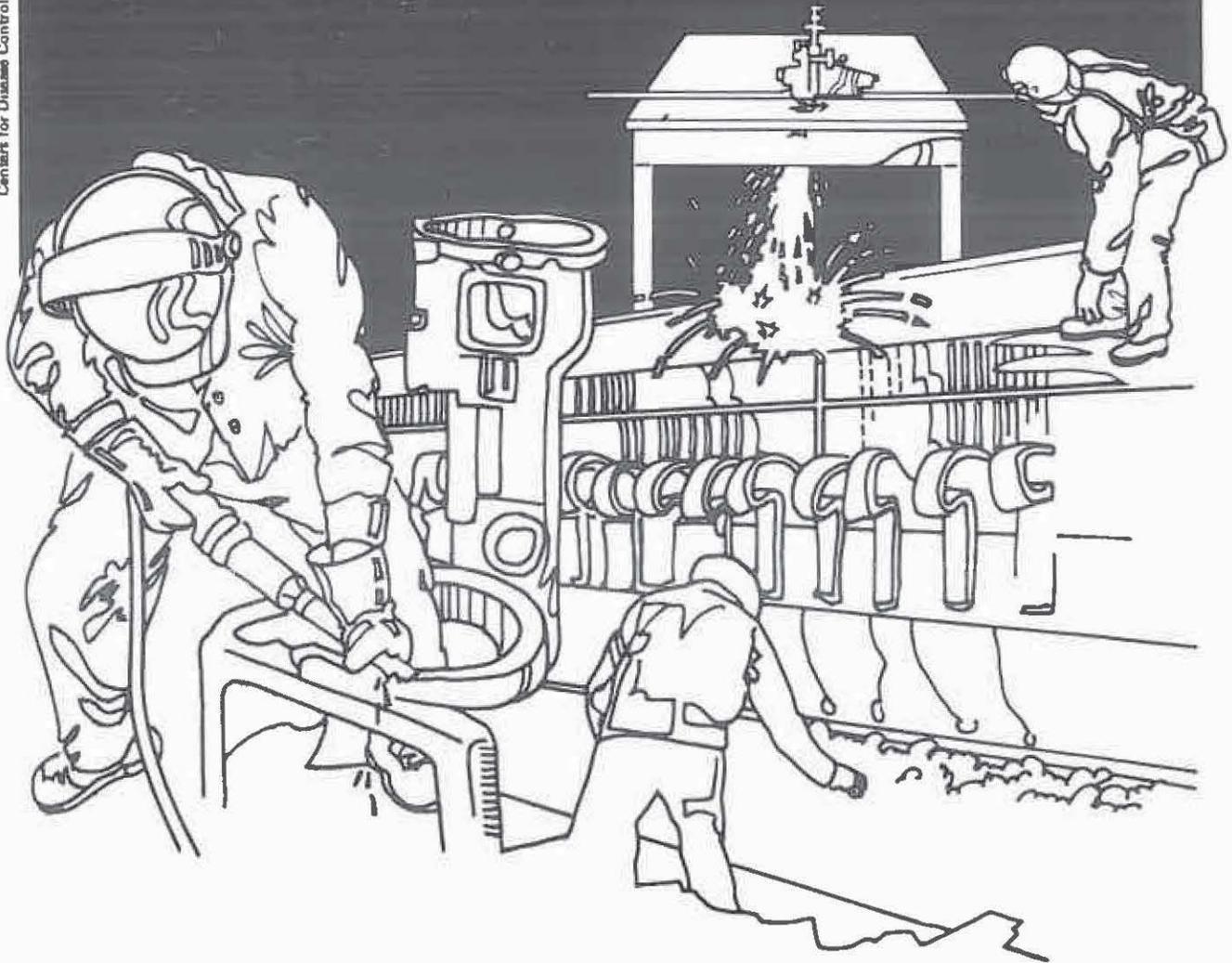


NIOSH



Health Hazard Evaluation Report

HHE 80-122-921
PORT OF SACRAMENTO
SACRAMENTO, CALIFORNIA

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 hygiene 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.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HE 80-122-921
July 1981
Port of Sacramento
Sacramento, California

NIOSH INVESTIGATORS:
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I. Summary

On May 2, 1980 the National Institute for Occupational Safety and Health received a request for a health hazard evaluation from the International Longshoremens' and Warehousemen's Union, Local 17, at the Port of Sacramento, Sacramento, California. The requestor was concerned that the employees working at the Port of Sacramento may be exposed to coke dust and fertilizers while transferring bulk material.

On May 13, 1980 NIOSH conducted an environmental and medical survey of the bulk storage facilities and the fertilizer bagging operation. A follow-up environmental survey was conducted November 25-26, 1980. No free silica (quartz or cristobalite) or polynuclear aromatics residue were detected in bulk samples of coke dust. Thus, the coke dust was treated as a nuisance dust. Twenty personal breathing zone air samples were collected for total nuisance dust while operators unloaded rail cars. Four personal breathing zone air samples were collected from the track mobile operators. These air sample concentrations ranged from 0.12 to 2.7 mg/m³ (milligrams of contaminant per cubic meter of air). None exceeded the California-Occupational Safety and Health Administration standard of 10 mg/m³. Twenty dust air samples were collected from workers while opening car doors to unload coke. These dust air sample concentrations ranged from 0.06 to 278 mg/m³; however no overexposures were presumed to have occurred because workers wore protective equipment (half mask respirator, paper coveralls, gloves, and astrogoggles) and replaced respirator dust cartridges whenever resistance to breathing occurred. Also most of these air sample concentrations are peak exposures which occur while opening rail car doors.

No environmental air sampling was conducted while employees worked in the warehouse because coke handling in the warehouse is infrequent and scheduled on short notice. Medical interviews were conducted with several employees who handle coke and fertilizers. Coke handlers working in the warehouse and at the rail car unloading facility complained of difficulty breathing and nausea. Fertilizer handlers complained of eyes, nose and/or throat irritation when bulk loading and bagging.

On the basis of these evaluations, NIOSH has determined that employees unloading rail cars were not overexposed to coke dust on the dates of this survey because exposures are short term. The complaints of difficulty breathing and nausea among coke handlers working in the warehouse appear to be related to plugging of the respirator dust cartridge caused by high particulate concentrations in the air rather than to any direct effect of the coke. The bulk fertilizer handlers experienced significant irritation of the eyes and upper respiratory tract which varies with different fertilizers. However, it is believed that all of these irritative effects can be controlled. Recommendations are listed on page 6.

KEYWORDS: SIC 9999 (bulk storage facilities) coke, fertilizers, hydroprils, ammonium sulfate, calcium nitrate, ferrous sulfate.

II. INTRODUCTION

On May 2, 1980 the National Institute for Occupational Safety and Health (NIOSH) received a request for a health hazard evaluation from an authorized employee representative of the International Longshoremen's and Warehousemen's Union, (Local 17) San Francisco, California. The requestor was concerned that employees working at the Port of Sacramento, California may be exposed to coke dust and fertilizers. The coke handlers experienced difficulty breathing and nausea when loading coke in the warehouse or off-loading coke from railcars; the maintenance men experienced similar symptoms when cleaning the dust hoppers. Several workers experienced irritation of the eyes, nose or throat when handling the fertilizers. On May 13, 1980 NIOSH conducted an environmental and medical survey of the bulk storage facilities and the fertilizer bagging operation. A follow-up environmental survey was conducted on November 25-26, 1980 to determine workers' exposures to total nuisance dust. An interim report was forwarded to the requestor and employer on July 8, 1980.

III. BACKGROUND

The Port of Sacramento, a subdivision of the State of California Port district, has been in operation since 1963.

The Port is designed to handle bulk storage and shipment of coke, fertilizers, wood chips, etc. Much of the material is handled using payloaders and a conveyor system. Work at the Port is seasonal and the work force may range from 29-60 employees. Workers are provided goggles, protective face creams, half mask respirators, gloves, and disposable cover-alls depending on their job.

Approximately twenty days per year are spent handling coke. Coke is either unloaded from rail cars and conveyed to the ship or the warehouse. Bulk unloading of cars is typically a three shift, three day operation requiring four to six employees per shift. Transfer of coke from the warehouse to the ship is accomplished with the use of payloaders. Three employees operate payloaders for half an hour and they are relieved for half an hour in order to replace their clogged respirator cartridges and pads. Thus, an employee works in the warehouse about four hours per day.

A number of fertilizers are unloaded, stored and reloaded for transportation. These include: Hydrophrils (3 types), ammonium sulfate, calcium nitrate and ferrous sulfate. Most fertilizer bulk storage areas are only partly enclosed. Respirators are made available to all employees working at the bagging operation or the bulk warehouse.

IV. HAZARD EVALUATION DESIGN

A. Evaluation Criteria

Occupational exposure criteria have been developed to evaluate a worker's exposure to chemical substances. Two sources of criteria were used to assess the work area concentrations: (1) American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV), and (2) California - Occupational Safety and Health Administration (Cal-OSHA) standards. These values represent concentrations to which it is believed that nearly all workers

may be exposed for an 8 hour day, 40-hour work week throughout a working lifetime without experiencing adverse health effects.

<u>Substance</u>	<u>8-Hour Time-Weighted Average Permissible Exposure Limit</u>
Total Nuisance Dust.....	10 mg/m ³ * (ACGIH and Cal-OSHA)

mg/m³ - Milligrams of a substance per cubic meter of air.

B. Toxicological Effects

1. Coke Dust - The coke handled at the Port of Sacramento during the dates of the survey is considered to be a nuisance dust based on laboratory analyses of several bulk samples. Nuisance dust is characterized as having little adverse effects on the lungs and does not produce significant organic disease or toxic effect when exposures are kept under reasonable control. Excessive concentrations of nuisance dust may reduce visibility, cause deposits in the eyes, nose or ears, or cause skin or mucous membrane irritation by chemical or mechanical action.
2. Fertilizers - No detailed information is available regarding the toxicity of ammonium sulfate, calcium nitrate or ferrous sulfate and limited toxicological information is available for hydroprills. The irritant ingredient of hydroprills is potash (potassium carbonate). Workers exposed to these fertilizers complained of nose or throat irritation and in some cases a mild amount of nausea.

C. Materials and Methods

1. Environmental

Twenty-four personal breathing zone air samples were collected for total nuisance dust using a polyvinyl chloride filter and a MSA vacuum pump operating at a flowrate of 1.5 liters per minute. The total weights were determined by weighing the samples plus the filters on an electro-balance and subtracting the previously determined tare weights of the filters.

One bulk sample was analyzed for polynuclear aromatic hydrocarbons. An aliquot of the bulk was dissolved in acetonitrile, filtered, evaporated and injected onto the Vydac 201 reverse phase column.

One bulk sample was analyzed for free silica (quartz and cristobalite) using NIOSH Physical and Chemical Analytical Method 259 (modified).

2. Medical

NIOSH medical and industrial hygiene staff conducted a walk through survey of the bulk storage facilities and the fertilizer bagging operation. Informal interviews were conducted with several coke and fertilizer handlers who were asked about symptoms they had experienced.

V. RESULTS

A. Environmental

No free crystalline silica or polynuclear aromatics were detected in bulk samples of coke.

Twenty-four environmental air samples (Table I) were collected for coke dust from two areas: The track mobile operators and workers opening car doors. Four samples collected from the track mobile operators ranged from 0.12-2.74 mg/m³. None of these samples exceeded the Cal-OSHA standard of 10 mg/m³. The twenty samples, collected during car door opening, ranged from 0.06-278 mg/m³, but no overexposures were presumed to have occurred because the employees wore goggles, gloves, disposable overalls, and half-mask respirator, and respirator cartridges were replaced whenever resistance to breathing occurred. Also, coke dust exposures are peak (2-3 minute) exposures occurring while opening rail car doors. The workers normally stand away from the cars once the doors are opened. Environmental air samples were not collected from all coke handling areas because coke is not handled routinely and shipments are unscheduled. Equipment operators driving payloaders in the warehouse and maintenance workers cleaning the dust hoppers experienced more breathing difficulties during these operations when unloading coke. Two of the three original payloaders were not enclosed; thus workers would work for one half hour before being relieved by their alternates in order to replace their respirator cartridges. Since this request, two more enclosed payloaders have been purchased, but workers are still wearing half mask respirators.

No environmental air sampling was conducted for fertilizers (ammonium sulfate, calcium nitrate, ferrous sulfate, or potassium carbonate) because there are no specific air sampling and analytical methods. Furthermore there are no health standards or evaluation criteria, and there is limited toxicological data for these substances. Since workers experienced irritative symptoms which vary with the fertilizers handled, the NIOSH Measurement Research Branch is being requested to develop air sampling and analytical methods for these specific fertilizers so that health problems and air levels can be documented and a new appropriate criteria can be developed. The NIOSH investigators believe that the fertilizer handlers' irritative symptoms can be controlled if workers wear the proper protective equipment recommended on page 6.

B. Medical

1. Medical Testing

The work force consists of approximately 29 full-time employees, and a varying number of casual employees. At the time of the investigation there were approximately 60 casual employees working in the port. No regular medical testing is performed on any of the employees and those complaining of medical problems are referred to a local clinic.

2. Bulk Warehouse Area

The bulk warehouse workers complained of difficulty in breathing and occasional nausea when handling coke. The difficulty in breathing was experienced during the last ten minutes of the one-half hour-shift which

each operator spent on the payloaders. This is probably caused by plugging of the respirator filters with coke dust. After the workers were relieved and left the area, none of them experienced difficulty in breathing until they re-entered the work area.

3. Wood Chip Area

The workers had no complaints of health problems associated with the wood chip area.

4. Fertilizer Warehouse

The workers experienced various irritant symptoms depending upon which fertilizer was being handled. The fertilizer handled by workers included:

a) Hydroprils

These are said to be the dustiest of the fertilizers. All hydroprils (3 types) are a combination of potassium, nitrogen and potash. The workers complain that all of these are irritating to their eyes, and to varying extents to the nose and throat. Hydropril Number 21-7 was felt to be the most irritating.

b) Ammonium Sulfate

The workers handling this fertilizer complained of mild irritation and some nausea.

c) Calcium Nitrate

The workers complained of the extreme irritation and drying effects of this fertilizer. One worker complained of chest tightness after handling this for several hours, and several workers complained of burning in their noses and throats.

d) Ferrous Sulfate

Although this was handled less frequently than the other fertilizers, there were a greater number of complaints of eye and nose irritation including several nose bleeds, and a mild amount of nausea. These fertilizers are handled on a markedly varied schedule. The workers expressed variation in the strength of their irritation and other reactions.

VI. CONCLUSION

On the basis of the survey, NIOSH has determined that employees were not over-exposed to coke dusts based on the time weighted average exposure concentrations and employees work procedures. Workers complaints of difficulty in breathing appeared to be related to the respirator being clogged. A significant health problem (irritation and occasional nausea) was found as a result of handling fertilizers. Consequently, the NIOSH Measurement Research Branch is being requested to develop air sampling and analytical methods in order to document exposure levels and irritative effects. It is believed that the workers irritative symptoms can be controlled with the use of protective equipment recom-

mended in the following section.

VII. RECOMMENDATIONS

- (1) The company should institute a formal respirator program in accordance with the Occupational Safety and Health Act (OSHA) requirements outlined in 29 CFR Part 1910.134. The respirators program should include the following: proper respirator selection, training and education of the user, fit testing, maintenance of equipment, proper and adequate storage, periodic inspection, surveillance of work area condition, periodic inspection of program to determine continued effectiveness and medical determination of user.
- (2) All workers (payloaders and baggers) handling fertilizers should wear dust respirators, goggles and gloves.
- (3) The company should conduct dust sampling inside the enclosed payloaders to determine respirable dust concentration.
- (4) Fertilizer air sampling should be conducted as soon as sampling and analytical methods are developed.
- (5) Engineering controls at the fertilizer bagging operation should be periodically checked to assure proper collection of dust.

VIII. REFERENCES

1. Documentation of Threshold Limit Values, American Conference of Governmental Industrial Hygienists, 4th Edition, Cincinnati, Ohio 1980.
2. NIOSH Manual of Sampling Data Sheets, 1977 ed., DHEW (NIOSH) Publication No. 77-159.
3. NIOSH Manual of Analytical Methods, Volume I, DHEW (NIOSH) Publication No. 77-157A.
4. NIOSH Manual of Analytical Methods, Volume III, DHEW (NIOSH) Publication No. 77-157C.

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X. DISTRIBUTION AND AVAILABILITY OF REPORT

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), 5285 Port Royal Road, Springfield, Virginia, 22151. 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. International Longshoremen's and Warehousemen's Union, Local 17.
2. Port of Sacramento.
3. California - Occupational Safety and Health Administration.
4. U.S. Department of Labor, Region IX.

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

TABLE I

Personal Breathing Zone Air Samples For
Total Nuisance Dust (Coke Dust)

Port of Sacramento
Sacramento, California
November 25-26, 1980

HE 80-122

<u>Job Description or Location</u>	<u>Sampling Periods (Minutes)</u>	<u>Sampling Volume (liters)</u>	<u>Concentration (mg/m³)¹</u>
Workers opening car doors	89	120	85.4
Workers opening car doors	90	135	16.2
Workers opening car doors	200	300	4.9
Workers opening car doors	145	218	29.2
Workers opening car doors	195	293	11.6
Workers opening car doors	70	105	40.8
Workers opening car doors	90	135	11.7
Workers opening car doors	160	240	0.06
Workers opening car doors	110	165	17.9
Workers opening car doors	170	255	6.6
Workers opening car doors	70	105	19.5
Workers opening car doors	45	68	278
Workers opening car doors	60	90	98.7
Workers opening car doors	30	45	19.6
Workers opening car doors	90	135	14.7
Workers opening car doors	185	223	10.2
Workers opening car doors	65	98	0.92
Workers opening car doors	185	278	216
Workers opening car doors	125	188	14.3
Workers opening car doors	70	105	3.6
Track Mobile Operator	375	563	0.12
Track Mobile Operator Relief Man	320	481	2.74
Track Mobile Operator	375	563	0.91
Track Mobile Operator Relief Man	145	218	0.64

(1) mg/m³- milligrams of contaminant per cubic meter of air.

Evaluation Criteria

Cal-OSHA- 10mg/m³, 8-hour time weighted average.