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

HAZARD EVALUATION AND TECHNICAL ASSISTANCE
REPORT NO. TA 77-54

SIDAL ALUMINUM CORPORATION
SPRINGFIELD, MASSACHUSETTS

MARCH 1978

Study Requested By:
Operation Manager
Sidal Aluminum Corporation
Springfield, Massachusetts

Study Conducted and Report Prepared By:
Mr. Raymond L. Ruhe
Industrial Hygienist
Industrial Hydiene Section
Hazard Evaluations and Technical Assistance Branch
Cincinnati, Ohio

SUMMARY

The Hazard Evaluation and Technical Assistance Branch of the National Institute for Occupational Safety and Health conducted an environmental investigation at the Sidal Aluminum Corporation, Springfield, Massachusetts on July 27-28, 1977.

Personal and area samples were collected for isopropyl alcohol, benzene, toluene, n-butyl alcohol, xylene, cellosolve acetate, triethylamine, total dust and nitric acid. The airborne concentrations measured were below the respective environmental criteria. It is concluded that the workers involved in the metal and sign shop at Sidal Aluminum, Springfield, Massachusetts were not exposed to toxic concentrations of these substances at the time of the NIOSH survey.

II. INTRODUCTION

The operation manager of Sidal Aluminum Corporation, Springfield, Massachusetts submitted to the Hazard Evaluations and Technical Assistance Branch of the National Institute for Occupational Safety and Health a request for technical assistance to determine airborne concentrations of isopropyl alcohol, benzene, toluene, n-butyl alcohol, xylene, cellosolve acetate, triethylamine, total nuisance dust and nitric acid used in the metal and sign shops.

The Sidal Aluminum Corporation manufactures all types of metal highway road signs (Stop, Railroad, etc.). The plant is two years old and its personnel totals 60 employees, including both administrative and production. The metal and sign shops have a total of 17 and 15 employees, respectively. The plant operates five days a week from 7:30 A.M. to 4:00 P.M.

Sheets of unused metal are received at the loading dock. They are then transferred to the shearing department in the metal plant where they are cut into various lengths. The metal is then punch-pressed to form the exact size for the highway sign. The punch metal is shipped to the Alodine® area, which consists of a total of six tanks. The various metal parts are suspended in a cleaning solution, deoxidizer and Alodine®, preceded and followed by various rinsing baths. This application cleans and preserves the metal and it is then shipped to the sign shop for silk screening.

Airborne samples were collected for solvents, acid and metal dust on July 27-28, 1977, also bulk liquid samples were collected of the solvents.

III. EVALUATION METHODS, CRITERIA AND TOXICOLOGY

A. Evaluation Methods

Personal and area samples for organic solvents were collected on charcoal tubes using a Sipin* pump operating at 50 to 200 cc/minute flow rate. The analyte was desorbed with carbon disulfide; the sample was separated with a gas chromatograph and analyzed with a flame ionization detector.

Concentration of nitric acid was determined by collecting personal samples using a glass midget impinger containing sodium hydroxide solution at 1.0 lpm with a MSA pump and analyzed by colormetric method.

Concentration of triethylamine was determined by collecting general area samples using a midget bubbler containing 10 ml of 0.05 M sulfuric acid at 1.0 lpm with a MSA pump and analyzed using a gas chromatograph with a flame ionization detector.

Samples for determination of total nuisance particulates were collected by capturing the particulates on tared vinyl metricel filters at a sampling rate of 1.5 lpm. The samples were analyzed gravimetrically.

B. Evaluation Criteria

1. Environmental

To assess the concentrations of air contaminants found in the place of employment, three primary sources of criteria were used: (a) NIOSH Criteria for Recommended Standards for Occupational Exposure to Substances (Criteria Documents); (b) Recommended and proposed Threshold Limit Values (TLV's) and their supportive documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1977); and (c) Occupational Health Standards as promulgated by the U.S. Department of Labor (29 CFR, Part 1910.1000).

In the following tabulation of criteria appropriate values are presented with reference.

Substance	Permissible Exposures (8-Hour Time Weighted Average)
Isopropyl Alcohol	980 mg/M^3** (a,b,c)
Benzene	3.2 mg/M^3 (c)
Toluene	375 mg/M^3 (a,b)
n-Butyl Alcohol	150 mg/M^3 (b,c)
Xylene	435 mg/M^3 (a,b)
Cellosolve Acetate	540 mg/M^3 (b,c)
Triethylamine	100 mg/M^3 (b,c)
Nitric Acid	5 mg/M^3 (a,b,c)
Total Dust	10 mg/M^3 (b)

**Approximate milligrams of substance per cubic meter of air sampled.

---

* Mention of commercial products does not constitute endorsement by NIOSH.

TLV's or occupational health standards for substances are usually established at levels designed to protect workers occupationally exposed on an 8-hour per day, 40 hours per week basis over a working lifetime. Because of a wide variation in individual susceptibility, some workers may experience ill effects at or below the designated levels. Thus, an evaluation of the workplace cannot be based entirely upon comparisons made against such TLV's or standards, as various TLV's and standards do not represent absolute protection of all workers. Federal standards are the legal standards and enforcement is a responsibility of the U.S. Department of Labor, OSHA.

2. Evaluation Toxicology

a. Isopropyl Alcohol -- is relatively non-toxic and is used widely for medicinal purposes such as massages and disinfecting. Concentrations in excess of 400 parts per million (ppm) may produce mild irritation of the mucous membranes. The evaluation criteria of 980 mg/M^3 will prevent narcosis. However, some workers may experience slight irritation to the mucous membranes.[2]

b. Benzene

In high concentrations benzene causes narcosis. Concentrations above 3000 ppm are irritating to eyes, nose and respiratory tract; continued exposure may cause an initial state of euphoria followed by giddiness, headache, nausea, a staggering gait and narcosis. The greatest hazard, however, is that benzene can cause an insidious and often irreversible injury to the bone marrow. This may result in aplastic anemia, benzene-induced leukemia, bleeding under the skin and other effects associated with decrease clotting ability of blood. Dermatologic effects are erythema, vesiculation or a dry dermatitis.[3] However, recent studies from clinical as well as from epidemiologic data are conclusive at this time that benzene is leukemogenic because it produces progressive, malignant disease of the blood-forming organs. Based on this more recent data NIOSH recommended to OSHA that an emergency standard for benzene be 3.2 mg/M^3. OSHA has recently published an emergency standard for benzene of 3.2 mg/M^3.

c. Toluene

Prolonged excessive exposure to this agent may acutely cause headache, weakness, fatigue, unconsciousness, loss of coordination, nausea, vomiting, anorexia, acute dermatitis and irritation of skin and mucous membranes. Toluene may also contain benzene.[4]

d. n-Butyl Alcohol

Butyl alcohol may cause eye irritation and may cause a narcotic effect. Mild irritation has been reported at 25 ppm which was objectionable and was followed by headaches at 50 ppm.[2]

e. Xylene

Xylene is a primary irritant affecting eyes, mucous membranes and skin. High levels affect the hematopoietic system in animals. Excessive exposure to high levels can cause pulmonary edema and severe liver dysfunction. Xylene may also cause dizziness, drowsiness, and incoordination at high levels. Xylene may also contain benzene.[5]

f. Cellosolve Acetate

In high concentrations, cellosolve acetate is irritant to the mucous membranes. All irritate eyes and nasal passages in varying degrees. Prolonged exposure can cause irritation of the intact skin. Cellosolve acetate may cause headache, drowsiness, and unconsciousness, if concentrations are high enough. Those effects are relatively slow and gradual in onset and slow in recovery after exposure.[3]

g. Nuisance Dusts

Nuisance dusts have little adverse effects on the lungs and do not produce significant disease or toxicity when exposures are kept under reasonable control. These dusts are biologically inert in that when inhaled the architecture of the alveoli remains intact; little or no scar tissue is formed; and any reaction provoked is potentially reversible. Excessive concentrations in workroom air may reduce visibility, cause unpleasant accumulations in the eyes, ears, nose and secondarily cause injury to the skin due to vigorous cleansing procedures necessary for their removal.[2] The 1977 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for dust is 10 mg/M^3. The current Occupational Safety and Administration (OSHA) standard is 15 mg/M^3.

(h) Nitric Acid

Nitric Acid is a strong irritant. Continued exposure to the vapor and/or mist is suspected of causing chronic bronchitis and possible chemical pneumonitis.[6]

(i) Triethylamine

The most significant characteristic of triethylamine is marked irritation to the cornea and lung tissue.[2]

IV. ENVIRONMENTAL RESULTS

The airborne particulate levels generated during the shearing and punch press operations on July 27, 1977 were measured. The results of the personal sampling data are presented in Table II. Because of the low levels of airborne total particulate collected, metal analysis of the respective samples could not be conducted. The total dust levels measured were 0.5 mg/M^3 or less which is 5% of the respective environmental criteria of 10 mg/M^3.

The airborne concentrations measured (isopropyl alcohol, benzene, toluene, n-butyl alcohol, xylene, cellosolve acetate, triethylamine and nitric acid) were substantially below the respective environmental criteria. It is concluded that the workers in the metal and sign shops at Sidal Aluminum Corporation, Springfield, Massachusetts, were not exposed to toxic concentrations of these substances at the time of the NIOSH survey on July 27-28, 1977. For a detailed description of all environmental tests, please refer to Tables I and III.

Ten employees in the metal and sign shops were interviewed to elicit symptomatology possibly related to health problems arising from their work environment. The interviews revealed no relevant symptomatology at the time of the survey.

V. RECOMMENDATIONS

1. An education program should be instituted so that employees are made aware of the toxicity and hazards associated with the materials handled in the metal and sign shops. Good work practices and first aid procedures should also be included in this program.

2. Personal hygiene of employees (e.g., washing hands, changing clothes, etc.), routine clean-up of the work area, and use of personal protective equipment should be stressed. Employee education about the importance of personal hygiene when eating and smoking should be stressed.

3. All local exhaust ventilation systems should be serviced regularly to insure that they are operating at maximum efficiency.

VI. REFERENCES

1. P & CAM, NIOSH Manual of Analytical Methods, HEW Publication No. (NIOSH) 75-121, Cincinnati, Ohio 1974.

2. Criteria for Recommended Standard for Occupational Exposure to Isopropyl Alcohol, NIOSH Publication No. 76-142, 1976.

3. Occupational Diseases, A Guide to Their Recognition, USPHS, Revised Edition 1977.

4. Criteria for Recommended Standard for Occupational Exposure to Toluene. HSM 73-11023, 1973.

5. Criteria for Recommended Standard for Occupational Exposure to Xylene. NIOSH 75-168, 1975.

6. Criteria for Recommended Standard for Occupational Exposure to Nitric Acid. NIOSH 76-141, 1976.

7. Revised Recommendation for an Occupational Exposure Standard for Benzene. NIOSH, August 1976.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Raymond L. Ruhe
Industrial Hygienist
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch
Cincinnati, Ohio

Originating Office:

Jerome P. Flesch
Acting Chief
Hazard Evaluations and
Technical Assistance Branch

Acknowledgments

Environmental Evaluation:

Norbert Schutte, Co-step
Industrial Hygiene Section
Hazard Evaluations and
Technical Assistance Branch

Report Typed By:

Margaret Ivory, Secretary
Division of Surveillance,
Hazard Evaluations and Field Studies
Cincinnati, Ohio

TABLE I
RESULTS OF ENVIRONMENTAL SAMPLING
SIGN SHOP
SIDAL ALUMINUM CORPORATION
SPRINGFIELD, MASSACHUSETTS

Job and/or Location	Date	Sample Period	Sample Volume (Liters)	Type	Isopropyl Alcohol *mg/M3	Benzene mg/M3	Toluene mg/M3	n-Butyl Alcohol mg/M3	Xylene mg/M3	Cellosolve Acetate mg/M3
Printer	7-27-77	0945-1148	6.3	**BZ	LD	LD	17	LD	7	LD
Printer	7-27-77	0947-1150	7.7	BZ	LD	LD	25	LD	LD	LD
Printer	7-27-77	0948-1150	5.9	BZ	LD	LD	73	LD	5	LD
Clerk	7-27-77	0951-1150	6.1	BZ	LD	LD	7	LD	LD	LD
Printer	7-27-77	0953-1150	6.4	BZ	LD	LD	13	LD	LD	LD
Screen Burner	7-27-77	0956-1148	5.2	BZ	LD	LD	14	LD	LD	LD
Silk Screen Area	7-27-77	0959-1513	14.3	***GA	LD	LD	30	LD	4	LD
Printer	7-27-77	1231-1512	8.5	BZ	LD	LD	21	LD	11	LD
Printer	7-27-77	1239-1522	8.0	BZ	LD	LD	35	LD	4	LD
Printer	7-27-77	1227-1515	9.4	BZ	LD	LD	22	LD	3	LD
Clerk	7-27-77	1234-1514	10.6	BZ	LD	LD	14	LD	3	LD
Printer	7-27-77	1236-1525	8.9	BZ	LD	LD	26	LD	3	LD
Screen Burner	7-27-77	1229-1527	7.6	BZ	LD	LD	36	LD	4	LD
Printer	7-28-77	0834-1149	10.3	BZ	LD	LD	35	11	28	LD
Printer	7-28-77	0833-1147	11.9	BZ	LD	LD	55	8	15	LD
Printer	7-28-77	0827-1148	9.5	BZ	LD	LD	92	11	21	LD
Spray Painter	7-28-77	0836-1145	8.4	BZ	LD	LD	35	6	15	LD
Clerk	7-28-77	0835-1146	10.9	BZ	LD	LD	30	5	11	LD
The NIOSH criteria document, 1977 ACGIH TLV and the current OSHA standard					980	--	--	--	--	--
NIOSH Recommended to OSHA an emergency standard for benzene					--	3.2	--	--	--	--
The NIOSH criteria document and the 1977 ACGIH TLV					--	--	375	--	--	--
The 1977 ACGIH TLV and the current OSHA standard					--	--	--	150	--	--
The NIOSH criteria document and the current OSHA standard					--	--	--	--	435	--
The 1977 ACGIH TLV and the current OSHA standard					--	--	--	--	--	540

* mg/M^3 - Milligrams of substance per cubic meter of air
** Personal Breathing Zone
*** General Area

Isopropyl Alcohol	Limit of Detection	0.05 Milligram/Sample
Benzene	Limit of Detection	0.01 Milligram/Sample
Toluene	Limit of Detection	0.01 Milligram/Sample
n-Butyl Alcohol	Limit of Detection	0.05 Milligram/Sample
Xylene	Limit of Detection	0.02 Milligram/Sample
Cellosolve Acetate	Limit of Detection	0.04 Milligram/Sample
LD	Less than detectable limits	

TABLE II
RESULTS OF ENVIRONMENTAL SAMPLING
METAL SHOP
SIDAL ALUMINUM CORPORATION
SPRINGFIELD, MASSACHUSETTS

Job or Location	Date	Sample Period	Sample Volume (Liters)	Type	Total Dust *mg/M^3
Supervisor of Shearman	7-27-77	0828-1503	595	**BZ	0.5
Shearman	7-27-77	0830-1503	592	BZ	0.3
Supervisor of Punch Press	7-27-77	0834-1506	590	BZ	0.3
Punch Press Operator	7-27-77	0836-1504	583	BZ	0.2
Punch Press Operator	7-27-77	0837-1505	583	BZ	0.5

The 1977 ACGIH standard is 10 mg/M^3. The current OSHA standard is 15 mg/M^3.

* mg/M^3 - Milligrams of substance per cubic meter of air.

** Personal Breathing Zone

TABLE III
RESULTS OF ENVIRONMENTAL SAMPLING
IMPINGER SAMPLES
SIDAL ALUMINUM CORPORATION
SPRINGFIELD, MASSACHUSETTS

Job or Location	Date	Sample Period	Sample Volume (Liters)	Type	Nitric Acid *mg/M3	Triethylamine mg/M3
Crane Operator (Alodine Area)	7-27-77	0852-1140	168	**BZ	0.1	--
Crane Operator (Alodine Area)	7-28-77	0815-1150	215	BZ	0.1	--
Sign Shop	7-27-77	1006-1429	263	***GA	--	LD
Sign Shop	7-23-77	1007-1429	262	GA	--	LD
The NIOSH criteria document and the 1977 ACGIH TLV and current standard					5.0	--
The 1977 ACGIH and the current OSHA standard					--	100

* mg/M^3 - Milligrams of substance per cubic meter of air.
** Personal Breathing Zone
*** General Area

Nitric Acid -Limit of Detection 1 µg/ml
Triethylamine-Limit of Detection 5 µg/ml
LD -Less than detectable limits

NIOSH 00115993

:72-101

PORT DOCUMENTATION PAGE | 1. REPORT NO. TA-77-54 | 2. NA | 3. Recipient's Accession No. PB82 179745

Title and Subtitle
Hazard Evaluation and Technical Assistance Report No. TA-77-54, Sidal Aluminum Corporation, Sringfield, MASS.

5. Report Date
March 1981

6. NA 075199

Author(s)
Ruhe, R. L.

8. Performing Organization Rept. No.
NA

Performing Organization Name and Address
Hazard Evaluation and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations, and Field Studies, NIOSH, Cincinnati, Ohio

10. Project/Task/Work Unit No.
NA

11. Contract(C) or Grant(G) No.
(C)
(G)

Sponsoring Organization Name and Address
Same as Above

13. Type of Report & Period Covered
Technical Assistance
July 1977

14. NA

Supplementary Notes
NA

Abstract (Limit: 200 words)

Environmental and personal air samples were analyzed for isopropyl-alcohol (67630), benzene (71432), toluene (108883), cellosolve-acetate (111159), triethylamine (121448), total dust, and nitric-acid (7697372) at the Sidal Aluminum Corporation (SIC-3334), in Springfield, Massachusetts, on July 27 to 28, 1977. The evaluation was requested by management on behalf of approximately 32 workers in the metal and sign shops. All measured concentrations of the contaminants were below the respective standards. The author concludes that a health hazard from chemical contaminants and dust does not exist at this facility. He recommends workers education regarding the toxicity of the materials handled in the metal and sign shops, proper employee personal hygiene, and regular maintenance of local ventilation systems.

Document Analysis a. Descriptors
Hazards-unconfirmed, Health-surveys, Air-sampling, Organic-solvents, Industrial-hygiene

Identifiers/Open-Ended Terms

COSATI Field/Group

Availability Statement
Available to Public

19. Security Class (This Report)
NA

21. No. of Pages
9