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. 77-86-439

MARTIN & SHAFT COMPANY
IDAHO SPRINGS, COLORADO

OCTOBER 1977

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Martin & Shaft Company in Idaho Springs, Colorado, on July 7, 1977. At the time of this evaluation, breathing zone samples were taken for acetone, 1,1,1-trichloroethane, and ethanol. All concentrations were below the most recent evaluation criteria. Based on environmental data and confidential employee interviews, a health hazard did not exist at the time of this evaluation.

II. DISTRIBUTION AND AVAILABILITY

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) Martin & Shaft Company
(b) U.S. Department of Labor - Region VIII
(c) NIOSH - Region VIII

For the purpose of informing the 10 affected employees, copies of the report shall be posted in a prominent place accessible to the employees for a period of 30 calendar 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.

NIOSH received such a request from the Martin & Shaft Company, Idaho Springs, Colorado, to evaluate the potential exposures associated with the use of acetone, 1,1,1-trichloroethane, and ethanol during the manufacture of friction igniters. This request was precipitated by the employer's interest in the health of his workers. None of the workers were complaining of work-related illnesses or injuries.

IV. HEALTH HAZARD EVALUATION

A. Process Evaluated (Wire Machine)

The Martin & Shaft Company, Idaho Springs, Colorado, produces friction igniters. They are used by the mining industry and also used by the Army to make artificial hand grenades for training purposes. The only area that was monitored during this survey was the location using acetone, 1,1,1-trichloroethane, and ethanol. These solvents were used in paints and other cleaning solutions throughout the plant. No other potentially toxic substances were being used in this operation to a degree to warrant further investigation.

B. Environmental Design and Methods

Breathing zone air samples were taken on all workers in the area where acetone, 1,1,1-trichloroethane, and ethanol were used. Samples were collected on organic vapor charcoal sampling tubes using low volume pumps operating at approximately 50 cubic centimeters per minute. All solvents were analyzed by gas chromatography. Confidential employee interview forms were completed on each worker in this area.

C. Criteria for Assessing Workroom Concentrations of Air Contaminants

The three sources of criteria used to assess workroom concentrations of air contaminants were: (1) recommended threshold limit values (TLV's) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH)(1976); (2) Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910), January 1976; and (3) NIOSH criteria for recommended standard for 1,1,1-trichloroethane, July 1976.

	Permissible Exposures 8-Hour Time-Weighted Exposure Basis (mg/M^3)		
Substances	TLV	OSHA Standard	NIOSH Criteria For Recommended Standard
Acetone	2400	2400	---
1,1,1-Trichloroethane . .	1900	1900	1900
Ethanol	1900	1900	---

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

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.

D. Toxicology

1. Acetone

Acetone is one of the least hazardous of the volatile solvents. Eye, nose, and throat irritation occur only after very high exposures such as in tanks and closed compartments. Narcotic (anesthetic) effects with headache, drowsiness, and incoordination should not occur under usual conditions.

Acetone is not known to produce chronic or accumulative systemic effects. Repeated and prolonged skin contact with the liquid can cause dryness and mild irritation of the skin.[1]

The 1000 ppm threshold limit is well below a concentration capable of producing narcotic symptoms or mucous membrane irritation. It is practically devoid of inhalation hazard.[2]

2. 1,1,1-Trichloroethane

1,1,1-Trichloroethane vapors may produce narcosis. A five-minute exposure to 5000 ppm can be expected to produce marked incoordination and anesthesia. Exposure to concentrations in excess of 1000 ppm for 15 minutes, or 2000 ppm for five minutes, can be expected to produce a disturbance of equilibrium in the majority of adults. Above 1700 ppm minor disturbances of equilibrium have been observed, with complaints of headache and lassitude. In controlled human exposures to 500 ppm, no effects other than slight transient eye irritation was noted; at 1000 ppm and above, mild eye irritation and some dizziness were noted. Following exposure, most of the compound is eliminated unchanged via the lungs, chiefly within 48 hours. Dermatitis may result from repeated skin contact with the liquid. Cardiac arrhythmias have been reported following ingestion.[3]

3. Ethanol

Industrial exposures to ethanol vapors are of no practical importance. In order for absorption by way of the respiratory tract to cause elevated blood ethanol levels, a worker would have to breathe 1000 ppm at a rate of 65 liters of air per minute. Since a ventilatory rate of 30 liters per minute is associated with hard work, a hazard of systemic effects from airborne ethanol is very unlikely.[4]

E. Environmental Results and Discussion

Workers were monitored during an entire work shift for acetone, 1,1,1-trichloroethane, and ethanol. All concentrations were well below the most recent evaluation criteria. Confidential employee interview forms were completed on each worker. None of the workers felt that they were overexposed, and none of them had symptoms.

Conclusions

Evaluation of the environmental data and the confidential employee interview forms clearly indicates that a health hazard did not exist during the time of this evaluation. For a review of environmental data, refer to Table I.

V. RECOMMENDATIONS

1. Management should make every effort to continue to provide a healthy and safe environment.

2. Employees should aid in ensuring their own health by:

   a. Wearing gloves when possible
   b. Not smoking, eating, or drinking in the immediate work environment
   c. Washing hands before smoking, eating, or drinking

3. Employee education should be attempted, namely, to acquaint the worker with the chemical nature and toxicity of each substance used at the work site.

VI. REFERENCES

1. Acetone Chemical Safety Data Sheet SD-87, August 1962.

2. Acetone, Hygienic Guide Series, American Industrial Hygiene Ass'n., Jan. 1964.

3. NIOSH - 1,1,1-Trichloroethane Standards Completion Project.

4. Hamilton, Alice, and Hardy, Harriet L. Industrial Toxicology, Publishing Sciences Group, Inc., third edition, p 299, 1974.

VII. AUTHORSHIP

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TABLE I

ATMOSPHERIC CONCENTRATIONS OF ACETONE, 1,1,1-TRICHLOROETHANE, AND ETHANOL

Martin & Shaft Company
Idaho Springs, Colorado

July 7, 1977

Sample Number	Location	Job Classification	Time of Sample	Acetone (mg/M^3)	1,1,1-Trichloroethane (mg/M^3)	Ethanol (mg/M^3)	Type of Sample
1	Wire Machine	Wire Machine Operator	7:50 AM - 3:00 PM	157	59	19	BZ
2	Wire Machine	Asst. Wire Mach. Opr.	7:54 AM - 3:00 PM	12	22	6	BZ
3	Wire Machine	Cord and Sleever	7:58 AM - 3:00 PM	3	40	21	BZ
4	Wire Machine	Cord and Sleever	8:00 AM - 3:00 PM	87	39	17	BZ
5	All Areas	Supervisor	8:01 AM - 3:00 PM	61	37	16	BZ
6	All Areas	Maintenance	8:07 AM - 3:00 PM	87	63	6	BZ
			EVALUATION CRITERIA	2400	1900	1900	
			NIOSH LIMIT OF DETECTION	<.001 mg/s	<.001 mg/s	<.004 mg/s	

mg/M^3 = approximate milligrams of substance per cubic meter of air
BZ = breathing zone
mg/s = milligrams per sample