

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

HEALTH HAZARD EVALUATION DETERMINATION REPORT 75-133-249  
NATIONAL LEAD INDUSTRIES, INC.  
ROWLEY, UTAH

DECEMBER 1975

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) on August 18 and 19, 1975, at the National Lead magnesium plant in Rowley, Utah. At the time of this evaluation, breathing zone samples were taken for chlorine in cell building No. 3 and in the reactor building. A health hazard was documented due to excessive worker exposure to chlorine gas. Confidential employee interviews document this hazard, since so many of the workers showed symptoms typical of overexposure to chlorine gas.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination report are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, Fifth and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- (a) National Lead Industries, Inc.
- (b) United Steelworkers of America
- (c) U.S. Department of Labor - Region VIII
- (d) NIOSH - Region VIII

This report should be posted in a prominent place accessible to the workers for a period of approximately 30 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 the United Steelworkers of America, Salt Lake City, Utah, to evaluate potential exposures to chlorine during the production of magnesium.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

This plant is located on the western edge of the Great Salt Lake and extracts magnesium from the lake. The brine water is taken from the lake, concentrated by evaporation, and then chlorinated into magnesium salts and dried. Magnesium is then extracted from the magnesium salts by electrolysis.<sup>1</sup> During the chlorination of the brine and during the electrolysis, workers are exposed to chlorine gas. At the time of this evaluation, only one of the four electrolytic cell buildings was in operation. Since all four of these buildings are connected by hallways, it is conceivable that when the plant is in full production, concentrations of chlorine would be much higher.

B. Evaluation Design

There are approximately 180 workers in the specific area of request. At the time of this evaluation, the plant was operating only one of its four cell buildings. Therefore, samples were taken in this cell building and the adjoining reactor building. Time of sampling ranged from 45 minutes to 123 minutes, which was recommended by the Western Area Laboratory for Occupational Safety and Health.

C. Evaluation Methods

All chlorine samples were taken with impingers, using 0.1 N sodium hydroxide solution. These were colorimetrically analyzed in the Western Area Laboratory for Occupational Safety and Health in Salt Lake City.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

The two sources of criteria used to assess workroom concentrations of air contaminants in this evaluation are: (1) Recommended and proposed threshold limit value (TLV) and supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH) (1975); and (2) occupational health standard as promulgated by the U.S. Department of Labor (Federal Register, June 27, 1974, Title 29, Chapter XVII, Subpart G).

In the following tabulation of criteria, the most appropriate value is presented with its reference footnoted.

<u>Substance</u>	<u>Permissible Exposure 8-Hour Time-Weighted Exposure Basis</u>
<sup>1</sup> Chlorine . . . . .	3 mg/M <sup>3</sup>

mg/M<sup>3</sup> = approximate milligrams of substance per cubic meter of air

<sup>1</sup>Reference: 1975 ACGIH TLV and the current OSHA standard

Occupational health standards are established at levels designed to protect individuals occupationally exposed to individual toxic substances on an 8-hour per day, 40-hour per week basis over a normal working lifetime.

Chlorine gas concentrations of  $15 \text{ mg/M}^3$  may produce respiratory irritation, corrosion of teeth, inflammation of the mucous membrane of the nose, and increased susceptibility to other respiratory disease.<sup>2</sup> Concentrations from  $3\text{-}6 \text{ mg/M}^3$  cause irritation of the eyes and nose.<sup>3</sup> Chlorine concentrations considerably higher than current threshold values may occur without being noticeable. Workers rapidly lose their ability to detect the odor of chlorine at low concentrations. It should be noted that concentrations of  $15 \text{ mg/M}^3$  often result in disease of the bronchi and may also lead to moderate reduction in pulmonary function.<sup>3</sup>

#### E. Evaluation Results, Discussion, and Conclusions

The initial survey was completed, and environmental samples were taken, on August 18 and 19, 1975. Results of environmental samples clearly illustrated that workers were exposed to excessive levels of chlorine (see Table I). Confidential employee interviews were performed on 21 workers by the NIOSH nurse. All of these workers reported symptomatology compatible with exposures to chlorine gas (see Table II).

#### Recommendations

Immediate provision of approved respiratory protection in high chlorine exposure areas and installation of adequate ventilation or other engineering controls to maintain chlorine concentrations below toxic levels is recommended.

#### F. References

<sup>1</sup>Occupational Health and Safety, International Labor Office, Geneva, Volume II, pages 809-810.

<sup>2</sup>Documentation of Threshold Limit Values, ACGIH, 1971, page 46.

<sup>3</sup>Occupational Health and Safety, International Labor Office, Geneva, Volume I, pages 287-288.

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Appreciation is extended to Jim Perkins, Western Area Laboratory for Occupational Safety and Health, Salt Lake City, for preparing sampling mediums on such short notice.

TABLE I  
 ATMOSPHERIC CONCENTRATIONS OF CHLORINE  
 August 18-19, 1975

Sample Number	Location	Time of Sample (min.)	Atmospheric Concentrations Chlorine (mg/M <sup>3</sup> )	Type of Sample
39	Reactor Building	59	0.65	RWBZ
29	Reactor Building	56	1.35	RWBZ
487	Reactor Building	46	0.75	RWBZ
94	Reactor Building	45	0.16	RWBZ
1	Cell Building #3	104	3.42	COBZ
2	Reactor Building	123	< 0.002	RWBZ
3	Reactor Building	105	< 0.002	RWBZ
4	Reactor Building	98	< 0.002	RWBZ
5	Reactor Building	90	< 0.002	RWBZ
820	Cell Building #3	110	< 0.002	COBZ
659	Cell Building #3	105	0.16	COBZ
10	Reactor Building	75	0.003	RWBZ
47	Reactor Building	60	0.04	RWBZ
632	Reactor Building	68	0.16	RWBZ
666	Reactor Building	65	0.09	RWBZ
753	Reactor Building	60	4.10	RWBZ
462	Reactor Building	52	0.02	RWBZ
743	Cell Building #3	61	1.78	COBZ
646	Cell Building #3	60	15.18	COBZ

HYGIENIC STANDARD

3.0

RWBZ = reactor worker's breathing zone

COBZ = cell operator's breathing zone

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TABLE II  
SYMPTOMS REPORTED BY WORKERS

Symptoms	Number of Workers Reporting Symptom	Percentage of Workers Reporting Symptom
Eye Irritation	21	100.0
Nose Irritation	0	--
Throat Irritation	8	38.1
Chest Discomfort	7	33.3
Cough	11	52.4
Headache	3	14.3
Shortness of Breath	11	52.4
Skin Irritation	7	33.3
Hoarseness	4	19.5

Total Number of Workers Interviewed = 21