to sodium hydroxide was determined by collecting an area impinger sample. The sample was back titrated to measure total alkalinity.

The parts cleaning operation and punch presses were evaluated by collecting personal breathing zone samples on charcoal tubes. The samples were then analyzed respectively for mineral spirits and the lubricant by gas chromatographic procedures.

Exposure to oil mist was measured by collecting samples on AA filters. Samples were analyzed by fluorescence spectrophotometry.

B. Medical

Employees in the work areas of concern were interviewed in regard to their work history, medical history and symptomatology associated with the work environment. The interviews were conducted in a non-directed manner, followed by directed questions in regard to symptomatology.

D. Evaluation Criteria

1. Physiological Effects

Phenol - Exposure to phenol results in marked irritation of the mucous membranes of the eyes, nose and throat. Severe chronic poisoning has been characterized by nausea, vomiting, difficulty swallowing, diarrhea, anorexia, headache, vertigo, and possibly by a skin eruption. The disease is fatal when there is extensive kidney or liver damage.

Formaldehyde - Eye irritation, upper respiratory tract irritation and dermatitis may result from exposure to formaldehyde.

Cyanide - Exposure to low concentrations may result in early symptoms of weakness, headache, occasional nausea and vomiting. Exposure to higher concentration causes instantaneous collapse and cessation of respiration.

Acrolein - Levels of 0.25 ppm of acrolein may cause some irritation, while a level of 1 ppm is practically intolerable and is capable of causing lachrymation and marked eye, nose and throat irritation.

Hydrochloric Acid - Hydrochloric acid is seldom inhaled in concentrations high enough to cause serious intoxication because of its irritant nature.

Fluorides - The inhalation of fluoride fumes and gases may produce respiratory and eye irritation. Nose bleeds also may occur at higher concentrations.

Phosgene - Phosgene is a lung irritant. Phosgene exposure produces a dryness or burning sensation in the throat, numbness, vomiting, pains in the chest, bronchitis and possibly dyspnea.

Styrene - Exposure to styrene at low concentrations may result in eye and nasal irritation.

Asbestos - Exposure to asbestos dust may result in a debilitating lung disease (asbestosis), mesothelioma and lung cancer. These malignant changes (lung cancer and mesothelioma) as well as asbestosis may develop 10-40 years after the exposure to asbestos dust has ceased.

Mineral Spirits - Effects of single acute exposure to mineral spirits have been reported ranging from headache, nausea, inebriation and stupor to anesthesia and coma. Acute exposure at high concentrations have been known to produce central nervous system depression. Prolonged or repeated exposure has been associated with irritation of the skin and mucous membranes of the respiratory tract and eyes.

Oil Mist - Exposure to oil mists will cause mucous membrane irritation and a chemical pneumonitis from direct contact of the liquid or aerosol with pulmonary tissue. Frequent and prolonged contact with the skin will lead to skin irritation and dermatitis. Due to the low order of toxicity, the standard is recommended as an index of good industrial practice as well as to prevent the relatively minor changes in the lungs that may occur from exposure.

2. Environmental Standard

To assess the potential toxicity for the concentrations of air contaminants found in the place of employment, three primary sources of criteria were used: (1) NIOSH criteria for recommended Standards for occupational exposure to substances (Criteria Documents); (2) recommended and proposed threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienist (ACGIH) (1975); and (3) occupational health standards as promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000).

In the following tabulation, criteria selected for this evaluation by the author are presented with references.

Substance	Permissible Exposures (8-hour Time Weighted Average)
1 Phenol	5 ppm *
1 Cyanide	5 mg/M ³
1 Acrolein	0.1 ppm
1 Hydrochloric Acid	7 mg/M ³
1 Fluorides	2.5 mg/M ³
1 Styrene	100 ppm
2 Oil Mist	5 mg/M ³
3 Formaldehyde	2 ppm
4 Phosgene	0.05 ppm
5 Asbestos	2 fibers/cc ***
5 Sodium Hydroxide	2 mg/M ³
6 Mineral Spirits	500 ppm

- ¹Reference: The 1975 ACGIH TLV and current OSHA standard.
- ²Reference: The 1975 ACGIH TLV. The current OSHA standard is 3 ppm.
- ³Reference: 1975 ACGIH TLV (intended change). The current OSHA standard is 0.1 ppm.
- ⁴Reference: The NIOSH 1972 criteria document and current OSHA standard. The 1975 ACGIH TLV is 5 fibers/cc. The proposed OSHA standard is 0.5 fibers/cc.
- ⁶Reference: Calculated ACGIH TLV based on aliphatic and aromatic components.

*Units of measured concentrations are:

- a) ppm $\frac{3}{3}$ parts of gas or vapor per million parts of air
- ** b) mg/M³ - milligrams of substance per cubic meter of air
- ***c) fibers/cc - fibers per cubic centimeter of air

TLV's or standards for substances are established at levels designated to protect workers occupationally exposed on an 8-hour per day, 40-hour per week basis over a working lifetime. Because of wide variation in individual susceptibility, some workers may experience discomfort at or below the designated levels. Thus, an evaluation of the work place cannot be based entirely upon comparisons made against TLV's or standards as various TLV's and standards do not represent absolute protection of all workers.

E. Evaluation Results and Discussion

1. Remelt Department

At the time of the initial survey it was not known that the scrap received no longer contained plastics. As a result, samples were collected for phenol, formaldehyde and aldehydes C₂-C₄ and cyanide, all decomposition products of plastics. No levels of these compounds were detected. Detector tubes for phenol and formaldehyde also failed to show any detectable levels.

During the initial survey, interviews were conducted with four employees, the furnace operator, his helper and two men who do the casting. The two men doing the casting behind the furnaces reported no health problems. The furnace operator and helper indicated that they had experienced occasional eye and nose irritation. This irritation usually occurred when they were charging the furnace and lasted approximately 45-60 minutes. Irritation was reported to be worse during the winter months and when large quantities of painted scrap were being melted. The fact that the scrap no longer contained plastics reduced the irritation problems but did not eliminate them.

On the follow-up survey (August 18) samples were collected during the day and evening shifts for fluorides, hydrochloric acid, phosgene, acrolein and styrene. All of the substances could account for the irritation being experienced and were present in or possible decomposition products of the degasser, fluxes or paints. Eight-hour samples were collected beside both furnaces for fluorides, hydrochloric acid, acrolein and styrene. Short-term samples (1/2 - 1 hour) for these substances were collected during charging, degassing and removal of the dross. Detector tube samples for phosgene were taken periodically. No detectable levels of styrene, acrolein or phosgene were found. The eight-hour sample collected on the day shift beside the open furnace showed a concentration for fluoride of 0.02 mg/M^3 . A short term sample for hydrochloric acid taken during degassing of the closed furnace had a concentration of 2.3 mg/M^3 . All other samples for fluorides and hydrochloric acid had no detectable levels.

There were no reported complaints of irritation during the time of this survey. The samples collected indicated the presence of fluorides and hydrochloric acid but on the day of the evaluation the concentrations were not at a level that would cause irritation. This is not to say that such levels could not be produced at other times under different weather conditions and slightly different operating conditions. It should also be noted that this report is not stating that the irritation was caused by the fluorides or hydrochloric acid or both. The cause cannot definitely be stated with the data that has been collected. It would be necessary to collect environmental samples on a day when employees were experiencing symptoms and even then the exact cause may not be determined.

Company representatives indicated that additional ventilation would be installed in the remelt area. Due to the sporadic nature of the problem, it is felt that by providing additional ventilation, especially ventilation for the open furnace, the irritation problem will probably be eliminated.

2. Fabrication Areas

At the aluminum extrusion process, a personal sample and an area sample for asbestos were collected. The locations and times are given in Table I. The sample results indicate concentrations of 0.15 fiber/cc and 0.07 fiber/cc, both below the 2 fiber/cc standard. The exposure to asbestos, therefore, is not considered a health hazard. It is recommended, due to the carcinogenic properties of asbestos, that the pads be changed before they become excessively worn to reduce exposures to the lowest possible level.

An area sample for sodium hydroxide was collected at the caustic soda tank where the dies are cleaned. No detectable levels of sodium hydroxide were found.

A twenty-six minute sample for mineral spirits was taken in the parts cleaning area. The concentration measured was low (10 mg/M^3). Although no health hazard is considered to exist, the ventilation in the area is very poor due to its location. The parts are cleaned in a low tank in the center of the room but the exhaust fan is located on the wall next to the ceiling. The exhaust fan is large and therefore draws a considerable quantity of air through the small room. In doing so, the vapors are drawn from the cleaning tank past the workers breathing zone. If parts are to be cleaned in that area, it would be advisable to redesign the local ventilation so that the vapors are drawn away from the worker.

Exposures to the lubricant used by the punch presses and rung saw were measured using charcoal tubes. Concentrations were low compared to the standards for the substances. The employees reported having sore throats, cough and frequent headaches. These symptoms, however, are not associated with the chemicals that make up the lubricant at the measured concentrations. Three individuals reported occasional cases of dermatitis on their hands. This problem can be eliminated by avoiding prolonged skin contact with the lubricant.

Samples for oil mist were collected on the Delco saws, the step machine and the double-header saw. Concentrations are given in Table II. The oil mist concentration measured on the double-header saw exceeded the OSHA oil mist standard of 5 mg/M^3 . It is most unusual to measure oil mist concentrations in excess of the standard and therefore the validity of the sample may be somewhat questioned. However, all employees interviewed who had worked on the saw reported throat irritation, headaches and complained of excessive noise. Therefore, based on the measured concentration and employee complaints, the operation of the saw should be considered a potential hazard. The operation of the saw does allow for its enclosure. Therefore, it is recommended that the saw be enclosed such as already had been done with one machine in the area. This would eliminate the oil mist problem and also reduce the noise produced by this operation. The oil mist levels on the remaining saws were below the OSHA standard.

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Table I

Asbestos

Aluminum Extrusion
R.D. Werner Co., Inc.
Greenville, Pennsylvania

August 18, 1976

<u>Sample Location</u>	<u>Sample Number</u>	<u>Sampling Period</u>	<u>Sample Volume (liters)</u>	<u>Asbestos (fibers/cc)</u>
Press 1 Area	53	8:45-14:58	604	0.15
Auxiliary Operator (Press 2)	60	8:40-14:56	564	0.07

Table II

Oil Mist
Fabrication Area
R.D. Werner Co., Inc.
Greenville, Pennsylvania

August 18, 1976

<u>Sample Location</u>	<u>Sample Number</u>	<u>Sampling Period</u>	<u>Sample Volume (liters)</u>	<u>Oil Mist (mg/M³)</u>
Delco Saw 21-8	78	7:01-15:25	756	0.81
Delco Saw 21-9	79	7:04-15:25	718	2.37
Step Machine	49	7:11-15:27	744	0.99
Double-header Saw	54	7:16-15:27	736	6.11