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. 78-50 (A, B, & C)- 517

COLORADO-UTE ELECTRIC ASSOCIATION
HAYDEN, NUCLA, AND MONTROSE (COLORADO)

AUGUST 1978

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Colorado-Ute power plants located in Hayden, Nucla, and Montrose (Colorado). At the time of this evaluation, breathing zone air samples were taken for crystalline silica (quartz and cristobalite), respirable coal dust, total coal dust, and fly ash. Workers at the Hayden plant were potentially exposed to excessive concentrations of crystalline silica and total coal dust. Excessive exposures to total coal dust and fly ash were found on workers at the Nucla plant. Workers at the Montrose (Bullock) plant were overexposed to crystalline silica, respirable coal dust, and total coal dust.

II. 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. Colorado-Ute Electric Association
2. International Brotherhood of Electrical Workers (Washington, D.C., and Grand Junction, Colorado)
3. U.S. Department of Labor/OSHA - Region VIII
4. NIOSH - Region VIII

For the purpose of informing approximately 80 affected employees, a copy of this 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 IBEW Local #111, Grand Junction, Colorado, to evaluate potential exposures to coal dust during the operation and maintenance of Colorado-Ute power plants located in Montrose, Hayden, and Nucla, Colorado.

IV. HEALTH HAZARD EVALUATION

A. Coal Handling Area

The three power plants surveyed during this evaluation used coal to generate electrical power. Only a small number of workers (usually 2 or 3) are working in direct contact with coal. Other parts of the power plants are kept clean, and there is no exposure to dust generated from the handling of coal. Throughout this evaluation, breathing zone air samples were taken only on personnel who were handling the coal. Several workers who were cleaning bag houses at the Nucla plant were also evaluated.

B. Evaluation Design

All workers were monitored in the areas where coal was being handled. Bag house workers were monitored in the Nucla plant, since this was the only plant that had workers involved in repairing bags during the time of this evaluation. Workers were monitored for both respirable and total coal dust, crystalline silica, and fly ash. Each worker was interviewed, and questions were directed at work history related to working in a dusty environment such as: Do you cough a lot? Do you produce particulate in your sputum? Do you experience shortness of breath when walking up steps? Do you smoke?

C. Evaluation Methods

All breathing zone air samples were collected on pre-weighed filters using vacuum pumps operated at either 2.0 or 1.7 liters per minute. Crystalline silica samples and respirable coal dust air samples were taken using cyclones with filters and pumps operated at 1.7 liters per minute.

D. Criteria for Assessing Workroom Concentrations of Air Contaminants

Three sources of criteria are generally used to assess workroom concentrations of air contaminants: (1) NIOSH criteria for recommended standards;

(2) recommended Threshold Limit Values (TLVs) and their supporting documentation as set forth by the American Conference of Governmental Industrial Hygienists (ACGIH), 1977; and (3) Occupational Safety and Health Administration (OSHA) standards (29 CF[illegible] 2920), January 1976. NIOSH criteria and ACGIH TLVs represent the most recent and relevant recommendations and are given prominence in this evaluation.

	Permissible Exposures 8-Hour Time-Weighted Exposure Basis (mg/M3)		
Substances	NIOSH Criteria for Recommended Standard	TLV	Current OSHA Standard
Crystalline Silica.	0.05	10 mg/m % Respirable Quartz + 2	
Coal Dust	----	2.0	2.0
Fly Ash	----	10.0	15.0

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.

E. Toxicology

Crystalline Silica--exposures at levels above the recommended criteria can produce a fibrotic condition of the lungs (silicosis). This is a disabling disease that can lead to permanent disability and death. If a worker's exposure exceeds one-half the recommended level of 0.05 milligrams per cubic meter, the following medical examination should be instituted:

> Medical examinations shall be made available to all workers subject to "exposure to free silica" prior to employee placement and at least once each 3 years thereafter. Examinations shall include as a minimum:
>
> (1) A medical and occupational history to elicit data on worker exposure to free silica and signs and symptoms of respiratory disease.

(2) A chest roentgenogram (posteroanterior 14" by 17" or 14" by 14") classified according to the 1971 ILO International Classification of Radiographs of Pneumoconioses, ILO U/C International Classification of Radiographs of Pneumoconioses 1971, Occupational Safety and Health Series 22 (rev), Geneva, International Labor Office, 1972.

(3) Pulmonary function tests, including forced vital capacity (FVC) and forced expiratory volume at 1 second (FEC 1) to provide a baseline for evaluation of pulmonary function and to help determine the advisability of the workers using negative- or positive-pressure respirators. It should be noted that pulmonary function tests may vary significantly in various ethnic groups. For example, in black persons, the test values for the FVC should be divided by 0.85 before the percentage value is compared with normal figures.

(4) Body weight.

(5) Height.

(6) Age.

(7) Initial medical examinations for presently employed workers shall be offered within 6 months of the promulgation of a standard incorporating these recommendations.

Medical Management

An employee with or without roentgenographic evidence of silicosis who has respiratory distress and/or pulmonary functional impairment should be fully evaluated by a physician qualified to advise the employee whether he should continue working in a dusty trade.

These records shall be available to the medical representatives of the Secretary of Health, Education, and Welfare, of the Secretary of Labor, of the employee or former employee, and of the employer.

Medical records shall be maintained for at least 30 years following the employee's termination of employment.

Any area where workers are subject to crystalline silica exposure, the following warning sign should be posted:

WARNING:
FREE SILICA WORK AREA
Unauthorized Persons Keep Out (reference 1)

Coal Dust--may produce coal miners pneumoconiosis, a lung disease which may be either simple or complicated. Coal miners pneumoconiosis may lead to permanent disability if the worker is exposed to coal dust in excess of the evaluation criteria (reference 2).

Fly Ash--has no health standard or other evaluation criteria. It has to be considered a nuisance dust, especially during these evaluations, because it did not contain measurable amounts of crystalline silica. Maintaining worker exposure below the nuisance dust evaluation criteria of 10 mg/M_3 should prevent workers from developing any occupational disease from fly ash. It would be advisable to check the fly ash for heavy metals such as lead, arsenic, and cadmium.

F. Environmental Results and Discussion

Examination of Tables I through VII illustrates that workers at the Hayden plant were potentially exposed to excessive concentrations of crystalline silica and total coal dust. Workers at Nucla were overexposed to total coal dust and fly ash. Workers at Montrose (Bullock) were overexposed to crystalline silica, respirable coal dust, and total coal dust. Coal handlers and the utility men that were cleaning the bag houses were overexposed to coal dust and fly ash. The coal handlers in the Hayden plant were adequately protected by NIOSH-approved respirators and an adequate respirator program. However, workers in the Nucla and Montrose plants did not have adequate respirators and were being grossly over-exposed to coal dust and fly ash. These workers should be given proper respirators, and a respirator program should be started immediately to protect the workers. Engineering controls are not feasible, since most coal handlers are working outside on a high stockpile of coal.

All workers at the Hayden, Nucla, and Montrose power plants were interviewed. The two coal handlers at the Hayden plant had no complaints. These workers were wearing proper respirators. This facility also had a good respirator program. The workers at the Nucla and Montrose plants complained of overexposure to dust. These workers did not have a respirator program and were not being adequately protected.

V. RECOMMENDATIONS

1. NIOSH-approved respirators and a respirator program should be initiated at the Nucla and Montrose plants.

2. Periodic coal dust monitoring should be performed at all three power plants.

3. Workers receiving dust exposures should have periodic physicals and chest x-rays.

4. Eating facilities should be provided and maintained in all three power plants.

VI. REFERENCES

1. NIOSH. Criteria for a Recommended Standard. . .Occupational Exposure to Crystalline Silica, NIOSH #75-120, 1974.

2. Plunkett, E. R., Handbook of Industrial Toxicology, Chemical Publishing Company, New York, 1976, p. 110-111.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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TABLE I

BREATHING ZONE AIR CONCENTRATIONS OF
RESPIRABLE CRYSTALLINE SILICA (QUARTZ & CRISTOBALITE)
AND RESPIRABLE COAL DUST

Colorado-Ute Electric Association
Hayden, Colorado

March 21, 1978

Sample Number	Location	Job Classification	Time of Sample	CRYSTALLINE SILICA Quartz (mg/M_3)	CRYSTALLINE SILICA Cristobalite (mg/M_3)	Coal Dust (mg/M_3)
2375	Tripper Deck	Coal Handler	7:40 AM- 3:10 PM	*	*	0.2
2347	Outside Coal Handling	Coal Handler Helper	8:10 AM- 3:00 PM	*	*	0.2
2387	Outside Coal	Coal Handler	8:05 AM-12:50 PM	0.06	*	0.8
			EVALUATION CRITERIA	0.05	0.05	2.0
			LABORATORY LIMIT OF DETECTION	0.03 mg/sample	0.03 mg/sample	---

* = below laboratory limit of detection

TABLE II

BREATHING ZONE AIR CONCENTRATION OF
TOTAL COAL DUST

Colorado-Ute Electric Association
Hayden, Colorado

March 21, 1978

Sample Number	Location	Job Classification	Time of Sample	Total Coal Dust (mg/M_3)
118	Outside Coal Handling	Coal Handling Operator	8:05 AM-12:50 PM	2.6
65	Outside Coal Handling	Coal Handling Helper	8:10 AM- 3:00 PM	1.4
66	Tripper Deck	General Room	8:30 AM- 2:00 PM	1.2
63	Conveyor	General Room	10:20 AM- 3:00 PM	15.0
			EVALUATION CRITERIA	10.0 1/

1/ = the nuisance dust TLV of 10 mg/M_3 was used, since these were not respirable samples

TABLE III

BREATHING ZONE AIR CONCENTRATIONS OF
TOTAL COAL DUST

Colorado-Ute Electric Association
Nucla, Colorado

March 22, 1978

Sample Number	Location	Job Classification	Time of Sample	Total Coal Dust (mg/M_3)
61	Basement	Equipment Operator	8:12 AM- 2:30 PM	0.7
115	"	Bag House Cleaner	8:28 AM- 3:02 PM	0.5
111	"	Utility	8:17 AM- 9:20 AM	56.0
64	"	"	8:20 AM- 2:25 PM	64.0
117	"	"	8:30 AM-12:00 noon	39.0
60	"	"	12:30 PM- 2:30 PM	1.6
			EVALUATION CRITERIA	10.0 1/

1/ = the nuisance dust TLV of 10 mg/M_3 was used, since these were not respirable samples

TABLE IV

BREATHING ZONE AIR CONCENTRATIONS OF
FLY ASH

Colorado-Ute Electric Association
Nucla, Colorado

March 22, 1978

Sample Number	Location	Job Classification	Time of Sample	Fly Ash (mg/M_3)
110	Outside Coal Handling	Bag House Cleaner	8:20 AM-2:25 PM	1.7
59	" " "	Coal Handler	8:17 AM-9:20 AM	83.0
			EVALUATION CRITERIA	10.0

TABLE V

BREATHING ZONE AIR CONCENTRATIONS OF
RESPIRABLE CRYSTALLINE SILICA (QUARTZ & CRISTOBALITE)
AND RESPIRABLE COAL DUST

Colorado-Ute Electric Association
Nucla, Colorado

March 22, 1978

Sample Number	Location	Job Classification	Time of Sample	CRYSTALLINE SILICA		Coal Dust (mg/M_3)
				Quartz (mg/M_3)	Cristobalite (mg/M_3)	
2380	Basement	Equipment Operator	8:12 AM-2:30 PM	0.1	*	---
			EVALUATION CRITERIA	0.05	0.05	2.0
			LABORATORY LIMIT OF DETECTION	0.03 mg/sample	0.03 mg/sample	---

* = below laboratory limit of detection

TABLE VI

BREATHING ZONE AIR CONCENTRATIONS OF
TOTAL COAL DUST

Colorado-Ute Electric Association
Montrose, Colorado

March 23, 1978

Sample Number	Location	Job Classification	Time of Sample	Total Coal Dust (mg/M_3)
100	Ash Truck	Heavy Equipment Opr.	8:10 AM-3:00 PM	22.0
68	Coal Handling	Coal Handler	8:20 AM-2:45 PM	0.7
70	" "	" "	8:20 AM-2:45 PM	0.02
			EVALUATION CRITERIA	10.0

TABLE VII

BREATHING ZONE AIR CONCENTRATIONS OF
RESPIRABLE CRYSTALLINE SILICA (QUARTZ & CRISTOBALITE)
AND RESPIRABLE COAL DUST

Colorado-Ute Electric Association
Montrose, Colorado

March 23, 1978

Sample Number	Location	Job Classification	Time of Sample	CRYSTALLINE SILICA		Coal Dust (mg/M_3)
				Quartz (mg/M_3)	Cristobalite (mg/M_3)	
2381	Coal Handling	Coal Handler	8:07 AM-3:00 PM	0.14	*	3.0
			EVALUATION CRITERIA	0.05	0.05	2.0
			LABORATORY LIMIT OF DETECTION	0.03 mg/sample	0.03 mg/sample	---