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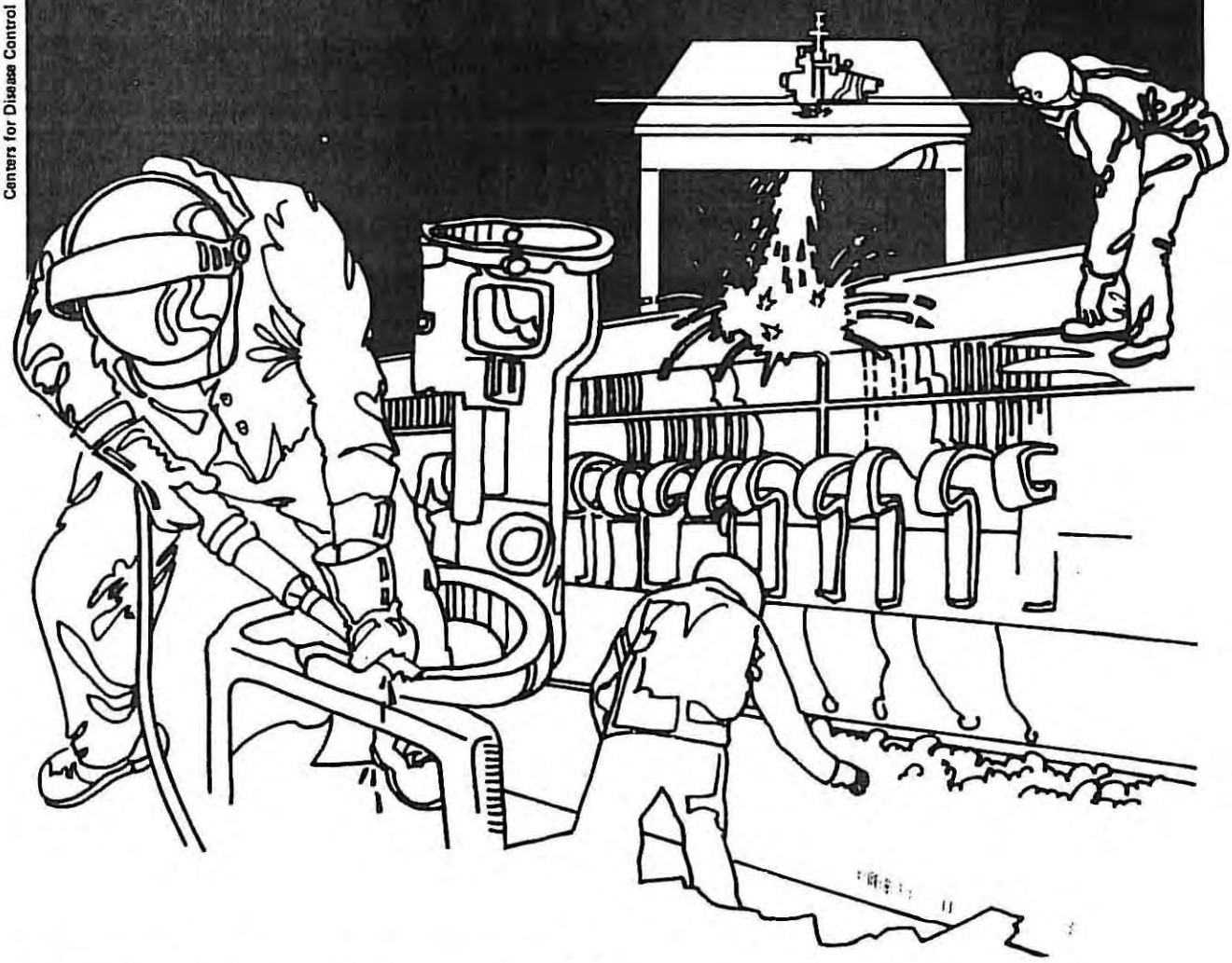

Health Hazard Evaluation Report

HETA 81-472-1380
PENNSYLVANIA POWER AND LIGHT
MARTINS CREEK STEAM
ELECTRIC STATION
MARTINS CREEK, PENNSYLVANIA

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from 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 Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial nygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

HETA 81-472-1380
OCTOBER 1983
PENNSYLVANIA POWER AND LIGHT
MARTINS CREEK STEAM ELECTRIC STATION
MARTINS CREEK, PENNSYLVANIA

NIOSH INVESTIGATORS:
Frank A. Lewis, I.H.

I. SUMMARY

In August 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from the International Brotherhood of Electrical Workers Local 1600 for a Health Hazard Evaluation at the Pennsylvania Power and Light Company's Martins Creek Steam Electric Station in Martins Creek, Pennsylvania. The union was concerned about potential health and explosion hazards to employees from coal dust in Units #1 and #2 and the coal field.

Personal air monitoring for respirable coal dust and % free silica was conducted on January 21, 1982 and non-directed medical interviews were given on October 15, 1981 and January 21, 1982. All five samples were within or at the recommended environmental criteria/standards used in this report. Respirable coal dust concentrations ranged from 0.3 to 1.8 mg/m^3 (evaluation criteria (ACGIH): 2.0 mg/m^3). Respirable quartz concentrations ranged from none detected (< 0.04 mg/m^3) to 0.05 mg/m^3 (evaluation criteria (NIOSH): 0.05 mg/m^3). One sample (for a boiler attendant/feeder operator) approached or possibly exceeded the NIOSH recommened criteria for respirable coal dust and quartz.

Medical interviews revealed no unusual or significant medical problems. At the time of the NIOSH survey, there was no precipitator clean-out nor asbestos removal activity at the plant. However, the company's written procedures, if followed, offer adequate protection to the employees.

Based on environmental studies conducted at the time of the survey, NIOSH has determined that a potential health hazard may have existed due to exposure to respirable coal dust and quartz. Recommendations were made to insure that potential health and explosion hazards are avoided in the future.

KEYWORDS: SIC 4911 (Electric Service) coal dust, respirable dust, respirable quartz, asbestos, explosivity.

II. Introduction

In August 1980, NIOSH received a health hazard evaluation request from the International Brotherhood of Electrical Workers Local 1600 for employees of the Martins Creek Power Plant, Martins Creek, Pennsylvania. On October 15, 1981, a NIOSH Regional Industrial Hygienist visited the Martins Creek Power Plant in order to determine whether the presence of coal dust in Units #1 and #2 and the coal field presents any health or explosion hazard to the employees.

The initial walk-through evaluation revealed no unusual amounts of coal dust in the air. However, accumulations of dust on the work surfaces and structural members indicate the build-up of dust over a period of time and/or large releases at points in time. This may present a housekeeping and dust problem if disturbed.

A letter (dated October 28, 1981) was sent to the company with recommendations to insure that potential health and explosion hazards are avoided and requesting that the company provide the following documents in order to thoroughly evaluate the plants' safety and health programs:

1. Air sampling data for coal dust (respirable and free silica (respirable) with % free silica in bulks
2. written respirator program
3. written housekeeping program
4. written emergency procedures in the event of a fire or explosion
5. written procedures for hot permit issuance for welding and cutting operations
6. written procedures/precautions for precipitator clean-out
7. written procedures for confined space entry
8. written maintenance schedule for equipment
9. any written engineering or process design changes planned to prevent health and explosion hazards
10. written medical surveillance program
11. asbestos insulation removal procedures/precautions.

These documents were provided to NIOSH as requested.

On January 21, 1982, NIOSH personnel re-visited the power plant in order to conduct air sampling (area and personal) throughout areas of concern for the purpose of determining the respirable coal dust and silica concentrations and the explosion potential of the dust.

In addition, the union (Local 1600 IBEW) requested on a separate request application that the following items be looked into:

1. exposure to toxic substances during clean-out of the precipitator
2. exposure to asbestos fibers from disturbance of other manipulations of the asbestos insulated pipes.

III. Background

This plant is engaged in the production of electricity. Coal (low sulfur content) is brought in by rail cars, unloaded to the crusher (2" sizing) house and is then conveyed to the tripper floor or to a pile for storage and then to the tripper floor.

It is then transferred for storage in silos and goes to the feeder floor and then to mill for further pulverizing (200 mesh). The powdered coal is blown into the boiler to produce steam which runs the generators to produce electricity. There are two boilers (#1 and #2) each with a pulverizing and feeder unit. Flyash is collected by an electrostatic precipitator and bottom ash is washed out with water and pumped to a settling basin.

Approximately two-hundred employees work at this facility including mechanical maintenance, electrical maintenance and operations and construction personnel. Employees (approximately 18) that would be potentially exposed to health and/or explosion hazards include the following job categories: Boiler Attendants, Feeder Operators, Tripper Floor Operators, Ash Equipment and Mill Operators and Maintenance Personnel.

Airborne dust conditions reportedly occurred because of the following situations (individually or in combination):

1. spills in the mill room because of false indication on mill level lines
2. during filling of the silos and the start up of the conveyor belt on the tripper floor
3. emissions from the boiler feed pumps in the pump room
4. "holes" in the pulverizer and empty silo conditions on the feeder floor
5. electrostatic precipitator clean-out.

Dusts of coal and flyash accumulate on the rafters and equipment. Any disturbance (e.g. hitting air cannon/coal valves on feeder floor with sledge hammer) may cause the dusts to become airborne once again.

The company medical surveillance program consists of chest x-ray, pulmonary lung function test and audiometric testing.

Respirators (single-use/throw-away are worn during a spill or spill clean-up and are sometimes worn if conditions call for it.

The company's housekeeping schedule calls for a hosing down of the mill rooms annually and to vacuum the feeder floor and mill room area during every annual overhaul. The crusher house is done on an as needed basis.

The electrostatic precipitator is washed down internally during every annual outage of the units. Employee entry is made under the control of a Tag and Permit system. During clean-up operations employees are required to use eye and respiratory protection (SCBA).

The company's procedures and precautions for the installation of non-asbestos type insulation and the removal of asbestos insulation are adequate and include the OSHA requirements from 1910.93 and 1910.1001.

At the time of the NIOSH survey, there was no precipitator clean-out or asbestos removal activities on the plant premises.

IV. Evaluation Methods

A. Environmental[1]

Coal dust and free silica - five personal air samples were evaluated by collecting the coal dust on pre-weighed mixed cellulose ester 37 mm diameter membrane filters, preceded by 10 mm diameter cyclones using personal air sampling pumps at 2.0 liters per minute. The respirable coal dust samples were analyzed using standard gravimetric techniques. The free silica (quartz) contents of the coal dust samples were determined by x-ray diffraction using NIOSH Method P&CAM 259.

The samples were taken on job operations that were observed or were reported to be those where coal dust exposures are possible (continuously or through circumstance).

B. Medical

Non-directed medical interviews were given to twelve employees representing job operations where coal dust exposures are present or where reports of exposures have occurred because of leaks, spills or clean-up activities. These job operations include boiler and feeder operators, and equipment and mill operators, tripper floor operators and crusher operators (although time in crusher area is minimal and respirator is used).

V. Evaluation Criteria

A. Environmental*

The sources of environmental evaluation criteria considered for this study were:

1) NIOSH criteria documents or other recommendations; 2) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values for 1981; and 3) U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) federal occupational health standards. The environmental criteria judged most appropriate for this study, and the OSHA legal standards are as follows:

Substance	Environmental Criteria (mg/m^3)	OSHA Standard[2] (mg/m^3)
Respirable Coal Dust (less than 5% quartz)	2 (ACGIH)[3]	2.4
Respirable Quartz	0.05 (NIOSH)	2.1

*These criteria are based on time weighted average (TWA) exposures for a normal 8-10 hour workday of a 40 hour work week.

B. Toxicology

Coal dust[4] - Simple coal workers' pneumoconiosis has no clinically distinguishing symptoms (almost all miners have a slight cough and blackish sputum, which is of no help in establishing whether or not the disease is present). Simple CWP is diagnosed according to the number of small opacities present in the chest film; the small opacities may be linear (irregular) or rounded (regular). Simple CWP often occurs concomitantly with chronic bronchitis and emphysema.

Any opacity greater than 1 cm in diameter in a coal miner is classified as complicated pneumoconiosis or progressive massive fibrosis, unless there is evidence to suggest another disease, such as tuberculosis. Complicated pneumoconiosis is associated with a reduction in ventilatory capacity, low diffusing capacity, abnormalities of gas exchange, low arterial oxygen tension, pulmonary hypertension, and premature death; it may appear several years after exposure has ceased and may progess in the absence of further dust exposures.

C. Explosivity[5]

Dust explosion test data from MSHA (Mine Safety and Health Administration) indicates that the minimum explosion concentration for bituminous or anthracite coal from Pennsylvania is 55 grams/m^3. Only a large leak/spill or deluge of coal dust could set up such a concentration at the study site. Recommendations have been made in a previous interim report and repeated in this final report to help prevent such conditions from occurring.

VI. Results and Discussion

A. Environmental

Respirable Coal Dust and Free Silica - Table I summarizes the results of the January 21, 1982 personal air sampling for respirable dust and free silica. Since the quartz content of the samples was less than 5% (four samples had none detected and one sample had 2.8% free silica as quartz), the ACGIH recommendation of 2.0 mg/m^3 is used as the survey evaluation criteria. The respirable coal dust concentration results ranged from 0.31 to 1.82 mg/m^3. All samples were within the ACGIH criteria (2.0 mg/m^3) and the OSHA standard (2.4 mg/m^3). The free silica or quartz content of the respirable dust ranged from none detected ($<$0.04 mg/m^3) to 0.05 mg/m^3. The samples were within or at the NIOSH recommendation of 0.05 mg/m^3 and none exceeded the OSHA standard of 2.1 mg/m^3. The sample result just at the NIOSH criteria of 0.05 mg/m^3 represents the boiler/feeder operator #2 in terms of two employees. The original operator had to leave (after approximately two hours) and another operator took over his work. The air sampling equipment was transferred from one to the other to evaluate the job operation.

B. Medical

The twelve interviews did not reveal any unusual or significant health problems. The major concerns however, were with occasional spills, or leaks that have lead to "dusty" conditions aforementioned in this report (III Background) and the associated health (respiratory) and safety (explosion/fire) problems.

Previous air sampling by the Pennsylvania Power and Light Company (12/79-2/80 and the Pennsylvania Department of Environmental Resources (4/73-6/73) also revealed that employees' exposures to coal dust and free silica were less than the environmental criteria (2.0 mg/m^3 - TLV for respirable coal dust).

However, based upon the NIOSH industrial hygienist's survey, visual observations and in keeping with good industrial hygiene practices, the recommendations issued October 28, 1981 are reissued in this final report and concur with recommendations previously made by Pennsylvania Department of Environmental Resources (letter to PP&L dated August 29, 1973).

VII. Recommendations

The following recommendations are reissued to insure that potential health and explosion hazards are avoided:

Housekeeping

1. Establish and maintain the highest order of housekeeping to prevent accumulation of combustible dusts. Even with well designed dust-tight equipment, small quantities may escape and present a serious hazard unless removed at frequent intervals.

2. Eliminate rough surfaces and ledges to minimize surfaces upon which dust might accumulate.

3. Remove dust accumulations by: (a) vacuum cleaning. If frequent cleaning is needed, central vacuum cleaning systems may be used to advantage. (b) Soft push brooms to remove light accumulations of combustible dust. Conveniently placed pneumatic collector openings near floor level and exhausting through refuse dust collectors are recommended. (c) Continuous suction at processes such as grinding, pulverizing and dumping, transfer points in conveying systems, and at other locations where large quantities of dust are liberated at frequent intervals. Convey the dust to safely located refuse-dust collectors.

4. Do not blow down dust accumulations with compressed air. If this must be done, it should be frequent enough so that blown dust is below the lower explosive limit.

5. Connect equipment exhaust ducts to a suitable collector.

6. Operate equipment under a slight negative pressure to prevent dust leakage outside of equipment.

7. Establish a preventative maintenance program to detect and correct deviations from the above.

Control of Ignition Sources

1. Prohibit open flames and smoking.

2. Permit no cutting or welding unless the vicinity is completely free of dust and other combustibles. Use non-combustible covers for combustibles, which cannot be removed. Use the welding permit system.

3. Use either dust-tight or intrinsically safe electrical equipment suitable for Class II, Division 1 or 2 occupancies as outlined in Art 500 of the National Electrical Code (see Data Sheets 5-1 and 5-7S) where required, or locate switches, motors, and other spark-producing equipmemt outside the combustible dust area. Interiors of equipment are Division 1 location.

4. Ground and bond all equipment to prevent accumulation of static electricity.

5. Guard against spontaneous heating of the product. Do not allow materials subject to spontaneous heating to accumulate in ductwork or equipment. Do not allow moisture to come in contact with such material. Collectors handling residues that are subject to spontaneous heating should be cleaned daily or as needed to prevent heating and hazardous accumulations.

6. Industrial lift trucks should be as recommended for Class II, Divison 1 or 2 locations.

Education

A continuous fire and explosion prevention program should be particpated in by both management and employees. In large plants such a program should be organized and supervised by the plant protection organization. The program should include instruction of new employees in the hazards of their departments, in the precautions to be followed, and in utilization of the protective equipment provided. Periodic refresher programs for employees should be provided. Weekly inspections of plant fire protection equipment and of factors affecting fire safety are necessary. A plant fire brigade should be organized and drilled in emergency procedures.

VIII. References

1. National Institute for Occupational Safety and Health. NIOSH Manual of Sampling Data Sheets. Cincinnati, Ohio: National Institute for Occupational Safety and Health, 1977. (DHEW NIOSH Publication #77 159).

2. Occupational Safety and Health Administration. OSHA Safety and Health Standards 29 CFR 1910.1000. Occupational Safety and Health Administration, Revised 1980.

3. American Conference of Governmental Industrial Hygienist. Threshold Limit Values of Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1981. Cincinnati, Ohio; ACGIH, 1981.

4. Chemical Hazards of the Workplace, Proctor & Hughes, Lippincott Co., Philadephia, PA 1978.

5. Factory Mutual System, Loss Prevention Data, Combustible Dusts, Page 59, August, 1976.

IX. Authorship and Acknowledgements

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Originating Office:	Hazard Evaluations and Technical Assistance Branch Division of Surveillance, Hazard Evaluation and Field Studies
Report Typed By:	Mary R. Tomassini, Secretary

X. Distribution and Availability of Report

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from the NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. Martins Creek Steam Electric Station
2. IBEW Local 1600
3. NIOSH Regon III
4. OSHA Region III

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

TABLE I

Results of Personal Air Sampling for Respirable Coal Dust

Martins Creek Steam ELectric Station
Martins Creek, Pennsylvania

January 21, 1982

Job Operation	Sampling Time (minutes)	Respirable Coal (mg/m^3)[a]	Respirable Quartz (mg/m^3)[a]
Boiler Attendant #1 and Feeder Operator	418	0.31	N.D. [b]
Boiler Attendant #2 and Feeder Operator	423	1.82	0.05
Ash Equipment and Mill Operator #1 & 2	425	0.48	N.D.
Ash Equipment and Mill Trainee #1 & 2	413	0.44	N.D.
Tripper FLoor Operator	387	0.50	N.D.
Evaluation Criteria		2.0 (ACGIH)	0.05(NIOSH)
OSHA Standard		2.4	2.1[c]

a- Milligrams per cubic centimeter; time-weighted average based on 8-hr. exposure.

b- N.D. (None Detected), <0.04 mg/m^3.

c- $\frac{10}{\%SiO_2+2} = \frac{10}{2.8\%+2} = 2.1$ mg/m^3 (PEL is based upon the % free silica (SiO_2) found in the respirable dust)