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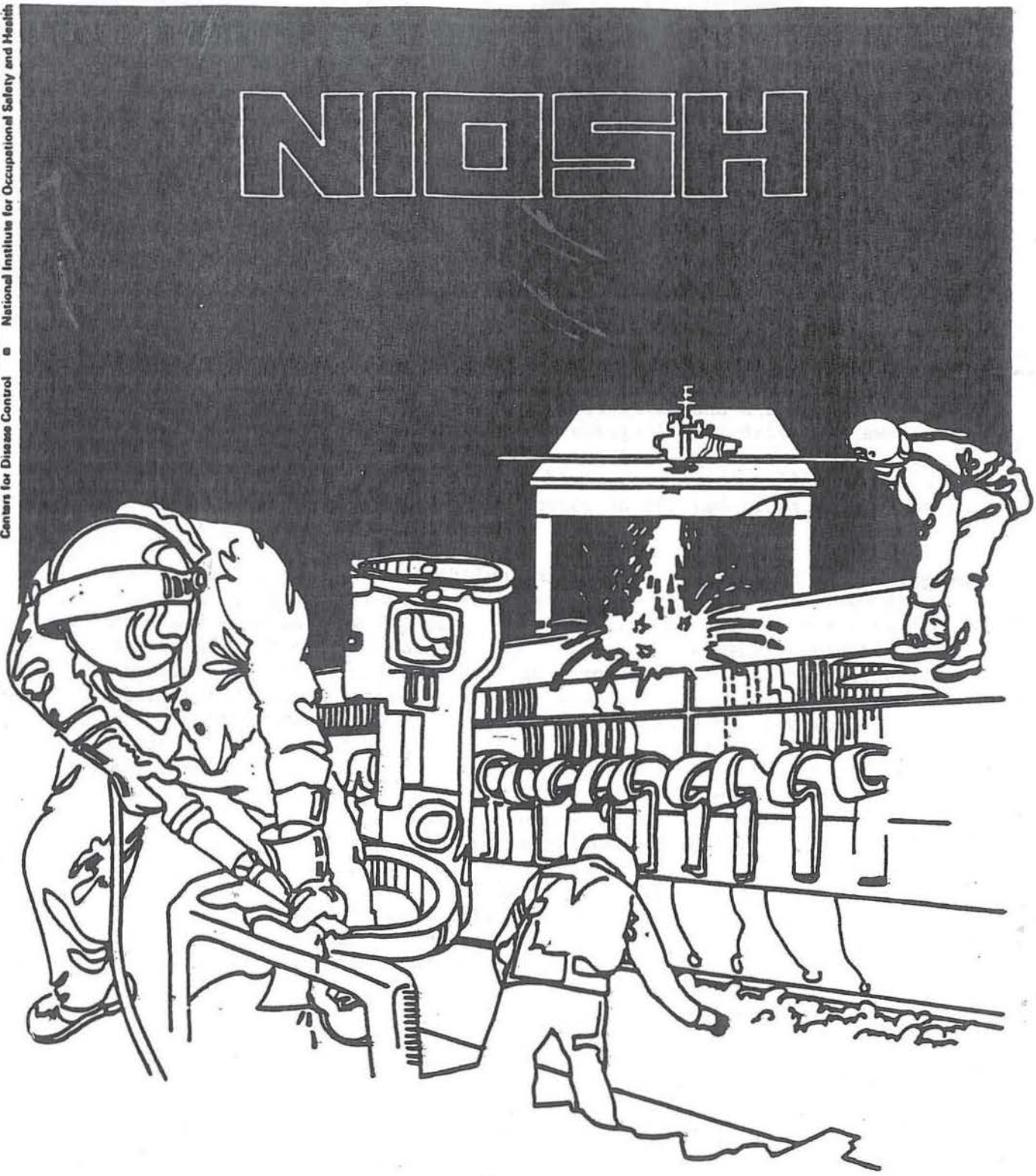

Health Hazard Evaluation Report

HETA 85-455-1724
CHAMPION INTERNATIONAL
FRENCHTOWN, MONTANA

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.

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CHAMPION INTERNATIONAL
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I. Summary

In July of 1985, the National Institute for Occupational Safety and Health (NIOSH) received a request from Hellgate Local 885, of the United Paperworkers International Union in Missoula, Montana to evaluate exposures to crystalline silica, lead and total particulate in the waste fuel and hog fuel boiler areas at the Champion International paper mill located in Frenchtown, Montana.

On September 23, 24, 1985, a NIOSH investigator and a State of Montana industrial hygienist, conducted an investigation to determine exposures to crystalline silica, total particulate, lead and chromium. A bulk sample of gasket material was also obtained for qualitative identification of asbestos. Each worker in the two furnace areas were informally interviewed.

The day shift was the most active and was the shift monitored during this evaluation. Nine personal breathing zone air samples and seven general room air samples were collected and analyzed for quartz, cristobalite, and total particulate. Six of the 15 air samples were respirable samples. Five of the six respirable samples were below the detection limits of 0.015 mg/sample for quartz and cristobalite. One sample had a cristobalite level of 0.03 mg/M3. The respirable particulate levels ranged from 0.2 to 3.2 mg/M3 with an average concentration of 1.2 mg/M3. All respirable crystalline silica and total particulate samples were below the evaluation criteria and did not pose a health hazard. Ten total dust samples were collected and analyzed for quartz, cristobalite, and total particulate. All concentrations were below the evaluation criteria. Levels of total quartz ranged from less than 0.015 mg/sample to 0.5 mg/M3; the average was 0.02 mg/M3 . Cristobalite was found in only 1 of the total cristobalite samples; it was 0.04 mg/M3. All 16 air samples were analyzed for total particulate, one overexposure was observed. The average concentration for the respirable particulate samples was 0.9 mg/M3 with a high of 3.2 mg/M3 and a low of less than 0.01 mg/sample. The total particulate concentrations ranged from 0.2 to 11.0 mg/M3 and had an average of 4.12 mg/M3. The only overexposure observed during the survey was the 11.0 mg/M3 total particulate general room level observed in the vicinity of the air lock hopper. Three filter samples were analyzed for chromium and lead; all levels were below the laboratory limit of detection of 0.002 mg/sample. One bulk sample of gasket material was analyzed for asbestos and contained 50 to 60 percent

chrysotile asbestos. Bulk sample analyses of dust collected in the boiler area showed it contained 3.1 percent quartz and less than 0.75 percent cristobalite.

On the basis of environmental data and employee interviews, it is concluded that a potential health hazard existed from overexposure to total dust in the waste fuel boiler area. A hazard also existed from the installation of asbestos gasket material without proper safety and health measures. Workers who routinely perform work in this area should be provided respirators.

KEYWORDS: SIC 2621 paper mills, crystalline silica, lead, chromium, and asbestos.

II. INTRODUCTION

In July of 1985, the National Institute for Occupational Safety and Health (NIOSH) received a request from the Hellgate Local 885 of the United Paperworkers International Union whose members work at the Champion International plant in Missoula, Montana to evaluate exposures to crystalline silica and lead in the waste fuel and hog fuel boilers at this facility.

Results of the air samples were discussed with union and management in November 1985.

III. BACKGROUND

This facility is a paper mill. The specific areas of concern in this evaluation were the hog fuel and waste fuel boilers. The waste fuel boiler area is where large trucks filled with scrap (from logs such as bark and chips) are dumped and the scrap used as a fuel for the power plant, for the operation of the paper mill. These scraps are dirty and have some sand and dirt attached to the bark. The workers were concerned about possible exposure to silica and lead during the normal operation of the boilers. The hog fuel boiler burns sawdust and bark but was under renovation at the time of this evaluation. Some of the repair workers were monitored while repairing the hog fuel boiler.

IV. ENVIRONMENTAL DESIGN AND METHODS

All workers in the waste fuel boiler area were monitored for crystalline silica, and total particulate. Samples were collected on pre-weighted FWSB filters with and without cyclones. Vacuum pumps were used to collect the samples with flow rates of 1.7 and 2.0 liters per minute. Samples were analyzed according to NIOSH method 7500. Lead and chromium samples were collected on AA filters using vacuum pumps operated at 2.0 liters a minute. These samples were analyzed according to NIOSH method 173. Asbestos identification was performed using polarized light microscopy and dispersion staining techniques.

V. EVALUATION CRITERIA

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and 3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended exposure limits, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

	mg/M^3 Environmental Exposure Limits 8-Hour Time-Weighted Average (TWA)	
	NIOSH	OSHA
Quartz	0.05	$\frac{10\ mg/M^3}{\%SiO_2 + 2}$
Cristobalite	0.05	$\frac{10\ mg/M^3}{\%SiO_2 + 2}$
ASBESTOS	0.1	0.2
LEAD	0.05	0.05
Chromium	0.025	1.0
Total Particulate	5.0	1.5

B. Toxicology

Crystalline Silica[1,2] - Crystalline Silica, usually referred to as free silica, is defined as silicon dioxide (SiO_2) molecules arranged in a fixed pattern as opposed to a non-periodic, random molecular arrangement defined as amorphous silica. The three most common crystalline forms of free silica encountered in industry are quartz, tridymite, and cristobalite, with quartz being by far the most common of these. NIOSH, in its recommendations for a free silica standard, has proposed that exposures to all forms of free silica be controlled so that no worker is exposed to respirable airborne concentrations greater than 0.05 mg/M^3, as averaged over a 10 hour working day, 40 hour work week. This recommendation was designed to protect workers from silicosis, a pneumoconiosis due to the inhalation of silicon dioxide-containing dust. Exposures to free silica greater than one-half the recommended standard or "action level" should initiate adherence to the environmental, medical, labeling, recordkeeping, and worker protection guidelines as contained in Chapter 1 of the NIOSH criteria document, "Occupational Exposure to Crystalline Silica". The current federal or OSHA standard for respirable free silica exposure is an 8 hour time weighted average based upon the 1968 ACGIH TLV formula of 10 mg/M^3 divided by the percent SiO_2 plus 2 ($10mg/M^3/\%SiO_2+2$) for respirable quartz. One-half this amount was established as the limit for cristobalite and tridymite. As can be seen from the calculation, the OSHA regulation is based on the percentage of free silica contained in the respirable particulate exposure, whereas the NIOSH recommended standard applies directly to the airborne concentrations of respirable free silica.

Lead[3,4] - Inhalation (breathing) of lead dust and fume is the major route of lead exposure in industry. A secondary source of exposure may be from ingestion (swallowing) of lead dust deposited on food, cigarettes, or other objects. Once absorbed, lead is excreted from the body very slowly. Absorbed lead interferes with red blood cell production and can damage the kidneys, peripheral and central nervous systems, and the blood forming organs (bone marrow). These effects may be felt as weakness, tiredness, irritability, digestive disturbances, high blood pressure, kidney damage, mental deficiency, or slowed reaction times. Chronic lead exposure is associated with infertility and with fetal damage in pregnant women.

Blood-lead levels below 40 micrograms/deciliter (ug/dl) whole blood are considered to be levels which may result from daily environmental exposure. However, fetal damage in pregnant women may occur at blood-lead levels as low as 30 ug/dl. Lead levels between 40-60 ug/dl in lead exposed workers indicate excessive absorption of lead and may result in some adverse health effects. Levels of 60-100 ug/dl represent unacceptable elevations which may cause serious adverse health effects. Levels over 100 ug/dl are considered to be extremely dangerous and often require hospitalization and medical treatment.

The Occupational Safety and Health Administration (OSHA) standard for lead in air is 50 ug/M^3 calculated as an 8-hour time weighted average for daily exposure. However, blood lead and protoporphyrin levels must be monitored at least every 6 months for workers exposed to air-lead levels above 30 ug/M^3 for more than 30 calendar days per year, and at least every 2 months if the worker's last blood-lead was at or exceeded 40 ug/100 g whole blood. The standard also dictates that workers with blood lead-levels greater than 60 ug/100 g whole blood must be immediately removed from further lead exposure if confirmed by a follow up test. Workers have protection for wage, benefits, and seniority for up to 18 months or until they can return to lead exposure areas.

Free Erythrocyte Protoporphyrin (FEP) can be used to measure the degree of interference with hemoglobin production at the time the red cells are made. Although some diseases and iron deficiency anemia can cause a rise in FEP, in a healthy man working with lead, lead absorption is the most likely cause for such an increase. Further the FEP levels can be related to the average blood-lead concentration over the past 3-4 months (the average life span of a red cell).[3] Normal values are below 50 ug/dl. The relationship between lead exposure and FEP is not particularly evident until elevated FEP levels are found. FEP essentially measures the same thing as the zinc protoporphyrin (ZPP) called for in the OSHA standard. ZPP equals 1.3 times FEP.

Chromium[5] - The most toxic route of entry is by inhalation followed by percutaneous. Chrome (metal) is very corrosive and is a strong sensitizer. Perforation of the nasal septum is seen frequently. Adequate ventilation and frequent monitoring of the work environment is necessary to prevent overexposures. Neither eating nor smoking should be allowed in the work area. Workers sensitized should be removed from the work place.

Total Particulate[6] - Total Particulate (Nuisance Dust) in excess of the evaluation criteria may cause numerous complaints such as eye, nose, throat irritation. These symptoms may occur at levels less than the evaluation criteria of 10 mg/M^3.

Asbestos[7,8] - Asbestos is a generic term applied to a number of hydrated silicate minerals, including chrysotile, amosite, crocidolite, tremolite, and anthophyllite. The uses of asbestos are numerous and include thermal and electrical insulation, fire blankets, safety garments, filler for plastics, and roofing materials. The most toxic route of entry is inhalation.

Studies have conclusively shown the association between asbestos exposure and cancer and asbestosis in humans. Lung cancers and asbestosis have occurred following exposure to chrysotile, crocidolite, amosite, and fibrous anthophyllite. Malignant mesotheliomas and lung and gastrointestinal cancers have been shown to be excessive in occupationally exposed persons. Malignant mesothelioma is a rare tumor of the lining of the cavity of the chest or of the abdomen. Asbestosis is a diffuse interstitial fibrosis of the lung. The first symptom of asbestosis is usually increased breathlessness on exertion, sometimes associated with aching or transient sharp pain in the chest. The onset of symptoms is usually slow.

Data exists which indicates that the lower the exposure, the lower the risk of developing cancer. No evidence for a threshold or for a "safe" level of asbestos exposure exists.

The NIOSH recommended standard is intended to protect against asbestosis and to reduce to the lowest risk possible the probability of developing asbestos-induced cancers.

VI. RESULTS AND DISCUSSION

Nine personal breathing zone samples were collected for crystalline silica and total particulate; all samples were below the evaluation criteria. The highest concentration for respirable silica was 0.02 mg/M3. The bulk analyses of material workers were exposed to contained only 3.1 percent quartz and less than 0.75 percent cristobalite. These small percentages of crystalline silica combined with the low exposures indicate that there is no hazard from crystalline silica. The only sample showing an overexposure was a general room air sample for total particulate showing 11.0 mg/M3. All three samples collected for lead and chromium were below the

laboratory limits of detection of 0.002 (Pb) and 0.0015 mg/sample (Cr). The bulk sample taken for asbestos content contained 50 to 60 percent chrysotile asbestos. At the time of this survey workers did not know that the gasket material was asbestos and were not taking any precautions when removing the worn gaskets and replacing them with the new gasket material. Other than the asbestos contact exposure and the one general room air sample taken in the vicinity of the air lock hopper, all environmental air samples were well within the evaluation criteria. Results of air sampling may be reviewed in Table 1.

VII. Recommendations

1. All workers using the asbestos gasket material should be advised that it is asbestos and take the necessary safety and health precautions, such as respiratory protection and proper disposal of the old gasket material.

2. Substitution of a material for the asbestos gasket material that is non-asbestos would eliminate a health hazard.

3. Maintenance of the current noise protection program is necessary.

VIII. REFERENCES

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X. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 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. Champion International
2. U. S. Department of Labor/OSHA - Region VIII
3. NIOSH - Region VIII
4. Colorado Department of Health

For the purpose of informing 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.

Table 1

Breathing Zone and General Room Air Concentrations
of Quartz, Cristobalite, and Total Particulate
at Waste Fuel and Hog Fuel Boilers Located
at Champion International in
Frenchtown, Montana
October 1, 2, 1985

Sample #	Job	Location	Sampling Time	mg/M^3 Qrtz	Crbl	TP
5169	Waste Fuel	Waste Fuel Boiler	7:50a - 3:08p	0.15	*	4.3
5166	Gen Area	Waste Fuel Boiler	7:47a - 3:32p	*	0.04	3.5
5181	Gen Area	Ofc Waste Fuel Blr	7:45a - 3:36p	*	*	0.2
R5172	Mill Wright	Hog Fuel Boiler	8:07a - 3:14p	*	*	0.7
5170	Mill Wright	Hog Fuel Boiler	8:20a - 3:13p	0.4	*	8.9
5167	Mill Wright	Hog Fuel Boiler	8:22a - 3:24p	0.2	*	1.4
R5175	Pipefitter	Hog Fuel Boiler	8:27a - 2:00p	*	*	0.2
5164	Pipefitter	Hog Fuel Boiler	8:30a - 2:00p	0.1	*	2.7
R5183	Waste Fuel	Waste Fuel Boiler	8:15a - 2:40p	*	*	0.5
5184	Wst Fl Gen.	Control Room	8:17a - 3:41p	0.3	*	3.8
R5182	Hopper Gen.	Hopper Area	8:20a - 3:19p	*	*	1.0
R5179	Scrubber	Scrubber Area	8:27a - 3:20p	*	0.02	3.2
5178	Gen. Area	Air lock Hopper	8:30a - 3:25p	0.5	*	11.0
5185	Gen. Area	5th Floor Hopper	8:40a - 3:20p	*	*	4.6
5180	Janitor	Office Area	9:40a - 10:25p	*	*	0.8
R5163	Oiler	All Areas	9:50a - 2:45p	*	*	1.6
Evaluation Criteria				0.1	0.05	(5)(10)

R = Respirable
* = Below limits of detection