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 80-71-703

BEAR CREEK URANIUM COMPANY
DOUGLAS, WYOMING

JUNE 1980

I. SUMMARY

In February 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request to evaluate exposure to CRC Solvent (a combination of perchloroethylene and 1,1,1-trichloroethane) at Bear Creek Uranium Company, Douglas, Wyoming. This solvent was used in various maintenance shops and cleaning operations. There were only several workers exposed.

One of the mine electricians received an exposure to perchloroethylene that exceeded the NIOSH evaluation criterion and the Occupational Safety and Health Administration (OSHA) standard. This perchloroethylene exposure was 6500 mg/M^3; the OSHA standard for this compound is 670 mg/M^3. None of the seven samples for 1,1,1-trichloroethane exceeded the OSHA's action level which is one-half the OSHA standard of 1900 mg/M^3. The high exposure to perchloroethylene was a result of the worker being confined inside a crane cleaning parts.

On the basis of environmental data, a health hazard existed from over-exposure to perchloroethylene used in confined spaces. Recommendations on ventilation and work practices necessary to control potential hazards are included on page 4.

II. INTRODUCTION

NIOSH received a request in February 1980 from the safety engineer of Bear Creek Uranium Company, Douglas, Wyoming, to determine if there was a health hazard from exposures to perchloroethylene and 1,1,1-trichloroethane during the repair and maintenance of various pieces of large surface mining equipment at Bear Creek Uranium Company,

Douglas, Wyoming.[1] An environmental survey was conducted on February 21, 1980, to evaluate exposures to perchloroethylene and 1,1,1-trichloroethane.

III. BACKGROUND

The Bear Creek Uranium mine is located approximately 60 miles north of Douglas, Wyoming. This is a mine which mines raw uranium ore and produces yellow cake which is sold to processing plants that further concentrate the uranium. The purpose of this survey was to evaluate solvent exposure in the various maintenance operations located at the mine.

IV. ENVIRONMENTAL METHODS AND MATERIALS

Perchloroethylene and 1,1,1-trichloroethane breathing zone and general room air samples were collected on organic vapor charcoal tubes using vacuum pumps operated at 50 cc per minute and analyzed by NIOSH Method P&CAM No. 127.

V. EVALUATION CRITERIA

A. Environmental

Two sources of criteria were used to assess workroom concentrations of air contaminants: (1) NIOSH criteria for recommended standards; (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)	
Perchloroethylene.....	339 (NIOSH)	690 (OSHA)
1,1,1-Trichloroethane....	1900 (NIOSH)	1900 (OSHA)

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

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

Perchloroethylene (References 1,2,3) -- Perchloroethylene is a colorless liquid hydrocarbon used as an industrial solvent particularly in dry cleaning and degreasing. Exposure is primarily through inhalation and skin absorption in industry.

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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.

The most common acute effect is its action as a central nervous system depressant. Symptoms include dizziness, inebriation, incoordination, lightheadedness, tiredness, and headache. Irritation of the eyes, nose, and throat are common. Gastrointestinal complaints are nausea and vomiting. Toxic effects on the liver and kidney may be seen in chronic exposures.

1,1,1-Trichloroethane (Reference 4) -- 1,1,1-Trichloroethane causes central nervous system depression.

A number of human fatalities related to industrial exposure in closed spaces have been reported, some of which may have been "sudden deaths" due to sensitization of the myocardium to epinephrine.

A few scattered reports have indicated mild kidney and liver injury in humans from severe exposure; animal experiments have confirmed the potential for liver, but not for kidney, injury. Skin irritation has occurred from experimental skin exposure to the liquid and from occupational use. The liquid can be absorbed to a moderate degree through the skin.

The odor threshold has been described by various investigators as ranging from 16 to 40 parts per million (ppm).

The NIOSH evaluation criterion was set at a level to prevent mild irritation.

VI. ENVIRONMENTAL RESULTS

One of seven air samples taken from perchloroethylene exceeded the NIOSH evaluation criteria and the OSHA standard. The reason for this high level of perchloroethylene is due to the men working on a large piece of mining equipment down in an open pit mine. This high exposure was caused by working in a confined space (inside a large crane). The sampling results may be reviewed in Table 1.

VII. DISCUSSION AND CONCLUSIONS

A health hazard existed at this work place to the electricians who were cleaning parts of heavy equipment in confined spaces. This conclusion is based on one of the seven air samples taken for perchloroethylene exceeding the OSHA standard and the NIOSH evaluation criteria. Working areas would be impossible to ventilate; therefore, respiratory protection must be provided that meets OSHA specifications outlined in General Industry Standard 1910.134.

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. Respirators should be worn by the electricians who use chlorinated solvents in confined spaces.

IX. REFERENCES

1. Irish, D.D. Alephatic Halogerated Hydrocarbons in Industrial Hygiene and Toxicology, Vol. II, 2nd Ed., Patty F.A. ed., New York, Interscience Publishers, 1963, pp. 1314-1317.

2. National Institute for Occupational Safety and Health Criteria for a Recommended Standard...Occupational Exposure to Tetrachloroethylene (Perchloroethylene), DHEW Publication No. (NIOSH) 76-185, 1976.

3. Current Intelligence Bulletin 20: Tetrachloroethylene (Perchloroethylene), January 20, 1978. DHEW (NIOSH) Publication No. 78-112.

4. Proctor, N.H., Hughes, J.P.. Chemical Hazards of the Workplace, J.B. Lippincott Company, 1978, p. 488.

X. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By: Bobby J. Gunter, Ph.D.
Regional Industrial Hygienist
NIOSH - Region VIII
Denver, Colorado

Originating Office: Hazard Evaluation and Technical Assistance Branch (HETAB)
Division of Surveillance, Hazard Evaluations, and Field Studies (DSHEFS)
NIOSH, Cincinnati, Ohio

Report Typed By: Marilyn K. Schulenberg
NIOSH - Region VIII
Denver, Colorado

XI. DISTRIBUTION AND AVAILABILITY

Copies of this determination report are currently available upon request from NIOSH, Division of Technical Service, 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. Bear Creek Uranium Company.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Wyoming Division of Health and Medical Services.
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

Atmospheric Breathing Zone and General Room Air Concentrations of
1,1,1-Trichloroethane and Perchloroethylene

Bear Creek Uranium Company
Douglas, Wyoming

February 21, 1980

Sample Number	Job Classification	Location	Sampling Time	mg/M^3 1,1,1-Trichloroethane	Perchloroethylene
1	Mine Electrician	B-1 Pit	1:00 PM - 3:40 PM	846	185
2	General Room	Mine Elec. Shop	1:25 PM - 3:30 PM	47	34
3	Mine Electrician	B-1 Pit	1:00 PM - 3:40 PM	714	6500
4	General Room	Mine Shop	1:30 PM - 3:30 PM	*	7
5	General Room	Mine Shop	8:00 AM - 1:10 PM	1	*
6	Lab Technician	Mill Laboratory	8:25 AM - 2:00 PM	*	*
7	Mine Mechanic	Mine Shop	8:42 AM - 2:30 PM	8	8
		EVALUATION CRITERIA		1900	339
		LABORATORY LIMIT OF DETECTION mg/sample		0.03	0.01

* = below laboratory limit of detection