

ABSTRACT

HEALTH HAZARD EVALUATION DETERMINATION

REPORT NO. 73-59-92

Toxic Substances: Respirable dust, free silica, lead, manganese, chromium, iron, and carbon monoxide.

Industry: Brick manufacturing.

Study Data: Workroom air concentrations (breathing zone and work area). Samples were taken both inside of plant and outside in the raw materials area.

Study Date: July 5-6, 1973

Study Results: Thirty-seven personal samples were taken for the above-mentioned chemicals. All results were negative except for respirable free silica, which exceeded the OSHA standard.

Toxicity Determination: Respirable samples were taken at four different locations on the following workers: Pub mill operator, bulldozer operator, maintenance superintendent, and the general foreman. All samples, with the exception of the maintenance superintendent, exceeded the established Federal standard.

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

HEALTH HAZARD EVALUATION DETERMINATION REPORT 73-59  
COLORADO BRICK COMPANY  
BOULDER, COLORADO

NOVEMBER 1973

I. TOXICITY DETERMINATION

Based on the results of an environmental evaluation conducted by the National Institute for Occupational Safety and Health (NIOSH) on July 5-6, 1973, it has been determined that employee exposures to free silica have exceeded the well-established Federal standard for the respirable fraction of silica at the Colorado Brick Company, Boulder, Colorado, and are therefore potentially toxic.

II. DISTRIBUTION AND AVAILABILITY

Copies of this hazard evaluation are available upon request from the Hazard Evaluation Services Branch, NIOSH, U.S. Post Office Building, Room 508, 5th and Walnut Streets, Cincinnati, Ohio 45202. Copies have been sent to:

- (a) Colorado Brick Company
- (b) Authorized Representative of Employees
- (c) U.S. Department of Labor - Region VIII
- (d) NIOSH - Region VIII

For the purpose of informing approximately 49 exposed employees, this report shall be posted in a prominent place readily accessible to workers for a period of at least thirty 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 an authorized representative of employees to evaluate the potential hazards associated with the alleged exposures to free silica, nuisance dust, lead, manganese, chromium, iron, and carbon monoxide during the manufacture of brick at the Colorado Brick Company, Boulder, Colorado.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

This plant manufactures bricks. Raw materials, which include sand and clay, are fed into a hopper where various additives are introduced. These

additives are wetted down with water, then extruded as a sheet of brick approximately ten inches wide. This sheet is passed through a series of wires which slice the bricks into normal size. The bricks are then placed in drying ovens, where they receive treatment for coloration. The bricks are taken from the drying ovens to kilns to be baked. After leaving the kilns, the bricks are stacked and packaged and are then ready for sale.

The primary areas of interest during this evaluation included the raw materials area, the drying ovens, and the kiln area. Possible exposures in these areas included free silica, nuisance dust, lead, manganese, chromium, iron, and carbon monoxide.

B. Evaluation Design

This plant employs approximately 49 workers. A total of 21 samples were taken, and all were obtained in areas where high dust exposures were observed. These samples are representative of all areas in the brick plant. Samples were taken for periods of three to four hours. Carbon monoxide measurements were taken in the drying oven area and on top of the kilns. All samples taken, with the exception of the respirable free silica, were below the established Federal standards. Results may be reviewed in the Appendix.

C. Methods

All dust and metal samples were collected on pre-weighed filters. Metal samples were analyzed in the Western Area Occupational Health Laboratory in Salt Lake City, and the total dust and respirable silica samples were analyzed in the NIOSH laboratory in Cincinnati.

D. Evaluation Criteria

The occupational health standards relevant to the substances of this evaluation as promulgated by the U.S. Department of Labor (Federal Register, October 18, 1972) are as follows:

Silica:	
Crystalline:	10mg/M <sup>3</sup> (a)
Quartz (respirable) . . . . .	% SiO <sub>2</sub> +2
Inert or Nuisance Dust:	
Total dust . . . . .	15 mg/M <sup>3</sup>
Lead . . . . .	0.2 mg/M <sup>3</sup>
Manganese . . . . .	5 mg/M <sup>3</sup> (b)
Chromium . . . . .	0.5 mg/M <sup>3</sup>

Iron (fumes) . . . . .	10 mg/M <sup>3</sup>
Carbon Monoxide . . . . .	55 mg/M <sup>3</sup>

- (a) Both concentration and per cent quartz for the application of this limit are to be determined from the fraction passing a size-selector with the following characteristics: Containing <1% quartz; if >1% quartz, use quartz limit.
- (b) Ceiling value; this concentration shall not be exceeded for any period.
- mg/M<sup>3</sup> - Milligrams of contaminant 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.

#### E. Evaluation Results and Discussion

On July 5 and 6, 1973, a total of 37 personal samples were taken in all areas where possible exposures were likely to occur. Laboratory analyses of these samples showed the following; (1) Lead values ranged from a low of less than 0.002 to a high of 0.003 mg/M<sup>3</sup>; (2) manganese values ranged from a low of 0.001 to a high of 0.30 mg/M<sup>3</sup>; (3) chromium values ranged from a low of 0.001 to a high of 0.008 mg/M<sup>3</sup>; (4) iron values ranged from a low of 0.01 to a high of 0.19 mg/M<sup>3</sup>; (5) three out of four of the respirable free silica determinations exceeded the established Federal standard (free silica samples were taken on the pub mill operator, bulldozer operator, maintenance superintendent, and the general foreman); and (6) carbon monoxide determinations were all well below the established standard, and concentrations ranged from 0 to 25 parts per million.

#### F. Recommendations

1. Due to the high free silica in these areas, a closed system should be developed to eliminate worker exposure to the free silica generated from bulldozing and handling of the raw sand and clay. The raw materials should be placed in a hopper and fed to the grinding area in a closed system. Until this is put into operation, all workers in this area should be fitted with proper respirators to eliminate the possibility of lung damage caused by breathing the respirable dust containing free silica.
2. In view of the excessive environmental levels of silica detected, it is strongly recommended that all employees who have in the past or are currently engaged in handling of raw materials with possible exposure to silica be given immediate chest X-rays and pulmonary function tests.
3. Numerous electrical and mechanical hazards were observed. These should be brought into compliance with OSHA standards.
4. The OSHA poster, which briefly states the intent and coverage of the Occupational Safety and Health Act, should be displayed in a place where employees normally report to work. This was not posted at any place throughout the plant.
5. Washroom and bathroom facilities should also be brought up to compliance with OSHA standards.
6. It would be advisable for the Colorado Brick Company to seek consultative services in eliminating many of their occupational safety hazards.

APPENDIX 1

## RESULTS OF PARTICULATE SAMPLING FOR METALS

Metal Analyses (mg/M<sup>3</sup>)

<u>Sample Number</u>	<u>Lead</u>	<u>Manganese</u>	<u>Chromium</u>	<u>Iron</u>
1	<0.002	0.02	<0.001	0.05
2	<0.002	0.007	0.001	0.15
3	<0.002	0.014	<0.001	0.15
4	0.003	0.002	0.002	0.02
5	0.003	0.001	<0.001	0.02
6	<0.002	0.001	<0.001	0.02
7	<0.002	0.03	0.004	0.10
8	<0.002	0.30	0.008	0.19
9	<0.002	<0.001	<0.001	0.005
10	<0.002	<0.001	<0.001	0.01

Samples 2, 4, 5, 6, 9, and 10 were taken in the kiln area.  
 Samples 1 and 7 were taken on the pub mill operator.  
 Sample 3 was taken on a worker in the brick drying area.  
 Sample 8 was taken on a brick laborer.

APPENDIX 2

## RESULTS OF SAMPLING FOR AIR-BORNE NUISANCE DUST

Nuisance Dust Analyses (mg/M<sup>3</sup>)

<u>Sample Number</u>	<u>Total Dust</u>
49	2.4
12	2.3
29	3.8
7	8.2
42	3.8
41	3.2
28	2.1
14	2.4
36	2.6
50	2.8
21	1.6
37	3.5
40	5.0
48	4.0
32	2.4
43	6.0
30	2.4
16	7.0
19	2.4
34	3.4
46	3.0
47	4.0
31	2.0

These samples were taken throughout the plant. The highest dust levels were in the raw materials area, while the lowest dust levels were found in the kiln and brick-making areas.

APPENDIX 3

## RESULTS OF SAMPLING FOR RESPIRABLE AIR-BORNE FREE SILICA

Free Silica Analyses (mg/M<sup>3</sup>)

<u>Sample Number</u>	<u>Job Classification</u>	<u>OSHA Standard Free SiO<sub>2</sub> mg/M<sup>3</sup></u>	<u>Respirable Dust (mg/M<sup>3</sup>)</u>
7	Pub Mill Operator	.45	1.83
42	Bulldozer Operator	.36	1.26
50	Maintenance Supt.	.83	.67
21	General Foreman	.45	.60

$$\frac{10 \text{ mg/M}^3}{\% \text{ SiO}_2 + 2} =$$

This formula was used in calculating the above concentrations.

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