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

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HE 80-99-707

DENVER DRY GOODS
DENVER, COLORADO

JULY 1980

I. SUMMARY

In March 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate exposures to lithium and lead (Pb) during the repair of the air conditioning system at Denver Dry Goods, Denver, Colorado. The worker and the work area were monitored for lithium and lead exposure. The worker's exposures to lead and lithium were 0.03 mg/M^3 and 0.008 mg/M^3, respectively. General room air samples ranged from 0.008 to 0.01 mg/M^3 for lithium and 0.01 to 0.02 mg/M^3 for lead. All air sample values were well within the recommend levels of .05 mg Pb/M^3 and 0.025 mg LiH/M^3.

On the basis of environmental data, no hazardous exposures existed from exposure to lithium and lead. Recommendations on ventilation and work practices necessary to control potential hazards are included on page 4.

II. INTRODUCTION

NIOSH received a request in March 1980 from an operating engineer of Denver Dry Goods in Denver, Colorado, to determine if there was a health hazard from lithium and lead exposures during the repair of the air conditioning system.[1] An environmental survey was conducted on April 15, 1980, to evaluate lithium and lead exposures.

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[1]Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 19 U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by any employer or authorized representative to employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

III. BACKGROUND

Lithium is used at the Denver Dry Goods (a department store) as a lubricant in a heat exchanger for an air conditioning system. Lead is contained in the pipe connection dope (lubricant). The system has to be cleaned and repaired yearly. This usually takes two to three months and is performed by two engineers. At the time of this survey the engineers were working without respiratory protection and adequate training on the potential hazards associated with lithium and lead exposures.

IV. ENVIRONMENTAL METHODS AND MATERIALS

Breathing zone and general room air samples for lithium and lead were collected on 37 mm AA filters using vacuum pumps operated at 1.5 liters per minute and analyzed by NIOSH Method P&CAM No. 173.

V. EVALUATION CRITERIA

A. Environmental

Two sources of criteria were used to assess workroom concentrations of air contaminants: (1) recommended threshold limit values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1979; (2) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910), January 1978.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis (mg/M^3)
Lead.....	0.05 (OSHA)
Lithium.....	0.025 (TLV)*

mg/M^3 = milligrams of substance per cubic meter of air

* = This is the TLV for lithium hydride. There is no existing evaluation criteria for lithium.

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

B. Toxicological

Lithium -- (Reference 1) The pure metal never occurs in nature, but salts, especially silicates, are common. Lithium is used in alloys, as a catalytic agent, and in heat exchangers for air-conditioning systems, as a lubricant. Lithium hydride, which produces hydrogen on contact with water, is used in manufacturing electronic tubes, in ceramics, and in chemical synthesis. Lithium carbonate has recently been used medicinally as an antidepressant. Lithium has been detected in many plant and animal tissues. The daily intake is estimated to be about 2 milligrams.

Lithium is readily absorbed from the gastrointestinal tract. Distribution in the human organs is almost uniform. Excretion is chiefly through the kidneys, but some is eliminated in the feces.

From the industrial point of view, except for lithium hydride, none of the other salts or the metal itself is known to be hazardous. However, NIOSH is currently investigating the toxicity of other lithium compounds. Lithium hydride is intensely corrosive. Lithium hydride also has the potential to produce burns on the skin because of the formation of hydroxides.

Lead -- Inhalation of lead dust and fumes is the major route of lead exposure in industry. A secondary source of exposure may be from lead dust contamination on food, cigarettes, or other objects. Once absorbed lead is excreted from the body very slowly. The absorbed lead can damage the kidneys, peripheral and central nervous systems, and the blood forming organs (bone marrow). These effects may be felt as weakness, tiredness, irritability, digestive disturbances, high blood pressure, kidney damage, mental deficiency, or slowed reaction times. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood lead levels below 40 ug/100ml whole blood are considered to be normal levels which may result from daily environmental exposure. However, fetal damage in pregnant women may occur at blood lead levels as low as 30 ug/100ml. Lead levels between 40-60 ug/100ml in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60 to 100 ug/100ml represent unacceptable elevations which may cause serious adverse health effects. Levels over 100 ug/100ml are considered dangerous and often require hospitalization and medical treatment.

The new OSHA standard for lead in air in most workplaces is 50 ug/M^3 on an eight-hour time-weighted average for daily exposure. For this particular industry the current standard is 50 ug/M^3. The new standard also dictates that in four years workers with blood lead levels greater than 50 ug/100ml must be immediately removed from further lead exposure and in some circumstances workers with lead levels less than 50 ug/100ml must also be removed. At present medical removal is necessary at blood lead levels of 70 ug/100 grams of whole blood or greater. Removed workers have protection for wage, benefits, and seniority until they can return to lead exposure areas.

VI. ENVIRONMENTAL RESULTS

None of the air samples taken exceeded the OSHA lead standard of 0.05 mg/M^3 or the 1979 TLV for lithium hydride of 0.025 mg/M^3. There is a potential for exposures to be higher. This depends on the amount of abrasive grinding being done. The engineer performing the grinding had no adverse medical symptoms at the time of this survey. The sampling results may be reviewed in Table 1.

VII. DISCUSSION AND CONCLUSIONS

It would not be feasible to install a ventilation system in this area since the system is only worked on about two months a year. Therefore, adequate respiratory protection that meets OSHA specifications outlined in the General Industry Standards 1910.134 should be implemented.

VIII. RECOMMENDATIONS

1. Smoking, eating, and drinking must be prohibited in the work area.

2. Workers should wash hands thoroughly before eating, smoking, and snuff usage.

3. Adequate respiratory protection should be provided to all workers during the yearly cleaning of the air-conditioning heat exchanger. (Example: half-face respirator with ultra filters.)

4. Workers should be given clean clothes at the beginning of each shift. These clothes should be removed and left at the facility at the end of the work tour.

IX. REFERENCES

1. Casarett, L.J., Doull, J. Toxicology, The Basic Science of Poisons, Macmillan Publishing Co., Inc., New York, 1975, pp. 481-482.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

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XI. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Services, Information Resources 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:

1. Denver Dry Goods.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health
5. State Designated Agency

For the purpose of informing all employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE 1

Breathing Zone and General Room Air Concentrations of
Lithium and Lead
in the Basement Area

Denver Dry Goods
Denver, Colorado

April 15, 1980

Sample Number	Job Classification	Sampling Time	mg/M3 Lithium	mg/M3 Lead
1	Operating Engineer	10:00 AM - 3:00 PM	0.008	0.03
2	General Area	10:05 AM - 3:05 PM	0.008	0.01
3	General Area	10:10 AM - 3:10 PM	0.003	0.02
4	General Area	10:10 AM - 3:10 PM	0.01	0.01
	EVALUATION CRITERIA		0.025*	0.05
	LABORATORY LIMIT OF DETECTION mg/sample		0.0001	0.003

* = This is the TLV for lithium hydride. There is no existing evaluation criteria for lithium.