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 HE 78-74-575

INTERLAKE STEEL, INC.
WILDER, KENTUCKY

March 1979

I. TOXICITY DETERMINATION

A health hazard evaluation was conducted by the National Institute for Occupational Safety and Health (NIOSH) at the Interlake Steel, Inc., Wilder, Kentucky, on August 30 and 31, 1978. At the time of this evaluation, breathing zone air samples were taken for manganese, calcium oxide, iron oxide and total particulate.

On the basis of environmental sampling in the workplace on August 30 and 31, 1978, it has been determined that the tractor operator was exposed to excessive levels of calcium oxide, iron oxide and nuisance particulate. The bulldozer operator was also exposed to calcium oxide and nuisance particulate above the prescribed health and safety criteria. All other environmental measurements were well within the most recent evaluation criteria.

Recommendations designed to aid in providing a safe and healthful working environment are included in Section V of this Determination Report.

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 have been sent to:

a) Interlake Steel, Inc., Wilder, Kentucky.
b) Authorized Representative of Employees - United Steelworkers of America; Local 1870, Newport, Kentucky.
c) United Steelworkers of America - Pittsburgh, Pennsylvania.
d) U.S. Department of Labor - Region V
e) NIOSH - Region V

For the purpose of informing the approximately 100 "affected employees" the employer shall promptly "post" for a period of 30 calendar days the Determination Report in a prominent place(s) near where exposed employees work.

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 (NIOSH) received such a request from an authorized representative of employees of the United Steelworkers of America, Local 1870, regarding employee exposures to manganese, calcium oxide and iron oxide in the melt shop of Interlake Steel, Inc., Wilder, Kentucky. The requestor also submitted a list of fifty present and former employees who feel their health problems are or were job related.

IV. HEALTH HAZARD EVALUATION

A. Plant Process

The Melt Shop is a large two story building that takes scrap metal (usually a mixture of various metal parts) and produces a molten metal from a furnace charged with coke, manganese and calcium oxide. The molten metal is then poured into various types of molds to form ingots which are transferred to the rolling mill to be reduced to a desired demension. The areas of the melt shop were monitored for manganese, calcium oxide, iron oxide and total particulate. No other potentially toxic substances were being used or generated in substantial quanities in this operation to warrant additional investigation.

B. Evaluation Design and Progress

An initial survey was conducted on July 13, 1978. This survey included obtaining background information and conducting a walk-through survey in the areas where the alleged hazards were present. No aerometric sampling was performed during the initial survey.

During the entrance conference on July 13, 1978, a request was made by NIOSH to examine the personnel records of employees who had been or were presently engaged in the melt shop activities of Interlake Steel, Inc., Wilder, Kentucky. At that time the Safety Director asked that a formal request be submitted in writing.

A SHEFS I report was distributed on July 21, 1978, reporting the findings to date and the future action to be taken.

On August 3, 1978, a formal request in writing was submitted to management and the union Representative requesting the following information on any employee, past or present, who had engaged in melt shop activities:

1. Name
2. Last known address
3. Social Security Number
4. Job title
5. Work status (i.e., presently employed at Interlake Steel, retired, deceased, terminated)
6. Date of employment

A follow-up environmental survey was conducted on August 30-31, 1978, in order to more fully evaluate employee exposure to substances mentioned in the earlier portion of this report.

C. Environmental Evaluation Methods

Personal air samples were used to evaluate employee exposures. The personal samples were obtained by attaching a battery powered vacuum pump to the worker's belt with the sampling media (e.g., filter in a closed face cassette) in a holder attached to the shirt lapel of the worker to obtain a representative sample of air in the breathing zone of the worker. Samples were obtained for a sufficient period of time so that for all practical purposes they may be considered as eight-hour time-weighted averages.

1. Total Particulate

Personal breathing zone samples were collected by using MSA*, Model G battery-operated vacuum pumps with tared 0.8μ pore diameter copolymer polyvinyl chloride acrylonitrile filter at a flow rate of 1.5 liters per minute. The sample weights were taken from a Perkin-Elmer Balance AD-2 to an accuracy of 0.01 mg.

The weight of the sample is determined by subtracting the tare pre-sample weight from the total weight.

2. Manganese, Calcium and Iron

These personal breathing zone samples were collected on tared 0.8μ pore size diameter copolymer polyvinyl chloride acrylonitrile filters at a flow rate

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

of 1.5 LPM using a MSA vacuum pump. The samples were digested in a mixture of concentrated HNO_3 and $HCLO_4$, diluted to 25 ml with deionized water and analyzed by means of direct aspiration AA.

3. Respirable Dust

Respirable dust levels were measured by drawing air at a flow rate of 1.7 LPM through a size-selective sampler. The device consisted of a 10 mm nylon cyclone to remove the non-respirable fraction of the total dust prior to collection of the respirable portion on a tared 0.8μ pore diameter copolymer polyvinyl chloride acrylonitrile filter for weight determination.

D. Evaluation Criteria

1. Environmental

To asses the concentrations of air contaminants, two primary sources of criteria were used: (a) Recommended and Proposed Threshold Limit Values (TLV's) and their supportive documentation as set forth by The American Conference of Governmental Industrial Hygienist (ACGIH) (1978); and (b) Occupational Health Standards as promulgated by the U.S. Department of Labor (29 CFR, part 1910.1000).

In the following tabulation of criteria, appropriate values are presented.

SUBSTANCE	ACGIH TLV	OSHA STANDARD
Manganese	5.0 mg/M^3*"C"	5.0 mg/M^3
Calcium Oxide	2.0 mg/M^3	5.0 mg/M^3
Iron Oxide	5.0 mg/M^3	10.0 mg/M^3
Total Particulate	10.0 mg/M^3	15.0 mg/M^3

* - Milligrams of Substance per cubic meter of air
"C" - Ceiling value and should never be exceeded

TLV's or occupational health standards for substances are usually established at levels designed to protect workers occupationally exposed for an 8-hours per day, 40-hours per week basis over a working lifetime. Because of a wide variation in individual susceptibility, some workers may experience ill effects at or below the designated levels. Thus, an evaluation of the workplace can not be based entirely upon comparisons made against such TLV's or standards, as various TLV's and standards do not represent absolute protection of all workers, setting of legal standards and enforcement is a responsibility of the U.S. Department of Labor, Occupational Safety and Health Administration (OSHA).

2. Physiological

a. Manganese

Chronic manganese poisoning is a clearly characterized disease which results from the inhalation of manganese fumes or manganese dust. The central nervous system is the chief site of damage. If affected persons are removed from exposure, some improvement frequently occurs. However, there may be some residual disturbances in gait and speech. When the disease is well established, the result is permanent disability.

b. Calcium Oxide

Calcium oxide is a moderately caustic agent producing irritation of the eyes, nose, throat and upper respiratory tract. It is reported to have caused a chemical pneumonia as a result of dust inhalation.

c. Iron Oxide

Excessive exposure to iron oxide fume may result in siderosis, a benign condition that takes <-10 years of exposure to develop. Siderosis appears as dense areas in chest x-rays resulting from discrete pigmentation caused by the iron oxide fumes. The spots (pigmentation) are not considered harmful themselves, however they may mask the presence of existing lung disorders and cause the disorders to go undectected in the early stages. Other symptoms include a shortness of breath and a tendency toward coughing. Shortness of breath or coughing tendencies do not always accompany positive x-ray finding. The condition often eases after excessive exposure is discontinued.

d. Total Particulate

This is a term that is applied to the total dust in the air. It is very non-specific, however, at levels that exceed 10 mg/M^3, work conditions are very dusty and uncomfortable and can lead to coughing, sneezing, and respiratory irritation.

E. Evaluation Results and Discussion

1. Environmental

Results of the environmental samples showed that the tractor operator was exposed to excessive air levels of calcium oxide, iron oxide and nuisance particulate. The bulldozer operator was exposed to excessive air levels of calcium oxide and nuisance particulate. All other environmental measurements were well within the most recent evaluation criteria. For a detailed description of sample results, please refer to Table I.

The tractor and bulldozer operators wore NIOSH approved disposable respirators for nuisance particulates while performing their duties. The fact that a respirator was worn was not taken into consideration in calculating exposures. It can be assumed that exposures of these persons making proper use of prescribed respiratory protection were materially reduced from the calculated values.

2. Epidemiological Evaluation

During our meeting of July 13, 1978, a request was made to examine the personnel records of employees who had been or were presently engaged in the Melt Shop activities of Interlake Steel, Inc., Wilder, Kentucky. At the time, the company Safety Director, asked that a formal request be submitted. This was done and the following information was requested on any employee, past or present, who had engaged in melt shop activities, name, last known address, social security number, job title, work status (i.e., presently employed at Interlake Steel, retired, deceased, terminated) date of employment, information of this same group of employees was also requested from the Union Representative.

On October 10, 1978, a letter was received from the company Safety Director, stating that the company was not in a position to supply the requested information, because it is not possible for the employee records to accurately reflect all their work activities. Most new employees are assigned to the labor pool and they are used throughout the steel plant divisions on an "as needed" basis. All employees who are assigned to the melt shop do not continuously work there, but do bid out of the department from time to time. For these reasons, at this point, it appears that the company records do not accurately reflect the work activities for the past twenty-eight years.

A list of employees that contained information about their health status based on recall, was received from the union representative. This information, while useful as supplementary data, was not adequate for the purpose of evaluating the mortality patterns in the plant.

It is possible that a proportionate mortality study could be conducted using the company's pension files. However, since it is believed that sufficient data exist on such epidemiologic studies on steel mills (reference 4 through 16) it is deemed not necessary at this time to conduct an epidemiologic evaluation of this specific operation. However, if additional data on death became available, the need for such a study could be reconsidered. Regardless, it is imperative that the company strongly consider the recommendations included in this report and adhere to all existing OSHA health and safety standards to reduce the potential for any continued acute or chronic effects resulting from work place exposures.

3. Conclusions

Based on the results of environmental evaluations conducted by The National Institute for Occupational Safety and Health on August 30-31, 1978, it has been determined that the tractor operator was exposed to excessive levels of calcium oxide, iron oxide and nuisance particulate. The bulldozer operator was also exposed to calcium oxide and nuisance particulate above the prescribed health and safety criteria. All other environmental measurements were well within the most recent evaluation criteria.

V. RECOMMENDATIONS

1. Investigate the possibility of storing limestone outside the melt shop to reduce the exposure to calcium oxide.

2. Investigate the possibility of wetting down all debris before the bulldozer dumps the material into the trucks. This should help to reduce the excessive nuisance particulate in the melt shop.

3. As good occupational medical practice, all men exposed to dusty environments containing of the so-called nuisance nature should be given yearly chest X-rays.

4. Personal protective equipment should be provided for employees exposed to hazards which cannot be adequately abated by engineering controls. At no time should personal protective equipment be substituted for engineering controls when engineering controls are feasible and are in accordance with required practice.

5. Better housekeeping is needed throughout the plant, including the practices of vacuuming dust and removal of scrap metal. Education of employees on better work habits would eliminate obvious hazards.

VI. REFERENCES

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Table I

Results of Environmental Sampl. . the Melt Shop

Interlake Steel, Inc., Wilder, Kentucky

August 30-31, 1978

Job And/Or Location	Date	Sampling Period	Sample Volume (Liters)	Type Type	Total Manganese mg/M^3*	Respirable Manganese mg/M^3	Total Calcium Oxide mg/M^3	Respirable Calcium Oxide mg/M^3	Total Particulate mg/M^3	Respirable Particulate mg/M^3	Total Iron Oxide mg/M^3
Crane Operator #108	8-30-78	0720-1416	624	**B2	.02	-	.63	-	1.23	-	.10
Crane Operator #108	8-31-78	0746-1401	637	B2	-	.01	-	.03	-	.28	-
Second Helper "A" Furnace	8-30-78	0722-1410	612	B2	.03	-	.29	-	2.92	-	.41
Second Helper "A" Furnace	8-31-78	0723-1400	674	B2	-	.01	-	.09	-	.89	-
First Helper "A" Furnace	8-30-78	0723-1410	610	B2	.03	-	.51	-	3.08	-	.20
First Helper "A" Furnace	8-31-78	0724-1400	676	B2	-	.02	-	.13	-	.81	-
First Helper "C" Furnace	8-30-78	0725-1412	610	B2	.01	-	.07	-	.52	-	.08
First Helper "C" Furnace	8-31-78	0726-1414	697	B2	-	.01	-	.09	-	.50	-
Third Helper "A" Furnace	8-30-78	0728-1413	607	B2	.35	-	.53	-	5.45	-	.36
Third Helper "A" Furnace	8-31-78	0733-1359	656	B2	-	.04	-	.14	-	.81	-
Second Helper "C" Furnace	8-30-78	0733-1417	606	B2	.05	-	.30	-	2.36	-	.23
Second Helper "C" Furnace	8-31-78	0726-1402	673	B2	-	.01	-	.06	-	.39	-
Ladleman Helper	8-30-78	0735-1415	600	B2	.01	-	.12	-	1.05	-	.11
Ladleman Helper	8-31-78	0733-1402	664	B2	-	***LD	-	.04	-	.09	-
Crane Operator #105	8-30-78	0739-1415	594	B2	.02	-	.06	-	.74	-	.11
Crane Operator #105	8-31-78	0754-1425	664	B2	-	.01	-	.02	-	.12	-
Steel Pourer	8-30-79	0742-1426	606	B2	.02	-	.08	-	.86	-	.11
Steel Pourer	8-31-79	0800-1402	618	B2	-	LD	-	.03	-	.05	-
Ladle Crane	8-30-79	0747-1420	589	B2	.02	-	.04	-	.73	-	.22
Ladle Crane	8-31-79	0800-1406	622	B2	-	LD	-	.02	-	.06	-
Tractor Operator	8-30-79	0814-1424	555	B2	.29	-	72.0	-	overloaded	-	5.10
Tractor Operator	8-31-79	0902-1410	462	B2	.02	-	2.8	-	11.5	-	.16
Bulldozer Operator	8-30-79	1002-1425	394	B2	.18	-	.44	-	15.8	-	1.07
Bulldozer Operator	8-31-79	1018-1412	351	B2	.54	-	4.0	-	31.8	-	2.65
Nozzle Setter Helper	8-30-79	0745-0803	27	B2	.11	-	.19	-	.37	-	.15
The 1978 ACGIH TLV and current OSHA standard					5.0	-	-	-	-	-	-
The 1978 ACGIH TLV, the current standard is 5 mg/M^3					-	-	2.0	-	-	-	-
The 1978 ACGIH TLV, the current OSHA standard 15 mg/M^3					-	-	-	-	10.0	-	-
The 1978 ACGIH TLV, the current OSHA standard 10 mg/M^3					-	-	-	-	-	-	5.0

* mg/M^3 - Milligrams of substance per cubic meter of air
** B2 - Personal breathing zone
*** LD - Less than detectable limits

Manganese - Limit of detection 3 µg/sample
Calcium - Limit of detection 3 µg/sample
Iron - Limit of detection 3 µg/sample
Total Particulate - Limit of detection 0.01 mg/sample