

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

HEALTH HAZARD EVALUATION DETERMINATION REPORT 73-126-186  
RAVEN INDUSTRIES, INC.  
SIOUX FALLS, SOUTH DAKOTA

APRIL 1975

I. TOXICITY DETERMINATION

Based upon the results of an evaluation conducted by the National Institute for Occupational Safety and Health (NIOSH) on October 29, 1974 it has been determined that employee exposures to fibrous glass, acetone and styrene vapor were not toxic as found in the production of fibrous glass containers at Raven Industries, Inc. Airborne concentrations of these contaminants were below permissible levels adopted in the Federal OSHA (8-hour time-weighted average) standards as well as the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit values. Twenty confidential employee interviews taken in different areas of the plant failed to elicit any symptoms or complaints during the time of the evaluation.

However, there exists a potential for employees to be overexposed to styrene vapor in the spin cast molding area. Four "short-term" concentrations in excess of 8-hour permissible level for styrene were recorded during the evaluation. These operations are, however, not continuous throughout the work day under the present work schedule. The ventilation system in this area was being re-evaluated and improved.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation determination 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) Raven Industries, Inc.
- (b) U.S. Department of Labor - Region VIII
- (c) 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 management at Raven Industries, Inc., Sioux Falls, South Dakota, to evaluate the potential hazards associated with alleged exposures to styrene, acetone, and dust generated from the production and finishing of large fiber glass containers.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

Raven Industries produces large fibrous glass containers. They do this by centrifugal molding, polymolding, and custom molding of fiber glass. After the fiber glass containers are dried, they are sent to the finishing area, where grinding and patching are often required. The only contaminants to which employees are potentially exposed consist of acetone, styrene, and a very small quantity of methyl ethyl ketone peroxide which is used as a catalyst in the production of fiber glass containers.

B. Evaluation Design

There are approximately 55 employees in this factory. Environmental samples were taken in all areas of the plant where there was a potential occupational exposure. After conferring with NIOSH physicians, and their review of the confidential employee interview forms, it was determined that a medical evaluation was not necessary.

C. Evaluation Methods

All solvent vapor samples were taken using low volume pumps (cc's per minute) and organic vapor sampling tubes. All dust samples were taken on pre-weighed filters. Methyl ethyl ketone peroxide samples were not collected, since this substance is very reactive; and NIOSH does not have field sampling techniques or laboratory analytical methods to measure this substance. Twenty confidential employee interviews, designed to elicit any job-related health effects known by employees, were completed by the NIOSH industrial hygienist in different areas of the plant.

D. Evaluation Criteria

The occupational health exposure limits most relevant to the substances of this evaluation are listed below:

<u>Substances</u>	<u>ACGIH 1974 TLV's</u> mg/M <sup>3</sup>	<u>NIOSH Recommended Standard</u> mg/M <sup>3</sup>	<u>STEL</u> mg/M <sup>3</sup>
Nuisance Dust, such as fiber glass	10	----	----
Acetone	2400	2400	----
Styrene	420	420	525

mg/M<sup>3</sup> - milligrams of contaminant per cubic meter of air

STEL - short-term exposure limits from ACGIH

The 1974 ACGIH threshold limit values and the NIOSH recommended standards level represent conditions under which it is believed that nearly all workers may be exposed in an 8-hour day, 40-hour week, over a normal working lifetime without adverse effects.

Short Term Exposure Limit is defined as the maximum concentration to which workers can be exposed for a period up to 15 minutes continuously without suffering from one or more of the following: 1) intolerable irritation, 2) chronic or irreversible tissue change, 3) narcosis of sufficient degree to increase accident proneness, impair self-rescue, or materially reduce work efficiency. No more than 4 excursions per day are permitted, with at least 60 minutes between exposure periods, and provided the daily TWA is also not exceeded.

#### E. Evaluation Results and Discussion

This hazard evaluation was performed on October 29, 1974. Breathing zone and general room samples were taken in different areas of the factory. Twenty-one organic vapor sampling tubes were forwarded to the Cincinnati laboratory for styrene and acetone determinations. A total of 18 fibrous glass dust samples were taken. These were also analyzed in the Cincinnati laboratory. Results of all sampling are contained in Tables I and II.

Employee exposures (on an 8-hour time-weighted average basis) to fibrous glass, acetone and styrene were below both the OSHA and ACGIH permissible levels.

However, some short-term samples for styrene indicated relatively high concentrations during the fibrous glass chopping and spin cast molding operation. Employee exposure during these times while high would not be expected to exceed the 8-hour permissible levels since these operations are not continuous throughout the work day under the present work schedule. Twenty confidential employee interview forms were completed in different areas of the factory. None of the employees interviewed had any complaints.

#### F. Recommendations

1. Ventilation system should be improved throughout Raven Industries to eliminate the high exposures to styrene and fiber glass dust.
2. Until ventilation is installed, NIOSH approved respirators and filters should be used in the chopping, hand molding, and fiber glass sanding areas.
3. There should be a followup industrial hygiene survey performed as soon as ventilation has been installed to ensure a safe work environment.

V. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By:

Bobby J. Gunter, Ph.D.  
Regional Industrial Hygienist  
NIOSH Region VIII  
Denver, Colorado

Originating Office:

Jerome P. Flesch, Chief  
Hazard Evaluation Services Branch  
Cincinnati, Ohio

Acknowledgments:

Raymond L. Ruhe, Industrial Hygienist  
Hazard Evaluation Services Branch  
Cincinnati, Ohio (for assisting with  
environmental monitoring)

NIOSH Cincinnati Laboratory (for  
performing analyses)

TABLE I

## ATMOSPHERIC CONCENTRATIONS OF FIBER GLASS DUST

Sample Number	Location	Time of Sample min.	Atmospheric Fiber Glass Dust mg/M <sup>3</sup>	Conc. Dust	Type Sample
3	Head Press	90	2.1		Operator's Breathing Zone
4	Special Products	88	2.4		Operator's Breathing Zone
11	Spin Cast	132	2.0		General Area
21	Head Press	109	2.8		Operator's Breathing Zone
26	Custom Products	220	0.5		General Area
27	Special Products	345	0.8		General Area
29	Poly Tank	193	2.0		Operator's Breathing Zone
30	Hand Lay Up	202	3.0		Operator's Breathing Zone
51	Head Press	241	2.6		Operator's Breathing Zone
52	Special Products	343	1.5		Operator's Breathing Zone
53	Custom Products	101	35.7		Operator's Breathing Zone
54	Special Products	235	2.0		Operator's Breathing Zone
55	Head Press	102	5.0		Operator's Breathing Zone
56	Spin Cast	357	2.0		General Area
57	Head Press	108	2.0		Operator's Breathing Zone
58	Special Products	350	1.6		Operator's Breathing Zone
59	Custom Products	320	0.4		General Area
60	Custom Products	223	9.6		Operator's Breathing Zone
1974 TLV			10.0		

TABLE II

## ATMOSPHERIC CONCENTRATIONS OF ACETONE AND STYRENE

Sample Number	Location	Time of Sample min.	Atmospheric Conc.		Type Sample
			Acetone mg/M <sup>3</sup>	Styrene mg/M <sup>3</sup>	
1	60" Mold	90	42.0	66.0	Operator's Breathing Zone
2	60" Mold	88	16.0	66.0	Operator's Breathing Zone
4	Spin Cast	71	156.0*	279.0	Operator's Breathing Zone
5	Spin Cast	65	62.5	188.0	Operator's Breathing Zone
7	Fiber Glass Chopping	63	125.0	458.0	Operator's Breathing Zone
9	Spin Cast	151	61.0*	238.0	Operator's Breathing Zone
10	Spin Cast	149	57.0	200.0	Operator's Breathing Zone
11	Fiber Glass Rolling	129	32.0*	228.0	Operator's Breathing Zone
12	Fiber Glass Chopping	123	63.0	319.0	Operator's Breathing Zone
13	Spin Cast	77	46.0*	212.0	Operator's Breathing Zone
16	Fiber Glass Rolling	47	68.0	253.0	Operator's Breathing Zone
17	60" Mold	97	15.0	29.0	Operator's Breathing Zone
18	Spin Cast	15	324.0	690.0	General Area
19	Fiber Glass Chopping	34	56.0	565.0	Operator's Breathing Zone
20	Spin Cast	10	100.0	560.0	General Area
21	Gel Pulling	12	82.0*	126.0	Operator's Breathing Zone
22	Fiber Glass Chopping	39	94.0*	194.0	Operator's Breathing Zone
23	60" Mold	66	19.0	128.0	Operator's Breathing Zone
24	Gel Pulling	120	39.0	62.0	Operator's Breathing Zone
25	Fiber Glass Chopping	52	68.0*	376.0	Operator's Breathing Zone
26	Fiber Glass Chopping	49	74.0*	361.0	Operator's Breathing Zone
OSHA Standard and 1974 TLV			2400.0	420.0	

\* Concentrations of acetone found in the second stage of the organic vapor sampling tube; therefore, these results represent minimum concentrations of Acetone present in the workroom atmosphere.