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 77-130-527

> > INLAND STEEL COMPANY 10 AND 14 INCH MERCHANT MILLS 3210 WAITLING STREET EAST CHICAGO, INDIANA 46312

> > > September 1978

### TOXICITY DETERMINATION

Based on environmental air samples, confidential employee interviews, evaluation of existing ventilation systems and work practices, and available toxicity information collected during March 14-16, 1978, it has been determined that a potential hazard to the health of workers exposed to sulfur dioxide exists at Inland Steel Company, 10 and 14 inch Merchant Mills. Fourteen of eighteen personal time-weighted average samples for sulfur dioxide exceeded the NIOSH recommended standard of 0.5 parts of sulfur dioxide per million parts of air(ppm). Concentrations ranged from 0.3 to 2.3 ppm, representing samples of crane, furnace, and rolling mill crews (Table 1).

One air sample (0.2 milligrams per cubic meter of air,  $mg/M^3$ ) exceeded the NIOSH recommended/proposed OSHA standard of 0.1 mg/M<sup>3</sup> for inorganic lead; another air sample (5.1 mg/M<sup>3</sup>) exceeded the Threshold Limit Value of 5 mg/M<sup>3</sup> for iron oxide. These samples represent exposures to two "rolling crew" employees, and indicate the possible existance of a problem (Table 2). Also, one sample for nitrogen dioxide (2 ppm) exceeded the NIOSH recommended standard of 1 ppm. Page 2 - Health Hazard Evaluation Determination Report HE 77-130

Recommendations are included in this determination report which are designed to insure a safe and healthful working environment. These include the need to reduce the emissions from furnaces through holes, etc., and to provide medical monitoring for effects on workers exposed to sulfur dioxide.

### II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION 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), 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:

- a) Inland Steel Company, E. Chicago, Indiana.
- b) Authorized Representative of Employees-United Steelworkers of America; Local 1010, E. Chicago, Indiana.
- c) United Steelworkers of America-Pittsburgh, Pennsylvania.
- d) U.S. Department of Labor-Region V.
- e) Indiana Division of Labor, Indianapolis, Indiana.
- f) NIOSH-Region V.

For the purpose of informing the approximately 150 "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 an 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 1010, regarding employee exposures to sulfuric acid mist, lead, lead paint, coke oven gas and resultant combustion products, and sulfur dust. It was determined that the acid mist exposures were the topic of another Health Hazard Evaluation<sup>1</sup>, and that potential exposures to lead paint no longer existed. This report is thus concerned with emissions to coke oven gas fired furnaces and to iron oxide and lead from the rolling mill operations. An interim NIOSH report (SHEFS I) was sent to the company and union representatives on January 9, 1978, (after the initial survey) stating that a follow-up survey would be conducted. Page 3 - Health Hazard Evaluation Determination Report HE 77-130

### IV. HEALTH HAZARD EVALUATION

### A. Conditions of Use

The 10 inch merchant mill is a 15 stand continuous mill with seven 14 inch roughing stands, three 12 inch intermediate stands, three vertical stands, and two 10 inch finishing stands, all in a line. Billets which enter the mill range in size from 2 7/16 to 4 3/8 inch squares and 27 to 31 feet in length. The billets enter a furnace heated 90% of the time with coke oven gas. During the evaluation, the gas had a rating of 495-505 BTU/ standard cubic foot and contained the composition of the following gases: 0.4% oxygen, 58% hydrogen, 3% carbon dioxide, 6% nitrogen, 23% methane, 8% carbon monoxide, and 210 grains per 100 cubic feet of hydrogen sulfide. After the hot billet has left the furnace and passed through the rolling stands it is carried out on a runout table to the hot bed. Bars and shapes are directed to alternate sides of the hot bed to cool. This mill produces merchant quality straight grade carbon steel products rolled into angles, flats, squares, hexagons, rounds, etc. or special bars such as resulfurized steels or leaded steels.

There are three main crews-furnace, mill, and crane - which operate the rolling mill. The furnace crew consists of the following job catagories. (1) The furnace charger transfers billets into the furnace via a buggy charger with a motor driven ram and moves them through the furnace with pusher arms; (2) the push out operator uses a peel (long handled spade-shaped arm) to push the billet out of the furnace onto the rolling mill; (3) the shearman operates a mechanism on the discharge side of the furnace to cut the billets to desired lengths; and (4) the heater controls the overall furnace operation. These employees have potential exposures to emissions entering the atmosphere from leaks or other furnace openings-sulfur dioxide, notrogen dioxide, hydrogen sulfide, carbon monoxide.

The rolling mill crew numbers approximately 10-15 employees. Employees, such as the assistant roller, rougher, and guidesetter are responsible for the rolling of billets through the stands until they pass onto the hot bed. These employees have potential exposures to iron oxide and lead if leaded steel is handled.

The 10 inch mill utilizes at least two cranes -#1 and #2 - to assist in the furnace charging and rolling. The cranemen have potential exposures to furnace emissions.

This mill building is approximately 1900 feet long and 100 feet wide and has been in operation 48 years.

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The 14 inch Merchant Mill is a 10 two high stand mill, having six 18 inch roughing stands in a semi-continuous train followed by four 14 inch stands arranged in a cross country arrangement. Billet sizes ranged fro 3 3/4 inch by 3 3/4 inch to 7 inch to 7 inch and are 8 to 14 feet long. The billets are heated in two continuous furnaces, which constantly charge and discharge billets. These furnaces, like those for the 10 inch mill, operate on coke oven gas. There is a furnace charger crewman for each furnace, but unlike the 10 inch mill, there are no push out operators or shearmen. Mill crewmen, such as the roller, assistant roller, and roll builder maintain the movement of billets through the first set of stands, or rougher train. From here the billets pass through four more stands called the finishing stands. The bars are moved by employees (such as the 1st and 2nd Catcher and Finisher) from one stand to another using skewed table rolls set at an angle. The steel is then carried over a run out table onto a hot bed to cool before further handling. This mill also produces structural products such as I-beams, in addition to those made in the 10 inch mill.

This mill utilizes cranes #0 and #1 to handle the steel processing oven the furnaces and rolling stands. Cobble burners also work near the Aside straightener, and may be exposed to lead fume or dust from leaded steels. All other employees have similar exposures to crews in the 10 inch Mill.

This mill building is approximately 1800 feet long and 100 feet wide and has been in operation 54 years.

There is a smaller area in between both mills referred to as the 14 inch Billet Dock. Cranes #5 and #6 operate here. The cranemen may have potential exposures to furnace emissions from both mills.

- B. Evaluation Methods
- 1. Environmental

Atmospheric samples for inorganic lead, iron oxide, and total particulate weight were collected on acrylonitrile/polyvinyl chloride copolymer filters with 0.8 micron pore size. The filters were encased in three piece plastic field monitor cassettes with the face cap removed. Personal samples were taken at the employee's breathing zone using a battery powered vacuum pump. The pumps were operated at flow rates of 1.5 liters per minute (lpm), and were worn by employees. The analytical limits of detection are 5 micrograms (ug)/sample for lead and 3 ug/sample for iron. Page 5 - Health Hazard Evaluation Determination Report HE 77-130

Atmospheric samples for sulfur dioxide were collected in impingers containing 0.3 N hydrogen peroxide solution. Air was drawn through the impinging solution at flow rates of 1.0 lpm using a vacuum pump. The pumps and impingers were worn by the employees. The analytical limit of detection is 25 ug/sample.

Atmospheric samples for nitrogen dioxide  $(NO_2)$  were collected by drawing air through triethanolamine-impregnated molecular sieve tubes. Air was drawn through the tubes at a flow rate of 10 milliliters per minute using battery powered vacuum pumps. The pumps and tubes were worn by the employees. The analytical limit of detection is 2 ug/tube.

Direct reading measurements for sulfur dioxide, nitrogen dioxide, carbon monoxide, and hydrogen sulfide were taken with NIOSH certified indicator tubes.

Additional measurements for carbon monoxide were taken using a continuous battery powered analyzer.

2. Medical

Twenty employees were interviewed by the Industrial Hygienists using non-directed questionnaires. Employees interviewed included personnel from the rolling mill, furnace, and crane crews. The interviews were given to obtain occupational work histories, smoking habits, and to reveal health symptoms which employees feel are related to their working environment.

- C. Evaluation Criteria
  - 1. Toxic Effects

<u>Sulfur Dioxide</u> - A colorless gas at ordinary temperatures with a strong suffocating odor. It is very irritating to the mucous membranes of the upper respiratory tract. Following acute overexposures, broncoconstriction with possible increases in mucous secretion and pulmonary flow resistance are possible. Chronic exposures may result in fatique, cough increased mucous secretion, and altered sense of smell. Aggravation of the effects has been reported when sulfur dioxide has been inhaled along with certain insoluble salts.<sup>2</sup>,<sup>3</sup> Page 6 - Health Hazard Evaluation Determination Report HE 77-130

<u>Iron Oxide</u> - Excessive exposure to iron oxide fume may result in siderosis, a benign condition that takes 6-10 years of exposure to develop.<sup>4</sup> Siderosis appears as dense areas in chest x-rays resulting from discrete pigmentation caused by the iron oxide fume. The spots (pigmentation) are not considered harmful themselves, however they may mask the presence of existing lung disorders and cause the disorders to go undetected in the early stages. Other symptoms include a shortness of breath and a tendency towards coughing. Shortness of breath or coughing tendencies do not always accompany positive X-ray findings. The condition often eases after excessive exposure is discontinued.<sup>5</sup>

Lead - Lead poisoning may occur through the inhalation and/or ingestion of lead fumes or dust. This results in the deposition of lead in the bones and tissue of the body and alterations in normal physiological function. No single sign or symptom may be considered diagnostic of lead poisoning. Lead poisoning may present such symptoms as a metallic taste in the mouth, loss of appetite, indigestion, nausea, vomiting, constipation, abdominal cramps, nervousness, insomnia, colic and also loss of kidney function (loss of kidney function may be irreversible).<sup>6</sup>

Many of the sources of lead poisoning are industrial, but man also absorbs lead in small amounts from his food and water, and from the air. These sources lead to the "normal" body burden of lead, not normally leading to poisoning. Goldwater and Hoover have reported a worldwide blood lead mean of 0.017\_milligrams of lead per 100 milliliters of whole blood (0.017 mg/100 ml).' The National Institute for Occupational Safety and Health defines the unacceptable level of lead to be 60 micrograms of lead per 100 milliliters (60 ug/100 ml) of whole blood or greater, or at levels equal to or greater than 0.20 mg of lead per liter of urine corrected to specific gravity of 1.024.<sup>8</sup>

<u>Nitrogen Dioxide</u> - Enters the body by inhalation and diffuses into the blood. Some of the gas combines with hemoglobin forming methemoglobin, which reduces the blood's oxygen carrying capacity. In addition,  $NO_2$  is irritating to the mucous membranes and respiratory system. Delayed pulmonary edema results from acute exposures to high concentrations of  $NO_2$ . Chronic exposures to low levels of the gas may result in decreased pulmonary functions.

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2. Evaluation Criteria

Airborne exposure limits for the protection of the health of workers have been recommended or promulgated by several sources. These limits are established at levels designed to protect workers occupationally exposed to a substance on an 8-hour per day, 40-hour per week basis over a normal working lifetime. For this investigation, the criteria used to assess the degree of health hazards to workers were selected from three sources:

- NIOSH: Criteria for a Recommended Standard...Occupational Exposure to various substances.
- Threshold Limit Values (TLV): Guidelines for Airborne Exposures as Recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) for 1977.
- OSHA Standards: The air contaminant standards enforced by the U.S. Department of Labor - Occupational Safety and Health Administrationas found in the Federal Register - 29 CFR 1910.1000 (Tables Z-1, Z-2).

Whenever possible, the NIOSH recommended standard will be the environmental standard applied since it represents the most recent knowledge concerning a substance. If one does not exist, the next most stringent recommended or legal standard will be used.

	Source				
Substance	NIOSH	TLV	OSHA		
Sulfur Dioxide	0.5 ppm	5 ppm	5 ppm		
Nitrogen Dioxide	1(c)	5(c)	5		
Carbon Monoxide	35	50	50		
Hydrogen Sulfide	10(c)	10	20(c)		
Iron Oxide	0.1	5 mg/M <sup>3</sup>	10 mg/M <sup>3</sup>		
Lead		0.15	0.2		
Total Particulates		10	15		

\*Concentrations, in parts of substance per million parts of air (ppm). or milligrams of substance per cubic meter of air  $(mg/M^3)$ , are based often on an 8-hour time-weighted average exposure (TWA). Values designated (c) represent concentrations which should not be exceeded even instantaneously as commonly measured in a 15-minute period.

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### D. Evaluation Results and Discussion

1. Environmental Air

The results of long term air sampling for sulfur dioxide gas and nitrogen dioxide gas are presented in Table 1. All 24 personal samples for NO2 were nondetectible with one exception (2 ppm - for the Craneman #2 in the 10 inch Mill on March 14); this sample exceeded the NIOSH recommended ceiling standard of 1 ppm. In 28 samples collected for SO2, the range of concentrations was from 0.3 to 2.3 ppm. The range of calculated 8-hour time weighted average concentrations (TWA) was from 0.2 to 2 ppm, with an average of 1 ppm. Fourteen of 18 TWA concentrations exceeded the NIOSH recommended standard of 0.5 ppm.

The results of detector tube air sampling for  $NO_2$  and  $SO_2$ , which give an instantaneous measurement of concentration, are presented in Table 2. All samples for  $NO_2$  were below the evaluation criteria. Samples for  $SO_2$  ranged from nondetectible to 5 ppm. These results show a good correlation with the long term samples.

The unacceptable  $SO_2$  concentrations indicate the presence of leaks from furnaces in both mills. The hole in the wall separating the Billet Dock from the 10 inch Mill is allowing emissions from the nearby 10 inch furnace to enter the atmosphere of certain Billet Dock cranes.

The results of long term air sampling for total particulates, inorganic lead, and iron oxide are presented in Table 3. Samples for total particulates were below the evaluation criteria. However, the 10 inch assistant Roller's concentration to inorganic lead  $(0.2 \text{ mg/M}^3)$  exceeded the NIOSH recommended/ proposed OSHA legal standard of 0.1 mg/M<sup>3</sup>. The 14 inch Finisher's concentration to iron oxide  $(5.1 \text{ mg/M}^3)$  exceeded the Threshold Limit Value of 5 mg/M<sup>3</sup>. Other concentrations of lead and iron oxide were below the evaluation criteria. Leaded steels were processed periodically during the evaluation, thus accounting for its presence.

All detector tube samples for carbon monoxide and hydrogen sulfide were below the evaluation criteria.

2. Medical

The employees of the 10 and 14 inch Merchant Mills receive a pre-employment physical examination, including blood and urine analysis, and chest Xray. Pulmonary function testing is not done prior to or during employment unless signs or symptoms arise. Certain employees receive special tests, such as blood lead level determinations, if exposed to such agents. Page 9 - Health Hazard Evaluation Determination Report HE 77-130

Tables 4 and 5 summarize the pertinent points of the employee interviews. Of twenty employees interviewed, twelve had health complaints which they felt were associated with their work environment. The most frequent health complaints were chest discomfort and pain, headaches, and tissue irritation (eye and throat) possibly resulting from work performed near the 10 inch mill furnace. These symptoms are consistant with those occurring with over exposure to SO<sub>2</sub> gas. Other problems mentioned included dermatitis from cable burning, occassional coughs from dust, an arthritic condition attributed to or aggravated by the cold and damp environment, hearing problems resulting from noise in the mill, lower backaches from shoveling slag, and leg cramps from working in water (water spray from stands).

### V. RECOMMENDATIONS

1. The opening in the wall between the 10 inch Merchant Mill and Billet Dock should be sealed. This would help to prevent crane operators in the Billet Dock from being exposed to coke oven gas emissions (sulfur dioxide, nitrogen dioxide, etc.) from the 10 inch Mill furnace.

2. Openings or leaks should be repaired in the furnaces; the furnaces should be ventilated to outside the mill(s) wherever sulfur dioxide or other contaminants might escape.

3. Cranes should not idle over furnaces(s) unless necessary, as hot furnace emissions would be more concentrated there.

4. Salamanders should be equipped with exhaust ducts at least seven feet high to avoid exposing nearby persons to sulfur dioxide and other possible contaminants (i.e., carbon monoxide). This is to dilute the high concentrations ( $\sim 25$  ppm of SO<sub>2</sub>) that can occur at the top of the salamander from hot coke.

5. Preplacement and annual medical examinations should be done whenever TWA exposures of sulfur dioxide exceed 0.25 ppm. These examinations should be directed toward complaints of mucous membrane irritation, cough, and shortness of breath. They should ascertain that nasal passages are open. Persons with a history of asthma or with subnormal pulmonary function should be watched closely. Simple expiratory function tests should be a part of the examination.<sup>9</sup>

6. Environmental monitoring should be conducted bimonthly for those operations in which the sulfur dioxide concentration exceeded the recommended environmental standard. Suitable controls should be initiated and monitoring continued until two consecutive surveys indicate the adequacy of the controls.<sup>3</sup>

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7. Inland Steel should evaluate the degree of employee exposure in both mills to lead and iron oxide. Monitoring should be conducted, but not limited to processes in which lead-loy and smaller gauged steels (wide strips/flats) are used. In the event that excessive exposures are indicated, the necessary engineering controls should be instituted. The evaluation of the extent of exposure of employees to nitrogen dioxide should also be considered.

8. The company should initiate a respirator program meeting the requirements outlined in the Occupational Safety and Health Standards, 29 CFR 1910.134 (b)(1)(11). Respiratory protection should be considered for those processes in which excessive exposures are identified as an interim measure until proper controls are implemented.

a. Only respirators approved by NIOSH or the Mine Health and Safety Administration should be used. The standard for approval is specified in 30 CFR 11. The company should insure that the respirators are used in a proper manner, and that they are properly cleaned, maintained, and stored.

b. Employees should not be assigned to task requiring use of respirators unless it has been medically determined that they are physically able to perform the work and use the equipment.

9. It was observed many employees heated their open containers of food near or on rolling stand equipment. This should be discontinued as food can become contaminated with particulate emissions from the process, such as lead or iron oxide.

10. In the 14 inch mill, impact noises are produced when billets are dropped onto the charging platform. The company may wish to conduct a noise survey there to define the extent of exposure.

### VI. REFERENCES

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- Criteria for a Recommended Standard--Occupational Exposure to Sulfur Dioxide. HEW Publication No. (NIOSH) 74-111. U.S. Department of Health, Education and Welfare, Center for Disease Control, National Institute for Occupational Safety and Health, 1974.

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- Revised Criteria for a Recommended Standard--Occupational Exposure to Inorganic Lead. HEW Publication No. (NIOSH) 78-158. U.S. Department of Health, Education, and Welfare, Center for Disease Control, National Institute for Occupational Safety and Health, 1978.
- Statement of Edward of Baier, Deputy Director for the National Institute for Occupational Safety and Health, Before the Department of Labor (OSHA) Public Hearing on Occupational Standard for Sulfur Dioxide, May 1977.

### VII. AUTHORSHIP AND ACKNOWLEDGEMENT

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## RESULTS OF AIR SAMPLING FOR SULFUR DIOXIDE (SO2) AND NITROGEN DIOXIDE (NO2)

	Inl	and	Stee	1 0	ompany	,
10	and	14 i	nch	Mer	chant	Mills
	E	Chi	cago	), I	ndiana	1
	Þ	larch	14-	-16,	1978	

			March 14	-16, 1978	3	CONCENTRATION ( ppn	n} <sup>2</sup>
					5	02	NO
Date	Job Intle	Sample <u>Number</u>	Type Sample	Sampling Period(hrs./min.)	Actual Conc.	Time-Weighted Average Conc.	
3/14	Heater-10 inch	N-3	Р	4/20			N.D.
	Heater-10 inch	S-3	P	3/0	1.2		
	Heater-10 inch	5-102	P	2/20	1 7	1.3	N.D.
3/14	Furnace charger-10 inch	N-1	P	2/30	1.7		N.D.
	Furnace charger-10 inch	S-1	P	2/30	N.D.		
	Furnace charger-10 inch	N-100	P	3/30		0.2	N.D.
3/14	Push out operator-10 inch	S-100	P	3/30	0.5		11 0
5/14	Push out operator-10 inch	5-24	P	3/0			N.U.
	Push out operator-10 inch	N-101	P	2/45			N.D.
2174	Push out operator-10 inch	5-101	P	4/15	1.4	1.4	
1/14	Billet Shearman-10 inch	R-4	P	4/10	~ ~		N.D.
	Billet Shearman-10 inch	N-103	p	3/0	0.8	1.0	N D
	Billet Shearman-10 inch	S-103	A	4/20	1.2	1.0	N.U.
	Crane #1-10 inch	N-5	Р	4/0			N.D.
	Crane #1-10 inch	S-5	A	4/0	1.5		
	Crane #1-10 inch	N-104 S-104	P	3/35	1.0	1.6	N.D.
3/14	Crane #6-14 inch	N-6	P	5/35	1.9		N D
	Crane #6-14 inch	5-6	A	6/50	1.3	1.3	n.v.
3/14	Crane #2-10 inch	N-7	Р	4/47			2.0
	Crane #2-10 1nch	S-7	A	4/47	0.6	202	10.0 20
	Crane #2-10 Inch	S-8	p A	3/10	0.9	0.7	N.D.
3/14	Office-14 inch billet dock	N-0	P	3/35	0.0		N.D.
3/15	Crane #5-14 inch billet dock	N-120	Р	4/55			N D
	Crane #5-14 inch billet dock	S-120	A	4/55	0.8		
	Crane #5-14 inch billet dock	N-123	P	2/30		0.7	N.D.
3/15	Furnace charger-10 inch	5-123	p	5/30	0.0	1.1	
5/15	Crane #6-14 inch	S-108	A	6/25	0.9	0.9	
3/15	Assistant Heater-14 inch	N-105	Р	7/30		015	N.D.
	Assistant Heater-14 inch	S-105	P	3/50	0.1	0.3	
3/15	ASSISTANT Heater-14 Inch	S-10/	P	3/42	0.5		
5/15	Crane #0-14 inch	5-106	A	7/42	0.3	0.3	N.D.
3/15	Furnace charger-14 inch	N-121	P	4/05	0.0	0.5	N.D.
	Furnace charger-14 inch	S-121	Р	3/0	1.5	0.022	100 AU
	Furnace charger-14 inch	N-124	P	3/10	0.4	0.7	N.D.
	remace charger-14 men	7-154	E.	3/10	0.4		
3/16	Crane #1-10 inch	N~500	Ρ	7/30			N.D.
	Crane #1-10 inch	S-500	A	3/55	2.0	2.0	
7/16	Crane #1-10 inch	S-501	A	3/25	2.3		
3/10	Assistant Heater-14 Inch	S-113	p	//25	0.4	0.4	N.D.
	Furnace charger-14 inch	N-112	P	7/25	0.4	0.4	N D
	Furnace charger-14 inch	5-112	P	7/20	1,4	1.4	
3/16	Crane #6-14 inch	S-111	A	7/55	1.3	1.3	1000
3/10	Furnace charger-10 inch	N-122 S-122	P	1/5/	1.4		N.D.
	Furnace charger-10 inch	5-128	P	4/05	1 0	1.2	
				17 65	1.0	1.2	
1. P 2. pp 3. N. 4. sa	<pre>= personal A = Area om = parts of gas per million pa D. = non detectible mple lost</pre>	rts of ai	r by volu	ne			

Evaluation	Criteria			
	NIOSH	0.5	5 ppm	1 ppm(c)
	TLV	5	ppm	5 ppm(c)
	OSHA	5	ppm	5 ppm

#### RESULTS OF AIR SAMPLING FOR VARIOUS GASES

#### Direct Reading Indicator Tubes or Bag Sampling

Inland Steel Company 10 and 14 Inch Merchant Mills E. Chicago, Indiana March 14-16, 1978

Concentration (ppm)<sup>2</sup>

<u>Date</u>	Job Title Location	Sample1 Method	Sample Time(s)	Carbon <u>Nonoxide</u>	Sulfur Dioxide	Nitrogen Dioxide	Nitrous <u>Gases</u>	Hydrogen <u>Sulfide</u>
3/14	Furnace charger-10 inch	I	10:00 am	5	1	к.р. <sup>3</sup>	-	N.D.
	Eurnace charger-10 inch	Â	12:50-1:45 pm	δ	i	N.D.	<0.5	0.3
	Billet Shearman-10 inch	ī	9:30 am	5	N.D	N.D.	-	N.D.
	Pushout operator-10 inch	ī	2:00 pm	<5	<1	N.D.		N.O.
	Crane #1-10 inch	B	8:00-10:00 Am	7	2.5	0.3	1	N.D.
	Crane #1-10 inch	B	10:00-11:00 am	8	<1	-0.3	0.5-1.0	N.D.
	Crane #1-10 inch	1	2:30 pm	8	5	N.D	0.8	N D
	Crane #1-10 inch	B	12:00-2:00 pm	5	ĩ	<0.3	0.5	N.D.
	Crane #1-10 inch	B	2:30-3:30 pm	5	2 5	<0.3	0 5-1 0	N D
	Crane #1-10 inch	ī	11:00 am	5	3	N.D	-	N.O.
	Crane #1-10 inch	B	11:30-2:00 pm	5	พัก	ND	0.5	N D
	Crane #2-10 inch	ñ	7:40-10:30 am	5	1	<0.5	0.5	ND
	Crane #2-10 inch	B	12-30-3-40 pm	5	í	N D	0.5	N D
	Office-14 inch billet dock	B	12.10-2.15 pm	5	ม่ก	N D	N D	N D
	Crane d6.14 Inch billet dock	ī	10-55 20	5	3	N D	H.D.	N D
	Crane 45-14 Inch billet dock	R	8.45-11.30 pm	5	คัด	N D	0.5	N D
	Crane #5-14 inch billet dock		11.30_2:00 pm	5	ND	N D	0.5	N D
	CIENC FO-14 INCH DITLET GOCK	ь	11.30-2.00 pm		N.D.	N.V.	0.5	N.D.
3/15	Crane #5-14 inch billet dock	I	11:25 am	5	N.D.	N.D.	0.5	-
	Crane #5-14 Inch billet dock	В	8:00-10:00 am	4	N.D.	N.D.	0.5	-
			11:00-12:00 pm					
	Crane #5-14 inch billet dock	В	1:00-2:45 pm	3	N.D.	N.D.	0.5	
	Furnace charger-10 inch	B	8:50-9:50 am	12	1	N.D.	0.5	-
	Furnace charger-10 inch	В	10:15-12:20 pm	7	N.D.	N.D.	N.D.	
	Crane #0-14 inch	В	8:00am-12:00 pm	1	N.D.	N.D.	N.D.	N.D.
	Crane #0-14 1nch	I	11:15 am	<5	N.D.	N.D.	N.D.	N.D.
	Crane #0-14 inch	В	12:00-1:30 pm	1	N.D.	N.D.	N.D.	N.D.
	Push out operator-10 inch	I	10:30 am	5	N.D.	N.D.	< 0.5	N.D.
	Assistant Heater-14 inch	8	8:15-9:15 mm	3	N.D.	N.D.	N.D.	N.D.
	Furnace charger-14 inch	I	10:00 am	< 5	< 0.5	N.D.	0.5	-
3/16	Crane #1-10 inch	т	8.00 20	c	2	N D	0.7	
3/10	Crane #1-10 inch	î	0:00 dan	5	2	N.D.	0.7	-
	Crane #1-10 inch	Ť	8-35 am	-	2 5	-	-	-
	Crane #1-10 inch	î	12:00 pm		1	-		-
	Crane #1-10 inch	î	12.00 pm	5	25	-	<0.5	-
	Crane #1-10 inch	Ť	2:2000	J	2.0		<0.5	-
	Crane d]_]0 inch	Ť	3+10 mm	3 <del>7</del>	3			-
	Furnace charger 10 inch	1	10+15 pm	E	1	-	-	
	Billot shearman-10 inch	Ť	10.15 dill	3	พ่า		-	a.v.
	Billot choarman-10 inch	4	0.30 sm	-	N.D.			-
	Billot choseman 10 inch	1 T	0.30 001	20	2.0		-	-
	Office 14 inch billet deck	÷	9:30 dill	SU	1	N.D.	-	N.U.
	Office 14 Inch billet dock	1 T	10.00	-	-1	N D	-	
	Office-14 inch billet der	p	9+40-10+10 pm	5	1.2	N.D.		N.D.
	Bushout anonstan 10 inch	B	0.45 50	2	1-4	N.U.	-	N.D.
	Fushout operator-10 Inch	1	9.40 am	5	<   ] "	N.D.	0.5	N.D.
	rumace charger-14 inch	1	2:50 pm	5	1-3	N.U.	<0.5	м.Ц.

B = Bag sample I = Detector tube
 ppm = parts of gas per million parts of air by volume.
 N D = condetectable

3.	R.D. =	non-detectable	

EVALUATION CRITERIA:  $\begin{array}{cccc} 0.5 & 1(c)^4 & - & 10(c) \\ 5 & 5(c) & - & 10 \\ 5 & 5 & - & 20(c) \end{array}$ 35 50 50 NIOSH TL V OSHA

4. Ceiling value not to be exceeded.

## RESULTS OF AIR PERSONAL SAMPLING FOR TOTAL PARTICULATES, IRON OXIDE, AND LEAD

Inland Steel Company 10 and 14 Inch Merchant Mills E. Chicago, Indiana

## March 14-16, 1978

 $Concentration(mg/M^3)^1$ 

Date	Job Title	Sample Number	Sampling Period(hrs./min.)	Total Paticulates	Lead	Iron Oxide
3/14	Assistant roller-10 inch	18	8/12	2.6	0.01	1.7
	Rougher-10 inch	8	7/30	4.5	0.01	3.5
	Guidesetter-10 inch	17	7/38	33.8 <sup>2</sup>	0.02 <sup>2</sup>	28 <sup>2</sup>
3/15	Craneman #0-14 inch	13	7/52	1.4	0.04	1.0
	Finisher-14 inch	3	7/39	6.8	0.07	5.1
	First catcher	6	7/14	5.0	0.03	3.2
	Cobble burner-14 inch	9	7/32	1.1	0.03	0.8
3/16	Craneman #1-10 inch	2	6/15	1.1	0.02	0.2
	Heater-10 inch	15	7/20	1.4	0.03	0.4
	Assistant roller-10 inch	4	7/40	2.1	0.2	1.2
	Cobble burner-14 inch	14	7/0	5.1	0.1	3.8

1.

mg/M<sup>3</sup>= milligrams of substance per cubic meter of air. Sampling filter cassette melted partially; sample questionnable. 2.

Evaluation Criteria			
NIOSH	-	0.1	-
TLV	10	0.15	5
OSHA	15	0.20	15

## JOB RELATED MEDICAL PROBLEMS AS OBTAINED BY EMPLOYEE INTERVIEWS

Inland Steel Company 10 and 14 Inch Merchant Mills East Chicago, Indiana

March 14-16, 1978

Case Number	rComplaints	Source of Problem Cited
1	Skin Rash Under Arms	Cobble Burning
2	Occasional Cough	Dust in Air
3	Occasional Cough	Throat Irritated from Dust
4	Headaches, Sore Throat, and Tight Chest	Not Identified
5	Headaches and Cough	Emmissions from 10" Mill Furnace
6	None	
7	Headaches, Chest Discomfort, and Eye Irritation	Emmissions from 10" Mill Furnace
8	None	
9	Arthritis	Cold Work Environment
10	Chest Pains	Emissions from 10" Mill Furnace
11	Throat Irritation	Not Identified
	Hearing Problems	Noise from Mill
12	<ul> <li>Lower Backaches</li> </ul>	Shoveling Slag
13	Leg Cramps	Working in Water(water spray from stands)
14	None	
15	None	
16	None	
17	None	
18	Ringing in Ears	Mill
19	None	
20	None	

## SUMMARY OF MEDICAL COMPLAINTS MENTIONED DURING EMPLOYEE INTERVIEWS

Inland Steel Company 10 and 14 inch Merchant Mills East Chicago, Indiana

March 14-16, 1978

Complaints	Workers Mentioning Problem*
Skin Rash	1
Cough	3
Headaches	3
Throat Irritation	2
Chest Discomfort/Pain	3
Eve Irritation	1
Arthritis	1
Ear Problems	2
Leg Cramps	1
Lower Backaches	1

\* Twenty employees were interviewed.