

FINAL REPORT
ENVIRONMENTAL PHASE
BUNKER HILL STUDY

Bunker Hill Company
Kellogg, Idaho

SURVEY DATES:

September 2-4, 1975
October 6-10, 1975
November 10-21, 1975

SURVEY CONDUCTED BY:

Division of Surveillance, Hazard Evaluations and Field Studies
Regional Industrial Hygienists
National Institute for Occupational Safety and Health

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I. TOXICITY DETERMINATION

This report contains information of findings of IH surveys conducted at the Bunker Hill Company lead smelter and zinc plant during October, 1975. The report also contains information from a review of the literature conducted upon receipt of the HHE request. Results of medical examinations are being tabulated and evaluated. Upon completion of this study, a determination will be made whether substances normally used as found in the work place are potentially toxic in such concentrations used or found.

A. LITERATURE REVIEW

A review of the literature conducted upon receipt of the Health Hazard Evaluation request revealed that: 1) arsenic and cadmium are known carcinogens in animals and suspect carcinogens in humans. 2) lead and cadmium are nephrotoxic; 3) lead is also responsible for central and peripheral nervous system damage and/or dysfunction; 4) sulfur dioxide and sulfuric acid mist are both acute and chronic respiratory irritants; 5) cadmium, copper, antimony, nickel and zinc fumes have been documented to cause metal fume fever; 6) cadmium fume can cause acute pneumonitis and/or acute pulmonary edema; 7) general dust can act as a nucleus for entrainment of sulfur dioxide resulting in acute lower respiratory tract irritation, including pulmonary edema; 8) antimony currently is suspected as being a human carcinogen; 9) cobalt can cause chronic interstitial pneumonitis, as well as skin and respiratory allergic reactions; and 10) arsine exposure can cause massive hemolysis leading to renal failure.

B. INDUSTRIAL HYGIENE SURVEYS

A total of 2316 samples for a total of 6269 determinations were collected at the lead smelter and zinc plant during October and November, 1975 to evaluate exposure in the work environment. Lead in air concentrations exceeded the proposed federal occupational (OSHA) standard of 0.1 mg/m^3 in all areas surveyed at the lead smelter except for crushing, grinding, and flotation operations. Persons working in the Roaster #5 and Old Roaster Buildings at the Electrolytic Zinc Plant were also exposed to lead at levels which greatly exceeded the proposed OSHA standard of 0.1 mg/m^3 .

In general, the highest zinc oxide, antimony and manganese concentrations were measured, near the blast furnace, fuming furnace, and baghouse operations at the Lead Smelter and in the melting and roasting departments at the Electrolytic Zinc Plant. (Refer to the appropriate table for exposures exceeding OSHA standards)

Exposures to cadmium dust exceeding the current OSHA standard of 0.2 mg/m^3 occurred at the baghouse, cadmium plant and roaster buildings of the Electrolytic Plant, and at the charge preparation and crushing plants of the Lead Smelter. Exposure to cadmium fume above the current OSHA standard of 0.1 mg/m^3 occurred at the pellet and sinter plants of the Lead Smelter, and at the cadmium plant of the Electrolytic Zinc plant.

General work area concentrations of sulfur dioxide at the roaster buildings of the zinc plant exceeded the ceiling values at 10 ppm recommended by the American Conference of Governmental Industrial Hygienists. However, calculated as 8-hour time-weighted average concentrations, the workers' exposure to sulfur dioxide in this area were less than the current and proposed OSHA standards of 5 and 2 ppm, respectively in the Roaster #5 but above the OSHA standard in the old roaster building.

Persons working in the cell room were exposed to sulfuric acid mist at concentrations above 1.0 mg/m³. However, the standard for sulfuric acid mist is based on a time weighted average concentration. Therefore, persons working in the cell room and exposed to sulfuric acid mist did not exceed the TWA concentration standard of 1.0 mg/m³.

Full shift personal samples were collected to determine TWA exposure concentrations for each worker participating in the survey. Sample results represent the exposure of workers to air contaminants existing at the time of the survey. Some plant processes at the lead smelter were not operating at full capacity during the survey. The sample results may or may not be representatives of conditions when these processes are operating at full capacity.

The appendix gives a comparison of Bunker Hill and NIOSH data. The samples were taken several months apart by the Bunker Hill Company and NIOSH industrial hygienists under various smelter operating conditions. A portion of the NIOSH samples were taken when the lead smelter was on curtailed operating conditions. Samples were analyzed by different laboratories. The Bunker Hill Co. excluded what the company considered "outliners" in 15 of the 18 job categories. NIOSH included all sample results. Therefore, it may be unfair to compare the Bunker Hill and NIOSH results; both may be correct for the environmental conditions existing at the time the samples were collected.

Ideally, it would be advisable for NIOSH to have taken a number of samples for all job categories. Cost of such a study would be prohibitive.

In spite of the problem listed, both NIOSH and Bunker Hill Co. data indicate air concentrations of lead greatly exceeding current OSHA standards of 0.2 milligrams per cubic meter in most areas where company and NIOSH data are compared.

Though the Bunker Hill Company questions some of the NIOSH sample results, "see company comments", the Bunker Hill Co. data clearly indicates extremely high lead air concentrations in some areas.

This report indicates areas where high concentration of toxic air contaminants were measured. A review of the tables in the report will also document areas where current OSHA standards were not exceeded.

II. 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 re-

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. A request for a Health Hazard Evaluation (HHE) was submitted to the National Institute for Occupational Safety and Health (NIOSH) by the United Steelworkers of America, Local 7854, on August 25, 1975. The HHE identified lead, cadmium, arsenic, general dust, sulfur dioxide and other metals or materials as substances which are normally present in the work environment and which may constitute a toxic exposure to employees working in all processes involving crushing and milling of raw ore, smelting and refining, and handling of the finished products. The request was deemed valid by NIOSH based on verification that the request complied with provisions of the Occupational Safety and Health Act of 1970.

III HEALTH HAZARD EVALUATION

A. DESCRIPTION OF PROCESS

Figure 1 depicts the Bunker Hill material flow.

Concentrator

Ore from the mining operations is transported to a plant called a concentrator where it is upgraded or concentrated.

To start the mechanical phase of concentrations, ores are dumped into bins at the crushing plant. They are then crushed and screened in two steps, reducing the material from a diameter as large as 12 inches, down to less than 1 inch. From there the ores are transported to a 2500 ton storage bin by means of seven feeders and conveyed inside to the ball mill bins. The ore is then drawn from these bins into the ball mills for further reduction in size. The ball mills rotate constantly and contain water and a charge of 40 tons of steel balls.

Crushed ore introduced into the ball mills is pulverized by the tumbling action of the balls, which are used up at the rate of approximately two pounds for every ton of ore ground. To free one mineral from another, the ore must be ground to about the size of fine sugar. The ore is discharged from the ball mill into a classifier. This mixture is of a siltlike consistency, about 80% solids by weight. The classifier equipment separates the properly ground ore from the coarse material. The oversize, coarse material is transferred to smaller (7' x 10') ball mills where it is reground. The fine material (60% minus 200 mesh) about 50% solids, is pumped to the lead flotation cells.

While in the ball mills, controlled introduction of certain reagents and additives, such as soda ash, sodium cyanide, zinc sulfate, and sodium isopropyl xanthate, make it possible to condition the pulp for flotation. Then, in the lead flotation cells, large propellers stir the solution; air is introduced to make bubbles; and the leadbearing minerals separate from the rest of the solution and are skimmed off the flotation cell as a froth. The remaining solution is further conditioned by additional reagents, such as copper sulfate and lime, and is pumped into the zinc flotation cells. Here, in a similar type of process as occurs in the lead flotation cells, the zinc-bearing minerals are floated away from the tailings.

Once separated, the lead and zinc concentrates are thickened by settling in separate tanks. The thickened slurry is then drawn off and fed to separate vacuum drum filters which reduce the moisture content to about 7% in the lead concentrate and 12% in the zinc concentrate. The concentrating process is now complete and the metal content has been upgraded from an average of 5-7% lead in the mine ore to 65% lead in the lead concentrate. The concentrate also contains approximately 6% zinc and about 40 ounces of silver per ton. Zinc concentrates contain about 54% zinc and 1.5% lead, with six ounces of silver per ton.

Smelter

Crude ores and concentrate arriving at the smelter are weighed and sampled to determine metallurgical composition and to provide the basis for payment on custom material.

Following sampling, the concentrates are dumped into storage bins at the ore preparation unit. Proper proportions of concentrates, crushed crude ores and fluxes are drawn from the bins, mixed thoroughly and pelletized. Conveyor belts carry the pelletized mixture to the sintering units where undesirable sulfur is removed by roasting. This operation also properly prepares the mixture for the blast furnace by agglomeration (gathering together in a porous mass). The resulting material is called sinter.

The sinter, now ready for the blast furnace, is mixed with coke and conveyed to the top of the furnace. Sufficient coke is added with the sinter to assure reduction, or release, of the metal from the sinter and other materials in the furnace. The blast furnace is essentially an oversized, water-jacketed chimney. Thus, air introduced through tuyeres, or ports, near the bottom of the furnace and gaseous reducing agents supplies oxygen to burn the coke, which in turn furnishes the heat necessary to smelt the charge into two products--a lead bullion and a waste material called slag. By virtue of reducing conditions in the furnace, solubility in lead, and density of lead bullion, i.e. copper, gold, silver, arsenic, antimony and bismuth are collected with the bullion which collects at the bottom, of the furnace and is drawn off in a continuous pour. The lighter slag floats on top of the bullion and is tapped off intermittently.

Because the blast furnace slag contains a higher percentage of zinc, it is stored in large pots and then charged in the molten state to a slag fuming furnace at a predetermined rate.

Air and coal are introduced into the fuming furnace and the bath heated until the metal is volatilized. The zinc vapor is oxidized in the top part of the furnace to zinc oxide fume.

The fume is then rapidly cooled by means of cooling pipes and collected in a baghouse. This zinc oxide powdered product is loaded in covered railcars and shipped to a paint manufacturer. In addition, heat from the waste gases of the fuming furnace produces steam which is used throughout the smelter for heat and also to drive auxiliary equipment.

The molten bullion from the blast furnace operation is transported in iron pots by an overhead crane to the lead refinery for separation of the various impurities. Firstly, the hot blast furnace bullion is cooled to partially remove impurities such as arsenic, antimony, nickel, zinc, sulfur and other elements as a cooling dross. Secondly, copper is extracted by the addition of sulfur and then cooling to separate and to rise to the surface as a dross. Once skimmed, the copper and cooling dross are smelted in a reverberatory furnace and the matte is sold to copper refiners.

Then, copper - free lead from the dressing kettles is pumped through a continuous softening process which removes arsenic and antimony and by oxidation and forms a skim. An electric furnace is used to treat this skim, producing an arsenical - antimonial lead known as hard lead.

Removal of gold and silver is the next phase in the refining process. Zinc metal is added to the lead in two steps; firstly, for the removal of gold, and secondly, for the removal of silver. The gold and silver combine with the zinc, and on cooling from a dross which is skimmed off and sent to the silver refinery. The zinc is then removed through retorting, and lead is taken off by cupellation. In the silver refinery the gold skim is refined by retorting and cupellation which produces a gold-silver alloy known as dore' metal.

The residual zinc not removed from the bullion after the gold and silver drosses have been skimmed off is removed by a vacuum dezincing process. In this operation, zinc is evaporated from the lead and redeposited as a metallic zinc on a condenser.

Addition of sodium hydroxide removes the last traces of impurities and the final product, corroding lead (99.98% pure), is cast for marketing in three forms: 100-pound pigs, 25-pound sectional ingots and one-ton blocks.

Zinc Plant

The feed for this facility arrives at the plant from many local and distant sources, including overseas. Following sampling and weighing, the concentrates are dumped into bins for storage. From storage they are moved to a dryer which reduces the moisture content to about four percent. Then they are taken to the drying hearths of the flash roaster where the drying process is completed.

The concentrates are then fed to a ball mill for fine grinding and then to an air classifier which separates the oversize materials. The oversize material is returned to the ball mill for regrinding; the undersize (-200 mesh) material is collected and fed back into the main section of the roaster where the sulfur is burned off in the form of sulfur dioxide gas (SO_2). Two 350-ton-per-day sulfuric acid units capture the SO_2 gas from the flue system and convert it into sulfuric acid (H_2SO_4) for utilization in the fertilizer plant or for marketing as sulfuric acid.

The sulfur-free, fine material which remains after roasting is called calcine. It is weighed in hoppers and apportioned into leach tanks. Returned electrolyte from the cell room (sulfuric acid) is then mixed with the calcine and the resulting reaction forms a leach solution. The zinc in

it is in solution with copper, cadmium, arsenic, antimony, cobalt, and nickel. Insolubles suspended in this mixture include lead, silver, gold iron, silica and calcium.

This impure zinc sulfate pulp is now pumped into Burt filters. These filters are 5-feet in diameter, 40-feet long, and are made of wood and steel. As the solution passes through a nylon canvas filter medium, the insolubles suspended in the mixture are deposited on the canvases. When filtration is complete, the cake is removed and is mixed with water to form a slurry. The slurry is discharged from ports at the end of the Burt filter and is piped to thickeners.

Residue settling to the bottom of the thickeners is collected, filtered and dried. The dried residue is sent to the lead smelter for recovery of contained metals, particularly lead, zinc and silver.

Purification of the zinc sulfate solution, which has passed through the Burt filters, is the next step in the process. A quantity of the solution is drawn into an agitated tank and enough zinc dust is added to precipitate or cement the copper. The solution then passes through a plate and frame filter press where the copper cement is filtered out. This same process is repeated step by step through four stages, and other impurities such as cadmium, cobalt, nickel, antimony and arsenic are precipitated out of the solution. Between each of the stages there is filtration, with the residue from the first two filtrations processed into a slurry for the cadmium plant. The residue from all other stages is returned to the first purification stage.

In the cadmium plant the residue is leached with spent electrolyte from the cell room and the copper is filtered out. Next, zinc dust is added to the remaining solution, and the cadmium is removed by precipitation and filtration. The resulting cadmium product, called sponge, is dissolved in a cadmium-cell electrolyte from which the cadmium metal is recovered by electro winning and then melted and cast into various shapes.

The zinc neutral solution produced in the purification section is drawn off in a continuous flow to the cell room. It is then used to replenish the zinc supply in the cell room solution, as it flows through the cells at a rate of 15 gpm through each cell. The zinc is electrowon from the solution and deposited on aluminum cathodes in the electrolytic cells. The cathodes are pulled either manually or mechanically every 24-hours and the zinc stripped and sent to the primary melting furnaces. The spent electrolytes is then returned to the leaching section. The 99.98+% pure zinc metal is tapped from the furnaces and cast into one ton blocks, 60-pound slabs, or pumped to alloy furnaces. In the alloy furnaces the zinc metal is mixed by the prescribed addition of certain other metals as specified in the production of various zinc alloys.

DESCRIPTION OF PLANT

The Bunker Hill and Sullivan Mining and Concentrating Company was first incorporated in 1887 and the present name of the Bunker Hill Company was

adopted in 1956. The corporate headquarters and major operations of the Company are located at Kellogg, Idaho, in the famed Coeur d'Alene mining district.

The Bunker Hill Company was originally involved in only the mining and concentrating of lead-silver ore as found in the Bunker Hill Mine. The company presently owns outright or has interest in five other mines producing, or about to produce, lead, silver, and/or zinc. Also included in the Kellogg complex is a dry chemical fertilizer plant, as well as lead and zinc smelting and refining facilities.

The first concentrator was constructed in 1886. The present concentrator, known as the "West mill," was built in 1912 and has been modified & modernized through the years.

Construction of Bunker Hill's lead smelter started in May, 1916 with the first blast furnace being put on line July 5, 1917.

Prior to construction of the company smelter and subsequent to that period until the 1930s, concentrates from the Bunker Hill Mine were smelted at the Tacoma smelter in Tacoma, Washington.

The Bunker Hill Electrolytic Zinc Plant has been in production since November, 1928. Known then as the Sullivan Mining Company Zinc Plant, this was the first commercial refining unit in the U.S.A. to produce zinc of such high purity, i.e., 99.99+%.

With two small electrolytic units the initial plant has a capacity of 50 tons per day. This was enlarged in 1937 when a third unit brought plant output to 120 tons daily. Eleven years later the addition of a fourth unit raised the capacity to 160 tons. The fifth unit in 1957, the sixth in 1963, and the seventh unit in 1967 increased the plant's daily production to about 310 tons.

The total work force of The Bunker Hill Company, which includes mining, concentrating, lead smelter, zinc plant and phosphate fertilizer plant, is 1500 steelworkers, 200 AFL and 350 salaried personnel. There are 48 female employees employed as production or maintenance personnel. A breakdown of employees by department is contained in Table 1.

The company's surface plants operate three shifts per day, seven days per week. Major products are lead, zinc, zinc oxide, cadmium, zinc alloys, silver, antimonial - arsenical lead, gold dross, copper matte, cobalt, sulfuric acid, nickel, phosphoric acid (52% P₂O₅), weak phosphoric acid (28% P₂O₅), superphosphoric acid (70% P₂O₅) and four grades of fertilizer (16-20-0, (16-20-0, 11-48-0, 13-39-0, and 18-46-0).

B. EVALUATION DESIGN

On September 2, 1975 Drs. Hector Blejer and Alan Palmer and Messrs. Dave Bayliss, Lee Larsen, Bruce Gehring, and Mel Cassady, NIOSH, met with officials from Bunker Hill Company and with Dr. Jerome Cole, International Lead and Zinc Research Organization (ILZRO), to discuss the request for the

HHE; NIOSH's requirements under federal regulations for conducting HHEs; and the requirements of the company.

At the completion of the meeting a walk-through survey was conducted. Observations made during the walk-through survey provided the basis for the protocol of the environmental phase of this study.

ENVIRONMENTAL PHASE-PART ONE:

On October 6, 1975 the first part of the environmental phase of the study began. Messrs. Troy Marceleno, Gary Streepy, Mark Jones, and Mel Cassady, NIOSH Division of Surveillance, Hazard Evaluations and Field Studies (DSHEFS) with the assistance of Mel Okawa, NIOSH Region IX, surveyed the primary crushers, concentrator, and lead smelter. Messrs. Lee Larsen, Robert Vandervort and Robert Miller of the NIOSH Western Area Laboratory for Occupational Safety and Health (WALOSH) with the assistance of Arvin Apol, NIOSH Region X, and Dr. Bobby Gunter, NIOSH Region VIII, surveyed the zinc plant.

Exposures to lead and cadmium were evaluated for a high percentage of exposed day shift workers in the lead smelter, zinc plant, primary crusher and concentrator. Samples for other heavy metals, sulfur dioxide, sulfates, (SO₂), acid mists, carbon monoxide, free silica, and hydrogen sulfide were taken in work areas where exposures to these substances occur. Sequential samplers were used in the lead smelter and zinc plant to check for variations in the concentration of toxic air contaminants during various shifts. General area samples were analyzed by phase contrast microscopy for particle size distribution.

ENVIRONMENTAL PHASE-PART TWO:

On November 9, 1975 the second part of the environmental phase began. Messrs. Gary Streepy, Harry Donaldson and Mel Cassady, DSHEFS, with the assistance of Irving Kingsley, NIOSH Region II, and Wes Straub, NIOSH Region III, surveyed the primary crusher, concentrator, and lead smelter during the first week. Messrs. Harry Donaldson, Eric Kus, and Mel Cassady, DSHEFS, with the assistance of Wes Straub, NIOSH Region III and Paul Roper, NIOSH Region IV conducted the remaining field work required the second week. Messrs. Robert Vandervort, Robert Miller, Roger Swindle and Lee Larsen, WALOSH, with the assistance of Harry Markel, NIOSH Region VI, surveyed the zinc plant during the first week. Robert Miller, Roger Swindle, George Butler and Lee Larsen of WALOSH with the assistance of Arvin Apol, NIOSH Region X, conducted the remaining field work required. Exposure to lead, cadmium and arsenic were evaluated for all job categories sampled during the day shift or the swing shift in the primary crusher, concentrator, lead smelter and zinc plant. Samples for other heavy metals, SO₂, SO₃, acid mists, free silica, arsine, hydrogen sulfide, nitrogen dioxide and ozone were taken in work areas where exposures to these substances occur. Sequential samplers were used in both plants to check for variations in air concentration of SO₂ and heavy metals during various shifts.

An experimental package for a new arsenic sampling method utilizing an impregnated filter medium to collect As O vapor specie, if present, was used. The experiment was designed also to determine the efficiency of the recommended NIOSH method for collecting arsenic. The field testsampling method of the experimental design was performed by a consultant with the assistance of NIOSH personnel. The consultant was also responsible for the analyses.

C. EVALUATION METHODS

All personal samples were 8 hour TWA's and for most seven to eight hours in duration with the exception of the strippers in the cell room. In this job category, the samples were calculated as a TWA because the stripper work on an incentive program and usually complete their work in approximately five hours.

The outlines of the sampling and analytical methods used are:

1. Heavy Metals

Samples for heavy metals were collected using an MSA Model G pump at a flow rate of 2.0lpm using Millipore AA filters as the collection medium. These samples were analyzed by atomic absorption spectrometry.

2. Free Silica

Free silica samples were taken on a respirable mass basis as outlined in the pertinent NIOSH Criteria Document. These samples were analyzed for free silica using x-ray diffraction.

3. Sulfur Dioxide and Sulfates

Area samples for sulfur dioxide and sulfates were collected in an impinger using a sequential sampler at a flow rate of 5 lpm using an acidic peroxide solution as a collection medium. The impinger was preceded by a Millipore AA filter to remove water soluble and insoluble sulfates. The sulfuric acid collected in the impinger was analyzed by titration. The prefilter was leached with water and analyzed for total sulfates.

4. Sulfuric Acid Mist

Samples for sulfuric acid were collected using an MSA sampling pump at a flow rate of 1-2pm using Millipore AA filters as a collection media. The samples were analyzed using a titration method for sulfate.

5. Carbon Monoxide, Ozone, Nitrogen Dioxide, Hydrogen Sulfide

Carbon monoxide, ozone, nitrogen dioxide, and hydrogen sulfide concentrations were determined using NIOSH-approved detector tubes and sampling pumps.

6. Arsenic

Samples for arsenic were collected using an MSA Model G pump at a flow rate of 2.0 lpm using Millipore AA filters as the collection medium. The arsenic concentrations were determined by generating the gaseous hydride of arsenic and analyzing by atomic absorption spectrometry.

7. Arsine

Arsine concentrations were determined by using NIOSH-approved detector tubes and sampling pump.

8. Respirable Particulates

Respirable particulate samples were collected using an MSA Model G pump at a flow rate of 1.7 lpm using a 10mm nylon cyclone to remove those particles greater than 10 microns in diameter and also using a second stage consisting of a pre-weighed 37mm Millipore AA filter. The respirable fraction was determined gravimetrically.

D. EVALUATION CRITERIA

1. Environmental

The criteria for evaluating the employee exposures were selected from 5 sources (the criteria relates to 3 sources, ACGIH, NIOSH and OSHA and the remaining two are variations of the three basic sources):

(a) Current legal standards: The Occupational Health Standards promulgated by the U.S. Department of Labor, Federal Register, June 27, 1974 Title 29 Chapter XVII, Part 1910 Sub-Part Z, Table Z-1 and Z-2 for 8-hour time-weighted average exposures;

(b) OSHA Proposed Standards: The airborne exposure limits which have been proposed; by the Occupational Safety and Health Administration (OSHA);

(c) NIOSH recommended Standards. The airborne exposure limits which NIOSH has recommended to OSHA for Occupational Health Standards;

(d) Threshold Limit Values (TLVs): Guidelines for airborne exposures recommended by ACGIH for 1975; and

(e) TLV-Intended Changes: The intended changes to the guidelines for airborne exposures recommended by the ACGIH for 1975.

The criteria used in this investigation to assess potential health hazards from airborne exposures are:

<u>Substance</u>	<u>Source</u>	<u>8-hour TWA Average</u>
Cadmium Dust	ACGIH-TLV Proposed	0.05 mg/m ³
	ACGIH-TLV	0.2 mg/m ³
	OSHA Current Legal Standard	0.2 mg/m ³
Cadmium Fume	ACGIH-TLV	0.05 mg/m ³
	OSHA Current Legal Standard	0.1 mg/m ³
Zinc Oxide	ACGIH-TLV	5.0 mg/m ³

	NIOSH Criteria	5.0 mg/m ³
	OSHA Current Legal Standard	5.0 mg/m ³
Nickel	ACGIH-TLV	1.0 mg/m ³
	OSHA Current Legal Standard	1.0 mg/m ³
Cobalt	ACGIH-TLV	0.1 mg/m ³
	OSHA Current Legal Standard	0.1 mg/m ³
Antimony	ACGIH-TLV Proposed	0.05 mg/m ³
	ACGIH-TLV	0.5 mg/m ³
	OSHA Current Legal Standard	0.5 mg/m ³
Manganese	ACGIH-TLV	5.0 mg/m C
	OSHA Current Legal Standard	5.0 mg/m C
Lead	ACGIH-TLV	0.15 mg/m ³
	OSHA Proposed Standard	0.1 mg/m ³
	OSHA Current Legal Standard	0.2 mg/m ³
	NIOSH Criteria	0.15 mg/m ³
Arsenic	ACGIH-TLV Proposed	0.05 mg/m ³
	ACGIH-TLV	0.5 mg/m ³
	NIOSH Criteria	0.004 mg/m ³

	OSHA Proposed	0.004 mg/m ³
	OSHA Current Legal Standard	0.5 mg/m ³
Arsine	ACGIH-TLV	0.05 ppm 0.2 mg/m ³
	OSHA Current Legal Standard	0.05 ppm ³ 0.2 mg/m ³
Copper Dust & Mist	ACGIH-TLV	1.0 mg/m ³
	OSHA Current Legal Standard	1.0 mg/m ³ 1.0 mg/m ³
Copper Fume	ACGIH-TLV	0.2 mg/m ³
	OSHA Current Legal Standard	0.1 mg/m ³
Sulfur Dioxide	ACGIH-TLV	13 mg/m ³ 5 ppm
	NIOSH Criteria	5 mg/m ³ 2 ppm
	OSHA Proposed	5 mg/m ³ 2 ppm
	OSHA Current Legal Standard	13 mg/m ³ (5 ppm)
Sulfuric Acid	ACGIH-TLV	1.0 mg/m ³
	NIOSH Criteria	1.0 mg/m ³
	OSHA Current Legal Standard	1.0 mg/m ³

E. EVALUATION RESULTS AND DISCUSSION

Tables 2 through 4 summarize the results from the analysis of personnel samples. Tables 5 through 25 summarize results by specific contaminants.

LEAD: Mines Plant (Mines & Concentrators)

1. Concentrator-Production Areas: 3 of 5 (20%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 3 of 15 (20%)

- 0.1 mg/m of air (Table 5).
2. Concentrator-Maintenance: 3 of 10 (30%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 5 of 10 (50%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 5).

LEAD: Lead Smelter

1. Charge Preparation
 - a. Crane Crew: 9 of 12 (75%) of the samples for lead exceeded the current legal standard of 0.2 mg/m and 10 of 12 (83%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - b. Charge Preparation Plant: 7 of 9 (78%) of the samples for lead exceeded the current legal standard of 0.2 mg/g³ and 8 of 9 (89%) of the samples exceeded the proposed OSHA standards of 0.1 mg/m³ of air (Table 6).
 - c. Crushing Plant: 4 of 4 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 4 of 4 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - d. Belt Crew: 6 of 6 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 6 of 6 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
2. Sintering
 - a. Pellet Plant: 2 of 2 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - b. Sinter Plant: 4 of 4 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 4 of 4 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
3. Smelter
 - a. Blast Furnace: 9 of 10 (90%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 10 of 10 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - b. Fuming Furnace: 17 of 20 (85%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 20 of 20 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
4. Refining
 - a. Lead Refinery: 10 of 14 (71%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 13 of 14 (93%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - b. Casting and Loading: 5 of 15 (33%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 10 of 15 (67%) of the samples exceeded the proposed OSHA standard 0.1 mg/m³ of air (Table 6).

- c. Cadmium Plant: 2 of 4 (50%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 3 of 4 (75%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - d. Silver Refinery: 5 of 6 (83%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 5 of 6 (83%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
5. Materials Recovery
- a. Labor Pool: 9 of 9 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 9 of 9 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - b. Dry House: 1 of 5 (20%) of the samples for lead exceeded the current standard of 0.2 mg/m^3 , and 4 of 5 (80%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - c. Acid Plant: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - d. Effluent Plant: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - e. Cadmium Plant: 2 of 4 (50%) of the samples for lead exceeded the current legal standard of 0.2 mg/g^3 , and 3 of 4 (75%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - e. Baghouse Service: 1 of 1 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - f. Baghouse Operator: 3 of 3 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 3 of 3 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
6. Maintenance
- a. Maintenance S-1: 5 of 6 (83%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 6 of 6 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - b. Maintenance S-2: 4 of 4 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 4 of 4 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - c. Maintenance S-3: 13 of 13 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 13 of 13 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - d. Maintenance S-4: 15 of 16 (94%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 16 of 16 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 6).
 - e. Maintenance S-5: 3 of 4 (75%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 4 of 4 (100%) of

- the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
- f. Maintenance S-7: 6 of 7 (86%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 7 of 7 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - g. Maintenance S-8: 1 of 1 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).
 - h. Maintenance S-10: 4 of 4 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 4 of 4 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 6).

LEAD: Zinc Plant

1. Acid Plant

- a. Operator - Helper: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- b. Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the OSHA standard of 0.1 mg/m³ of air (Table 7).

2. Baghouse & Cottrell

- a. Operator/Flue Dustman: 6 of 6 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 6 of 6 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- b. Maintenance: 1 of 1 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- c. Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

3. Cadmium Plant

- a. Caster: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- b. Shifter/Leadman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- c. Pressman/Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

4. Concentrate Handling

- a. Concentrate Handling Operator: 2 of 4 (50%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 3 of 4 (75%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).
- b. Loader - Helper: 3 of 3 (100%) of the samples for lead exceeded

the current legal standard of 0.2 mg/m³, and 3 of 3 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

- c. Ore Loader: 5 of 6 (83%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 5 of 6 (83%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

5. Electrolytic Department

a. Anode Shop

(1) Fabrication: 1 of 2 (50%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 2 of 2 (100%) of the samples exceeded proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

b. Cellroom

(1) Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(2) Leadman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(3) Cell repair: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 8 of 23 (35%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(4) Stripper: 1 of 17 (6%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³, and 1 of 17 (6%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(5) Utility - Cleanup: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ but 1 of 2 (50%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

6. Leach Department

a. Leach

(1) Leachman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(2) Mud Mill Operator: 2 of 2 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m³ and 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(3) Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(4) Shift Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

b. Burt Filter

(1) Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

(2) Repairman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

7. Maintenance

a. Z-1 Area

- (1) Maintenance Mechanic: 12 of 15 (80%) of the the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 14 of 15 (93%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Maintenance Relief Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/g^3 , but 1 of 1 (100%) exceeded the proposed OSHA standard of 0.1 mg/g^3 of air (Table 7).
- (3) Oiler: 8 of 8 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/g^3 , and 8 of 8 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

b. Z-2 Area

- (1) Maintenance Mechanic: 6 of 11 (50%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 7 of 11 (50%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Mechanic Helper: 1 of 4 (25%) of the samples for lead exceeds the current legal standard of 0.2 mg/m^3 , and 2 of 4 (50%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (3) Oiler: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

c. Melting Department Maintenance

- (1) Mechanic: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Mechanic Helper: 1 of 1 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

d. Cellroom Maintenance

- (1) Carpenter Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Oiler: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (3) Carpenters: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (4) Mechanics: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

e. Machine Shop

- (1) Welder: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Blacksmith: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (3) Machinist Apprentice: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

8. Melting Department

a. Casting

- (1) Shift Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

- (2) Melting Department Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (3) Skimming and Lading: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (4) Scrap Furnace Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (5) Furnaceman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (6) Alloyer: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

b. Shipping

- (1) Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- (2) Scaleman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

9. Purification Department

- a. Foreman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- b. Pressman: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- c. Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- d. Laborer - Cleanup: 1 of 4 (25%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 2 of 4 (50%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- e. Tank Hitter: None of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 or the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).

10. Roasters

- a. Operator: 5 of 5 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 and the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- b. Helper: 3 of 3 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 3 of 3 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- c. Lancer: 4 of 4 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 4 of 4 (100%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- d. Boiler Operator: 2 of 3 (67%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 2 of 3 (67%) of the samples exceeded the proposed OSHA standard of 0.1 mg/m^3 of air (Table 7).
- e. Wedge Operator: 2 of 2 (100%) of the samples for lead exceeded the current legal standard of 0.2 mg/m^3 , and 2 of 2 (100%) of the

samples exceeded the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

- f. Pre Treatment Operator: None of the samples for lead exceeded the current legal standard of 0.2 mg/m³ or the proposed OSHA standard of 0.1 mg/m³ of air (Table 7).

CADMIUM: (Mine & Concentrators)

Mines Plant

1. Concentrator-Production Areas: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 8).
2. Concentrator-Maintenance: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV standard of 0.05 mg/m³ of air (Table 8).

CADMIUM: Lead Smelter

1. Charge Preparation

- a. Crane Crew: 1 of 11 (9%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 11 of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Charge Preparation Plant: 5 of 11 (45%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 5 of 11 (45%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- c. Crushing Plant: 1 of 4 (25%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 1 of 4 (25%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- d. Belt Crew: 2 of 6 (33%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 2 of 6 (33%) of the samples exceeded the proposed ACGIH-TLV of mg/m³ of air (Table 9).

2. Sintering

- a. Peller Plant: 1 of 3 (32%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 2 of 3 (67%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Sinter Plant: 1 of 4 (25%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ and 4 of 4 (100%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).

3. Smelter

- a. Blast Furnace: 2 of 11 (20%) of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³, and 5 of 10 (60%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Fuming Furnace: 1 of 21 (5%) of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³, and 1 of 21 (5%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).

4. Refining

- a. Lead Refinery: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³, or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Casting and Loading: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- c. Cadmium Plant: 2 of 4 (50%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ and 2 of 4 (50%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- d. Silver Refinery: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).

5. Materials Recovery

- a. Labor Pool: 4 of 9 (44%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, but 5 of 9 (56%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Dry House: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- c. Acid Plant: The one sample for cadmium did not exceed the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- d. Effluent Plant: The one sample for cadmium did not exceed the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- e. Baghouse Service: The one sample for cadmium did not exceed the current legal standard of 0.1 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- f. Baghouse Operator: 3 of 7 (43%) of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³, and 4 of 7 (57%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).

6. Maintenance

- a. Maintenance S-1: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- b. Maintenance S-2: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, but 2 of 4 (50%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- c. Maintenance S-3: 1 of 11 (9%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 8 of 11 (73%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- d. Maintenance S-4: 1 of 20 (5%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, and 8 of 20 (40%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- e. Maintenance S-5: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, but 1 of 4 (25%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- f. Maintenance S-7: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).
- g. Maintenance S-8: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV

- of 0.05 mg/m³ of air (Table 9).
- h. Maintenance S-10: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 9).

CADMIUM: Zinc Plant

1. Acid Plant

- a. Operator-Helper: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- b. Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

2. Baghouse & Cottrell

- a. Operator/Flue Dustman: 2 of 6 (33%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust, 3 of 6 (50%) exceeded the current legal standard of 0.1 mg/m³ for a fume; and 5 of 6 (83%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- g. Maintenance: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust; 1 of 1 (100%) exceeded the current legal standard of 0.1 mg/m³ for a fume; and 1 of 1 (100%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- c. Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust; 0.1 mg/m³ for fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

3. Cadmium Plant

- a. Caster: 2 of 3 (67%) of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for fume and 3 of 3 (100%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- b. Shifter/Leadman: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for fume, but 1 of 3 (33%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- c. Pressman/Operator: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for fume, 2 of 5 (40%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

4. Concentrate Handling

- a. Concentrate Handling Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust, and 1 of 4 (25%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- b. Loader-Helper: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust and none of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- c. Ore Loader: 1 of 6 (15%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust and 5 of 6 (83%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

5. Electrolytic Department

a. Anode Shop

(1) Fabrication: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

b. Cellroom

(1) Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Leadman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(3) Cell repair: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(4) Stripper: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(5) Utility-Cleanup: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

6. Leach Department

a. Leach

(1) Leachman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Mud Mill Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(3) Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(4) Shift Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

b. Burt Filter

(1) Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Repair: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

7. Maintenance

a. Z-1 Area

(1) Maintenance Mechanic: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust, 11 of 11 (73%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Maintenance Mechanic Apprentice: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m^3 for fume, but 6 of 10 exceeded the current legal standard of 0.2 mg/m^3 for dust, but 6 of 10 (60%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m^3

of air (Table 10).

(3) Maintenance Relief Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(4) Oiler: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 , for dust, but 3 of 7 (43%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

b. 2-2 Area

(1) Maintenance Mechanic: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 , for dust, but 2 of 11 (18%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Mechanic Helper: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(3) Oiler: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

c. Melting Department Maintenance

(1) Mechanic: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 , for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Mechanic Helper: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

d. Cellroom Maintenance

(1) Carpenter Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Oiler: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(3) Carpenters: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(4) Mechanics: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

e. Machine Shop

(1) Welder: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m^3 for fume or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Blacksmith: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m^3 for fume or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(3) Machinist Apprentice: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

8. Melting Department

a. Casting

(1) Shift Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m^3 for dust or the proposed ACGIH-TLV of 0.05 mg/m^3 of air (Table 10).

(2) Melting Department Operator: None of the samples for cadmium exceeded

the current legal standard of 0.2 mg/m³ for dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

(3) Skimming and Ladling: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

(4) Scrap Furnace Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

(5) Furnaceman: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for a fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

(6) Alloyer: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for a fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

b. Shipping

(1) Operator: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for a fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

(2) Scaleman: None of the samples for cadmium exceeded the current legal standard of 0.1 mg/m³ for a fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

9. Purification Department

a. Foreman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

b. Pressman: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

c. Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

d. Laborer - Cleanup: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

e. Tank Hitter: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a fume or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

10. Roasters

a. Operator: 1 of 5 (20%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for a fume, and 5 of 5 (100%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

b. Helper: 1 of 3 (33%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for fumes, and 3 of 3 (100%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

c. Lancer: 1 of 4 (25%) of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³, for fumes and 3 of 4 (75%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

d. Boiler Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust, and 2 of 3 (67%) of the samples exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).

e. Wedge Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for fumes, but 2 of 2 (100%) of the samples

- exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 10).
- f. Pre Treatment Operator: None of the samples for cadmium exceeded the current legal standard of 0.2 mg/m³ for dust or the proposed ACGIH-TLV of 0.05 mg/m³ of air. (Table 10).

ZINC: Mines Plant (Mine Concentrators)

1. Concentrator-Production Areas: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 11).
2. Concentrator-Maintenance: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 11).

Zinc: Lead Smelter

1. Charge Preparation

- a. Crane Crew: 1 of 9 (11%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Charge Preparation Plant: 4 of 7 (57%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- c. Crushing Plant: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- d. Belt Crew: 1 of 3 (33%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

2. Sintering

- a. Pellet Plant: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Sinter Plant: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

3. Smelter

- a. Blast Furnace: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Fuming Furnace: 2 of 19 (11%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

4. Refining

- a. Lead Refinery: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Cadmium Plant: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- c. Silver Refinery: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

5. Material Recovery

- a. Labor Pool: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Dry House: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

6. Maintenance

- a. Acid Plant: The one sample taken at the acid plant did not exceed the current legal standard of 5.0 mg/m³ of air (Table 12).
- b. Baghouse Service: None of the samples for zinc exceeded the current

legal standard of 5.0 mg/m³ of air (Table 12).

- c. Baghouse Operator: 1 of 3 (33%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 12).

Only two samples out of all the maintenance areas exceeded the current legal standard for zinc of 5.0 mg/m³ of air (Table 12).

ZINC: Zinc Plant

1. Acid Plant

- a. Operator - Helper: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ and of air (Table 13).
- b. Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

2. Baghouse & Cottrell

- a. Operator/Flue Dustman: 5 of 6 (83%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13)
- b. Maintenance: 1 of 1 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- c. Foreman: 1 of 1 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

3. Cadmium Plant

- a. Caster: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- b. Shifter/Leadman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- c. Pressman/Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

4. Concentrate Handling

- a. Concentrate Handling Operator: 2 of 4 (50%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- b. Loader - Helper: 2 of 2 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- c. Ore Loader: 5 of 6 (83%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

5. Electrolytic Department

a. Anode Shop

(1) Fabrication: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

b. Cellroom

(1) Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

(2) Leadman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

(3) Cell repair: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

(4) Stripper: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

(5) Utility - Cleanup: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

6. Leach Department

a. Leach

- (1) Leachman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Mud Mill Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (4) Shift Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

b. Burt Filter

- (1) Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Repairman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

7. Maintenance

a. Z-1 Area

- (1) Maintenance Mechanic: 13 of 15 (87%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Maintenance Mechanic Apprentice: 7 of 10 (70%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Maintenance Relief Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (4) Oiler: 8 of 8 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

b. Z-2 Area

- (1) Maintenance Mechanic: 3 of 11 (27%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Mechanic Helper: 1 of 4 (25%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Oiler: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

c. Melting Department Maintenance: 2 of 3 (67%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

- (2) Mechanic Helper: 1 of 1 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

d. Cellroom Maintenance

- (1) Carpenter Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Oiler: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Carpenters: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (4) Mechanics: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

e. Machine Shop

- (1) Welder: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Blacksmith: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Machinist Apprentice: None of the samples for zinc exceeded the

current legal standard of 5.0 mg/m³ of air (Table 13).

8. Melting Department

a. Casting

- (1) Shift Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Melting Department Operator: 8 of 11 (73%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (3) Skimming and Ladling: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (4) Scrap Furnace Operator: 3 of 3 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (5) Furnaceman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (6) Alloyer: 2 of 2 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

b. Shipping

- (1) Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- (2) Scaleman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

9. Purification Department

- a. Foreman: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- b. Pressman: 1 of 3 (33%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- c. Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- d. Laborer - Cleanup: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- e. Tank Hitter: 1 of 1 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

10. Roasters

- a. Operator: 5 of 5 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- b. Helper: 2 of 2 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- c. Lancer: 4 of 4 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- d. Boiler Operator: 2 of 3 (67%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- e. Wedge Operator: 2 of 2 (100%) of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).
- f. Pre Treatment Operator: None of the samples for zinc exceeded the current legal standard of 5.0 mg/m³ of air (Table 13).

ARSENIC: Mines Plant (Mine Concentrators)

1. Concentrator-Production Areas: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 14).

2. Concentration-Maintenance: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 3 of 7 (43%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 14).

ARSENIC: Lead Smelter

1. Charge Preparation

- a. Charge Preparations: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 1 of 2 (50%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- b. Belt Crew: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).

2. Sintering

- a. Pellet Plant: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 3 of 3 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- b. Sinter Plant: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 3 of 4 (75%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).

3. Smelter

- a. Blast Furnace: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 4 of 6 (67%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- b. Fuming Furnace: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 4 of 10 (40%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).

4. Refining

- a. Lead Refinery: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 5 of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- b. Casting and Loading: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , and 1 of 10 (10%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- c. Silver Refinery: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 4 of 6 (67%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).

5. Maintenance

- a. Maintenance S-1: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- b. Maintenance S-2: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- c. Maintenance S-3: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 15).
- d. Maintenance S-4: None of the samples for arsenic exceeded the current

- legal standard of 0.5 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 15).
- e. Maintenance S-5: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 15).

ARSENIC: Zinc Plant

1. Acid Plant

- a. Operator - Helper: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

2. Baghouse & Cottrell

- a. Operator/Flue Dustman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 1 of 2 (50%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- b. Maintenance: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- c. Foreman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

3. Cadmium Plant

- a. Caster: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- b. Shifter/Leadman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- c. Pressman/Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

4. Concentrate Handling

- a. Concentrate Handling Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- b. Loader - Helper: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- c. Ore Loader: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

5. Electrolytic Department

a. Anode Shop

- (1) Fabrication: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

b. Cellroom

- (1) Cell repair: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (2) Stripper: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA action level of 0.002 mg/m^3 of air (Table 16).
- (3) Utility - Cleanup: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).

6. Leach Department

a. Leach

- (1) Shift Foreman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (2) Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (3) Mud Mill Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 , or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).

b. Burt Filter

- (1) Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (2) Repairman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).

7. Maintenance

a. Machine Shop

- (1) Welder: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (2) Blacksmith: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (3) Machinist Apprentice: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).

8. Melting Department

a. Casting

- (1) Shift Foreman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (2) Melting Depart Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (3) Skimming and Ladling: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m^3 or the proposed OSHA standard of 0.004 mg/m^3 of air (Table 16).
- (4) Scrap Furnace Operator: None of the samples for arsenic exceeded the

current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

- (5) Furnaceman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

b. Shipping

- (1) Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- (2) Scaleman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

9. Purification Department

- a. Pressman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- b. Helper: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- c. Laborer - Cleanup: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 1 of 2 (50%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- d. Sampler: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 1 of 1 (100%) of the samples exceeded the proposed OSHA action level of 0.002 mg/m³ of air (Table 16).

10. Roasters

- a. Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- b. Helper: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 3 of 3 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- c. Lancer: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 2 of 2 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- d. Boiler Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ but 1 of 2 (50%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- e. Wedge Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- e. Pre Treatment Operator: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³ or the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).
- f. Foreman: None of the samples for arsenic exceeded the current legal standard of 0.5 mg/m³, but 1 of 1 (100%) of the samples exceeded the proposed OSHA standard of 0.004 mg/m³ of air (Table 16).

ANTIMONY: Lead Smelter

1. Pellet Plant

- a. Feed Preparation Plant Operator: None of the samples for antimony exceeded

the current legal standard of 0.5 mg/m³, but 1 of 2 (50%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).

- b. Utility Laborer: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³, but 1 of 2 (50%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air. (Table 17).

2. Sinter Plant

- a. Sinter Plant Operator: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³, but 1 of 2 (50%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).
- b. Sinter Plant Assistant: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³, but 1 of 2 (50%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).

3. Smelter

- a. Blast Furnace: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³, but 4 of 10 (40%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).
- b. Fuming Furnace: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³, but 3 of 15 (20%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).

4. Refining

- a. Lead Refinery: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³ of air, but 1 of 14 (7%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).
- b. Cadmium Plant: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).
- c. Silver Refinery: None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 17).

5. Materials Recovery

- a. Labor Pool: None of the samples exceeded the current legal standard of 0.05 mg/m³, but 1 of 9 (11%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³, (Table 17).
- b. Acid Plant: None of the samples exceeded the current legal standard of 0.5 mg/m³, but 1 of 9 (11%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ (Table 17).
- c. Baghouse Service: None of the samples exceeded the current legal standard of 0.5 mg/m³, but 1 of 9 (11%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ (Table 17).
- d. Baghouse Operator: None of the samples exceeded the current legal standard of 0.5 mg/m³, but 1 of 9 (11%) exceeded the proposed ACGIH-TLV of 0.05 mg/m³ (Table 17).

ANTIMONY: Zinc Plant

None of the samples for antimony exceeded the current legal standard of 0.5 mg/m³ or the proposed ACGIH-TLV of 0.05 mg/m³ of air (Table 18).

COBALT: Lead Smelter

None of the samples for cobalt exceeded the current legal standard of 0.1 mg/m³ of air (Table 19).

MANGANESE: Lead Smelter

None of the samples for manganese exceeded the current legal standard of 5.0 mg/m³ of air (Table 21).

MANGANESE: Zinc Plant

None of the samples for manganese exceeded the current legal standard of 5.0 mg/m³ of air (Table 22).

NICKEL: Lead Smelter

None of the samples for nickel exceeded the current legal standard of 1.0 mg/m³ of air (Table 23).

NICKEL: Zinc Plant

None of the samples for nickel exceeded the current legal standard of 1.0 mg/m³ of air (Table 24).

COPPER: Lead Plant

None of the samples for copper exceeded the current legal standard of 1.0 mg/m³ of air (Table 25).

COPPER: Zinc Plant

None of the samples for copper exceeded the current legal standard of 1.0 mg/m³ of air (Table 26).

V. RECOMMENDATIONS

General Recommendations

The following are general recommendations on approaches which have been utilized and are considered to be good practices in mining and smelting operations for the effective control dust and fume exposures. For the specific methods and design which would be successful in Bunker Hill's operation it will be necessary for a staff engineer or consultant experienced in ventilation design to evaluate the needs. The existing ventilation systems should be evaluated for effectiveness. Many systems are poorly designed and/or poorly maintained.

1. Transition places should have a slope no greater than 12 degrees included angle. Transition pieces observed during the study in the crusher (High Line - Lead Smelter) went from 24" or 36" duct into a 48" duct directly with no tapered transition.
2. No two branches should enter a main directly opposite each other. One main header was observed having 5 or 6 branches entering at about the same location.
3. A branch should enter a main at no greater angle than 45 degrees. In some instances in the lead smelter, branches entered mains at 90 degrees.
4. Abrupt changes in directions of gas flow will result in wearing at that point and also plugging.
5. Exhaust points at material drops should have at least two belt widths

ahead of the drop, or placed on an enclosure sufficiently high to prevent material from bouncing into the high velocity air stream.

6. Conveyor enclosure heights should be a minimum of $3/4$ belt width off the conveyor to provide sufficient particulate settling capacity.

7. If at all possible, to reduce piston or bellows action as the material drops onto conveyor belts and properly to protect the belt, "dead beds" or "rock boxes", the width of the material flow should be installed. "V" plates should follow the dead bed to provide an air space on both sides of the conveyor enclosure as well as to center the load. The length of the "V" plate will depend on the material volume and belt speed. It should, however, be sufficiently long to insure material pass-through before reaching the end of the plate.

8. As material drops onto conveyors, to abate further escapement of material from under the enclosures, adjustable angular rubber skirts should be installed. Also, fitted rubber curtains should be installed at the entrance and exist of all conveyors enclosures.

9. Inspection ports for hoods at conveyor transfer points were left open and doors were observed to be missing or replaced by a large mesh screen all of which reduces the effectiveness of the system and should be corrected accordingly.

10. Repair of local exhaust systems is required as most were observed to be in a very poor state of disrepair.

Ore bins: The lancing of the ore bins by means of air disperses fine dust particles into the work environment in copious amounts. A study is needed to determine the feasibility of installing local exhaust ventilation at the ports or the possibility of utilizing a curtain to minimize escape of contaminants into the work area.

Material Handling: See the recommendations outlined in "General Recommendations" regarding conveyor skirting, "dead beds," exhaust points and enclosures at ore transfer points, hood curtains and exhaust hoods at conveyor leading points.

Crushing Plant: A redesign and upgrading of the existing system is needed. The existing systems are poorly maintained and appear to be "field engineered," with portions of the system missing and generally poor ventilation practices employed.

Pelletizing Plant: Considerable dust and steam was generated in this plant. With the poor visibility due to such steam and dust and the poor lighting, it was difficult to determine the source of the problem. The investigators, therefore, could not determine what control system is needed for this area. It is recommended that staff engineers or consulting engineers who are more familiar with the operation evaluate the pelletizing operation to determine what engineering measures would be most effective in controlling the excess lead concentrations.

Sinter Plant: Considerable dust and steam are produced at the classifying and screening operation. Therefore, no effort was made to inspect the

entire building to evaluate existing systems. It is recommended that staff engineers or consultants also evaluate this area.

Sinter Storage Bins: The underground feeders from the sinter storage bin constituted an extremely dusty area. At the time of our visits a Johnson/March chemical dust suppressant system had been installed but it was not yet operational. Chemical dust suppressant systems have been proven to be very effective in mining operations and other types of industries.

Blast Furnace Charging Equipment:

During our second visit furnace operational problems were experienced which resulted in poor combustion in the furnace. Because it was an upset condition, the effectiveness of the present hood system could not be evaluated. The changes that were proposed in the Company-OSHA abatement plan should be implemented and then the company and OSHA should reevaluate this area.

Blast Furnace Trapping Floor: The capture velocities of the hoods for the pots or ladles appear to be too low because fume is escaping. The fume escaping could also be due, in part, to the fact that the hood does not cover the pot. In addition to correcting the above problems, exposures would be reduced if the launders were covered and exhausted.

Slag Fuming Furnace: The main source of exposure in this area appears to be at the furnace charge opening. Engineering staff should study this operation to see if some type of local exhaust system is technically feasible. The lancer operator is not able to wear respiratory protection because of the temperature experienced during the charging cycle.

Lead Refinery: During our visits it was difficult to assess the contribution of lead from the blast furnace area and the kettles. Based on our observations it is our belief that such contribution from the kettles is significant. It appears that for this operation it may be difficult to control the fumes emanating from the kettles because of the nature of the process. It is recommended that this operation be studied by staff engineers or consultants to see if some type of local exhaust is technically feasible.

Silver Refinery: It is recommended that existing ventilation systems be upgraded and also that a feasibility study be done on how to isolate this area completely from the lead refining operation.

Lunchrooms: In portions of the lunchrooms at both the lead smelter and zinc plant, the lead concentrations exceeded the current legal standard or the proposed standard for lead. It is recommended, therefore, that all lunchroom areas be upgraded to include placing the area under positive pressure by providing fresh filtered, tempered air. Also, lunchrooms should be cleaned frequently and swipe samples should be included as part of the antimony program. Another alternative would be to close down all existing lunchrooms and build a central lunchroom outside of the production area. (If the latter approach is taken, then some mechanism has to be implemented to prevent workers from wearing contaminated clothing in this area).

Respirator Usage and Administrative Controls:

It is strongly recommended that Bunker Hill Company continue on an interim

basis to enforce the requirements of respirator usage and related administrative controls, until engineering controls have been implemented and are proved to be effective. The present program of respirator maintenance is adequate.

Personal Hygiene Practices:

1. All personnel should be required to wash hands before eating or smoking.
2. Smoking should be prohibited except in designated clean areas.

Shower Facilities: Everyone should take a shower prior to leaving the plant. No one should wear work clothes home.

The "Dry" should be constructed to contain both lockers for civilian clothes and separate lockers for work clothes. Showers should be set up so that no worker can get from the "contaminated" change area to the clean without taking a shower. Suspended baskets should be investigated as a potential source of lead exposure.

Zinc Plant

1. Good housekeeping is essential if high concentrations of toxic materials are to be reduced to safe levels.
2. Conveyor systems should be enclosed and transfer points provided with exhaust ventilation.
3. The vacuum system at the Roaster Building should be maintained in good operating condition and used to keep dust deposits from accumulating.
4. In areas where work practices require the opening of process equipment with resultant release of SO₂, exhaust ventilation should be installed to prevent escape of SO₂ into the general work environment.
5. An alarm system should be installed to warn employees of hazardous concentrations of SO₂, where applicable.
6. Full facepiece respirators should be provided to prevent eye irritation where exposure to eye irritating concentrations of SO₂ occur. (Full facepiece respirators should not be used in SO₂ concentrations above 50 times the OSHA standard).
7. Self-contained breathing apparatus should be provided and located at strategic locations in the work place to facilitate escape and rescue.
8. Operator rooms and lunchrooms should be maintained under positive pressure with respect to the rest of the work environment. Fresh-tempered air should be supplied to each operator room and lunchroom. Lunchrooms and operator rooms should be cleaned at least daily and more frequently if swipe samples indicate potentially toxic exposures to lead or other toxic materials.
9. Handwashing facilities should be provided near lunchroom facilities. Employees should wash hands before eating.

10. Smoking should be prohibited except in designated, clean areas.
11. Exhaust hoods in the melting department should be positioned to capture the gases and particulate evolved from the melting furnaces.
12. Acid mist exposures in the cell room should be monitored on a regular basis to assure that workers are not over exposed to acid mist concentrations in excess of the current legal standard.

Table 1
Distribution of Male Workers in Smelter & Concentrator Areas
(Excludes Mine & Fertilizer Plants)

Department/Process	Total Number	Percent by Process
<u>Lead Smelter</u>		
Maintenance	104	26
Charge Preparation	58	16
Material Recovery	64	16
Sintering	16	4
Smelting	75	19
Refining	76	19
Total	393	35
<u>Zinc - Cadmium</u>		
Maintenance	111	24
Roasting	78	17
Leaching	38	8
Purification	40	9
Melting	54	12
Electrolytic	100	22
Cell Repair	38	8
Total	459	41
<u>Crusher - Concentrator</u>	28	2
<u>Miscellaneous</u>		
Maintenance in Other Non-Smelter Areas	244	22
Grand Total	1,124	100
<u>Sub Groups</u>		
Female Smelter Workers	63	--
Clerical Workers	245	--

TABLE 2

CONCENTRATOR and LEAD SMELTER

Concentration, mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
CONCENTRATOR										
Crushing Plant										
Crushing Plt. Crew Leader					0.004					
Crushing Plt. Operator										
Utility Laborer										
Grinding & Flotation										
Flotation Opr. Helper	0.019	<0.001	--	0.020	0.001					
Concentrate Loader	0.135	<0.001	--	0.021	<0.001					
Flotation Operator	0.168	0.002	--	0.031	<0.001					
Ball Mill Operator	0.029	<0.001	--	0.020	0.001					
Concentrator Utility	0.030	0.002	--	0.013	<0.001					
Concentrator Crew Leader										
Concentrate Loader Asst.	0.030									
Vacuum Filter Operator					0.001					
Maintenance										
Mechanics	0.178	0.002	--	0.049	0.004					
Electricians	0.100	<0.002	--	0.018	<0.001					
Quality Control										
Sampler										
Charge Preparation										
Crane Crew										
Locomotive Engr.										
Conductor										
Asst. Conductor										
Locomotive Crane Opr.	3.07	0.001	--	1.292	0.001					
Locomotive Crane Helper	.017	0.067	--	3.85						
Sampler			--	--						

TABLE 2 (Cont.)

CONCENTRATOR and LEAD SMELTER

Concentration, mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Charge Preparation										
Proportioning Overhead										
Crane Operator	1.816	0.018		1.62						
Utility Laborer	--	0.012	--	6.60	--					
Helper (Air Lance)	4.644	0.531	--	18.35	0.010					
Crushing Plant										
Mill Operator	1.21	0.023	--	1.535	--					
Crusher Operator	10.33	0.513	--	0.315	--					
Belt Crew										
Conveyor Operator	4.714	0.204	--	2.085	0.012					
Tripper Operator	6.567	0.354	--	--	--					
SINTER PLANT										
Pellet Plant										
Feed Preparation										
Plant Operator	12.674	0.204	--	2.28	0.051	0.36	--	--	0.039	
Utility Laborer	14.101	0.076	--	1.941	0.029	0.042	--	--	0.071	
Sinter Plant										
Sinter Plt. Operator	14.805	0.290	--	2.317	0.023	0.039	--	--	0.140	
Sinter Plt. Asst.	8.877	0.214	--	2.909	0.003	0.077	--	--	0.146	
SMELTER										
Blast Furnace										
Blast Furnace Operator	1.737	--	0.038	0.563	0.024	0.052	--	--	0.011	
Slag Tapper	0.796	--	0.012	0.178	0.007	<0.010	--	--	0.003	
Blast Furnace Feeder	22.383	--	0.225	2.936	<0.001	0.064	--	--	0.083	
Utility Man	8.295	--	0.114	1.026	--	0.112	--	--	0.015	
Overhead Crane Operator	2.919	--	0.037	0.735	0.008	0.079	--	--	0.022	

TABLE 2 (Cont.)

CONCENTRATOR and LEAD SMELTER

Concentration, mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Fuming Furnace										
Overhead Crane Operator	0.282	--	0.001	0.245	0.03	0.015			<0.001	
Fuming Furnace Operator	0.487	--	<0.001	0.511	<0.001	<0.010			<0.001	
Fuming Furnace Operator Helper	4.1	--	0.025	0.370	--	0.205			0.020	
Kiln Operator	--	--	--	--	--	--			--	
Kiln Operator Helper	--	--	--	--	0.002	--			--	
Baghouse Operator	0.342		0.002	0.905	0.005	0.017			0.002	
Baghouse Operator Helper	0.675		0.009	1.169	0.002	0.053			--	
Granulator Operator	0.329		0.002	0.905	<0.001	0.056			<0.001	
Boiler Operator	0.269		0.003	0.511	0.060	<0.010			<0.001	
Lancer Operator	1.079		0.005	0.225	0.005	0.020			0.004	
Furnace Man Trainee	11.152		0.105	--	--	--			--	
REFINING										
Lead Refinery										
Reverb Furnace Operator	--	--	--	--	0.200	--	--	--	--	--
Dross Floor Head Operator	0.545	--	0.001	0.463	--	0.083	--	--	<0.005	
Dross Floor Operator	0.355	--	0.002		0.022	0.024	--	0.015	<0.005	
Overhead Crane Operator	--	--	--	--	--	--	--	--	--	
Kettle Head Operator	0.208	--	<0.001	0.056	--	0.017	--	0.002	<0.005	
		--					--		--	
		--					--		--	
Casting and Loading										
Weigher	0.310	--	0.001	--	<0.001	--	--	--	--	
Casting & Loading Helper	0.335	--	0.007	--	0.003	--	--	--	--	
Head Loader	0.409	--	0.003	--	<0.001	--	--	--	--	
Head Casting Operator	--	--	--	--	<0.001	--	--	--	--	
Caster & Fork Lift Opr.	0.144	--	0.001	--	<0.002	--	--	--	--	

TABLE 2 (Cont.)

CONCENTRATOR and LEAD SMELTER

Concentration, mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Cadmium, Silver & Electric Furnace										
Head Operator (Cd Plt.)	1.225	0.684	--	0.114	--	0.037		--	<0.005	
Operator (Cd Plt.)	4.849	2.645	--	0.290	--	0.012		--	<0.005	
Crew Leader (Silver Ref.)	0.258	0.001	--	--	--	--		--	--	
Cupel Operator (Silver Ref.)	0.690	0.003	--	0.814	0.009	<0.010		--	<0.001	
Retort Operator (Silver Ref.)	0.443	0.001	--	0.616	0.008	<0.010		--	<0.002	
Crew Leader (Hard Lead)	--	--	--	--	--	--	--	--	--	
Head Operator (Hard Lead)	--	--	--	--	--	--	--	--	--	
Operator (Hard Lead)	--	--	--	--	--	--	--	--	--	
MATERIALS RECOVERY										
Acid Plant Operator	0.059	<0.001	--	0.015	--	<0.012	<0.002	<0.001	<0.001	<0.002
Baghouse Operator	0.965	0.223	--	2.91	0.043	0.013	<0.002	0.017	<0.005	<0.002
Baghouse Service Attendant	1.290	0.016	--	0.175	0.010	0.049	<0.002	0.004	<0.001	<0.002
Baghouse Laborer	5.64	0.154	--	0.289	0.055	0.030	<0.002	0.015	<0.005	<0.002
Effluent Plant Operator	0.174	0.014	--	--	--	--	--	--	--	--
Contract Main Baghouse	20.16	1.140	3.04	3.04	--	0.054	<0.002	0.047	0.015	<0.002
MAINTENANCE										
Blowerhouse Operator	0.037	0.001	--	0.006	<0.001					
Maintenance S-1										
Mechanic	0.631	0.013	--	0.139	--					
Lube Man	0.130	0.003	--	0.062	--					
Welder	0.303	0.026	--	0.065	--					
Maintenance S-2										
Carpenter	8.094	0.096	--	1.178	0.006					
Millright	7.936	0.038	--	1.087	--					
Maintenance S-3										
Mechanic	8.320	0.158	--	1.806	0.052					
Maintenance S-4										
Mechanic	3.820	0.066	--	1.206	--					
Lube Man	0.125	0.001	--	0.257	0.051					

TABLE 2 (Cont.)

CONCENTRATOR and LEAD SMELTER

Concentration, mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Maintenance S-5										
Mechanic	4.039	0.052	--	0.368	0.010					
Maintenance S-7										
Pipefitter	0.408	0.005	--	0.105	--					
Maintenance S-8										
Painter	1.300	0.025	--	0.47	--					
Maintenance S-10										
Electrician	2.151	0.015	--	0.754	--					
OSHA, Current Standard	0.2	0.2	0.1	5.0	0.5	0.5	0.1	0.1	5.0c	1.0
OSHA, Proposed Standard	0.1	--	--	--	0.004***	--	--	--	--	--
NIOSH Recommended	0.15	--	--	5.0	0.002	--	--	--	--	--
TLV - ACGIH	0.15	0.2	0.05c	5.0	0.5	0.5	0.1	0.2	5.0c	1.0
TLV - ACGIH Proposed	--	0.05	--	--	0.05*	0.05**	--	--	--	--

c- A ceiling value which should not be exceeded.

** Antimony trioxide production.

(1) Both fume and dust exposure are considered likely to occur for these 106 classifications of departments.

*** 0.002 action level.

*Arsenic trioxide production

45

ELECTROLYTIC ZINC PLANT
Contaminant Concentration mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
ACID PLANT										
Operator-Helper	0.026	ND		0.075	ND	ND	ND	0.001	ND	ND
Foreman	0.061	ND		0.134	--	--	--		ND	--
BAGHOUSE & COTTRELL (1)										
Operator/Flue Dustman	7.287	0.677		106.796	0.005	.012	0.008	0.112	.316	0.018
Maintenance	1.170	0.117		15.600	0.025	ND	ND	0.086	0.134	0.004
Foreman	0.117	0.006		1.678	0.003		--	--	--	--
CADMIUM PLANT (1)										
Caster	0.032		0.100	0.127	--	ND	ND	ND	0.002	ND
Shifter/Leadman	0.028	0.016		0.826	ND	ND	ND	0.006	0.008	ND
Pressman/Operator	0.036	0.063		0.192	0.001	ND	ND	0.009	0.020	ND
CONCENTRATE HANDLING										
Conc. Handling Operator	0.452	0.035		5.750	0.001	0.013	0.004	0.019	0.015	ND
Loader-Helper	0.824	0.076		24.818	0.017	0.023	ND	0.148	0.167	ND
Ore Unloader	0.780	0.136		22.284	0.010	0.006	ND	0.121	0.069	0.005
ELECTROLYTIC DEPARTMENT										
Anode Shop										
Fabrication	0.201		ND	0.184	ND	ND	--	--	0.093	--
Cellroom										
Operator	0.012	ND		0.115	--	ND	ND	ND	0.019	ND
Leadman	0.059	ND		0.162	--	ND	ND	ND	0.033	ND
Cell Repair	0.064	ND		0.225	0.001	ND	ND	ND	0.098	ND
Stripper	0.059	ND		0.571	ND	ND	ND	ND	0.018	ND
Utility Cleanup	0.074	ND		0.713	ND	ND	ND	ND	--	ND
LEACH DEPARTMENT										
Leach										
Leachman	0.014	0.003		0.552	--	ND	ND	0.002	<0.006	ND
Mud Mill Operator	0.286	0.005		0.554	0.007	ND	ND	0.008	0.022	ND
Operator	0.051	0.003		0.847	0.003	ND	ND	0.003	0.009	ND
Shift Foreman	0.016	ND		0.295	ND		--	--	--	--
Burt Filter										

TABLE 3 & 4 (Cont.)

ELECTROLYTIC ZINC PLANT
Contaminant Concentration mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Operator	0.062	0.002		0.362	ND	ND	ND	0.003	0.010	ND
Repairman	<0.001	0.003		0.472	ND	ND	ND	0.010	0.010	ND
MAINTENANCE										
Z-1 Area (1)										
Main. Mechanic	0.659	0.062		14.605		0.004			0.067	
Main. Mechanic, App.	0.510	0.050		9.610		0.004			0.042	
Main. Rel. For.	0.182	0.018		4.700		ND			0.023	
Oiler	0.550	0.070		12.832					<0.010	
Z-2 Area Maintenance										
Main. Mechanic	0.221	0.047		2.237		0.012			0.034	
Mechanic Helper	0.197	0.017		0.211		ND			0.015	
Oiler	0.045	0.007		1.157		ND			0.010	
Melting Dept. Main.										
Mechanic (1)	0.035	ND		13.991		ND			0.037	
Mech. Helper (1)	0.460	ND		16.300		ND			0.050	
Cellroom Maintenance										
Carpenter Foreman	0.010	0.010		0.102		ND			0.010	
Oiler	0.010	0.010		0.356		ND			0.010	
Carpenters	0.033	0.001		0.513		ND			0.075	
Mechanics	0.033	0.004		0.404		ND			0.016	
Machine Shop										
Welder	0.049		0.004	0.509	ND	ND	ND	ND	0.022	ND
Blacksmith (1)	0.043		0.003	0.370	ND	ND	ND	ND	0.019	0.003
Machinist-Apprentice	0.034	0.002		0.135	ND	ND	ND	ND	0.004	ND
MELTING DEPARTMENT										
Casting (1)										
Shift Foreman	0.023	ND		1.694	ND	ND	ND	0.003	0.005	ND
Melting Dept. Oper.	0.031	0.002		11.598	ND	ND	ND	0.005	0.008	ND
Skimming & Ladling	0.021		ND	3.565	ND	ND	ND	0.004	0.008	ND
Scrap Furnace Oper.	0.007	ND		5.556	ND	ND	ND	0.004	0.012	ND
Furnaceman	0.009		ND	3.565	ND	ND	ND	0.003	0.006	ND

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ELECTROLYTIC ZINC PLANT
Contaminant Concentration mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
Alloyer	0.009		ND	8.762	ND	ND	ND	0.003	0.005	ND
Shipping										
Operator	0.017		ND	0.189	ND	ND	ND	0.004	0.001	ND
Scaleman	0.009		0.009	0.090	ND	--	--	--	--	--
PURIFICATION DEPART.										
Foreman	0.025	0.003		0.024	--	ND	ND	0.005	0.005	ND
Pressmen	0.030	0.018		2.423	0.010	ND	ND	0.024	--	ND
Operator	0.015	0.003		0.622	0.003	ND	ND	0.003	0.003	ND
Laborer-Cleanup	0.122	0.011		1.284	0.005	ND	ND	0.022	0.027	ND
Tank Hitter	0.030	0.003		13.268	--	ND	ND	0.007	0.009	ND
Sampler					0.005		--	--		--
ROASTERS (1)										
Operator	0.750	0.084		14.293	0.011	ND	0.007	0.039	0.114	0.006
Helper	2.057	0.394		18.585	0.042	0.028	0.017	0.792	0.709	0.099
Lancer	1.191	0.072		23.461	0.012	0.020	0.004	0.145	0.132	0.005
Boiler Operator	0.481	0.046		9.083	0.007	--	--	--	--	--
Wedge Operator	0.679	0.069		14.188	0.002	--	0.003	0.064	0.089	ND
Pre Treatment Oper.	0.063	0.002		0.337	ND	ND	--	--	--	--
Foreman							--	--	--	--
MAINTENANCE										
(Summary)										
Mechanics (1)	0.357	0.004		8.130	--	0.003	0.001	0.065	<0.1	0.002
Oilers	0.446	0.051		10.416	0.004	0.040	ND	0.052	<0.1	ND
Carpenters (1)	0.035	0.006		0.422	ND	ND	ND	0.002	<0.1	ND
Electricians (1)	0.252	0.036		3.080	0.046	ND	ND	0.057	<0.1	ND
Lead Burners	0.361		0.014	0.182	0.003	0.013	ND	0.009	<0.1	0.002
Yard Crew (1)	0.311	0.039		5.340	0.007	ND	ND	0.035	<0.1	ND
Metalizer	0.417	0.011		1.200	--	ND	ND	0.032	<0.1	ND

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TABLE 3 & 4 (Cont.)

ELECTROLYTIC ZINC PLANT
Contaminant Concentration mg/m³

AREA	Pb	Cd		Zn	As	Sb	Co	Cu	Mn	Ni
		Dust	Fume							
OSHA, Current Std.	0.2	0.2	0.1	5.0	0.5	0.5	0.1	0.1	5.0 _c	1.0
OSHA Proposed Std.	0.1	--	--	--	0.004	--	--	--	--	--
NIOSH Recommended	0.15	--		5.0	0.002	--	--	--	--	--
TLV-ACGIH	0.15	0.2	0.05 _c	5.0	0.5	0.5	0.1	0.2	5.0 _c	1.0
TLV-ACGIH Proposed	--	0.05	--	--	0.05*	0.05**	--	--	--	--

c A ceiling value which should not be exceeded.

* Arsenic trioxide production.

** Antimony trioxide production.

(1) Both fume and dust exposures are considered likely to occur for these job classifications of departments.

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TABLE 5
MINES PLANT
Lead Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
01 CONCENTRATOR Crushing Plant									
01 Crushing Plant Crew Leader									
02 Crushing Plant Operator									
03 Utility Laborer Grinding & Flotation									
04 Flotation Operator Helper	3	0.008-0.036	0.019	0	0	0	0	0	0
05 Concentrate Loader	4	0.011-0.263	0.135	2	50	2	50	2	50
06 Flotation Operator	1	0.168	0.168	0	0	1	100	1	100
07 Ball Mill Operator	1	0.029	0.029	0	0	0	0	0	0
08 Concentrator Utility	3	0.029-0.030	0.030	0	0	0	0	0	0
09 Concentrator Crew Leader									
10 Concentrate Loader Asst.	3	0.029-0.030	0.030	0	0	0	0	0	0
11 Vacuum Filter Operator Maintenance									
12 Mechanics	8	0.021-0.787	0.178	2	25	2	25	4	50
13 Electricians	2	0.034-0.229	0.100	1	33	1	33	1	33
14 Electrician Helper									

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TABLE 6
LEAD SMELTER

Lead Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
02 CHARGE PREPARATION									
Crane Crew									
01 Locomotive Engineer									
02 Conductor									
03 Asst. Conductor									
04 Locomotive Crane Operator	5	0.039-13.435	3.07	2	40	3	60	3	60
05 Locomotive Crane Helper	6	0.473-7.493	2.017	6	100	6	100	6	100
06 Sampler			--	0		0		0	
Charge Preparation									
5 07 Proportioning Overhead Crane Operator	3	0.114-3.348	1.816	2	67	2	67	3	100
08 Utility Laborer									
09 Helper (Air Lance) Crushing Plant	6	0.057-12.83	4.64	5	83	5	83	5	83
10 Mill Operator	1		1.21	1	100	1	100	1	100
11 Crusher Operator Belt Crew	3	0.662-29.516	10.33	3	100	3	100	3	100
12 Conveyor Operator	5	1.054-14.904	4.714	5	100	5	100	5	100
13 Tripper Operator	1		6.567	1	100	1	100	1	100

LEAD SMELTER
Lead Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SINTER PLANT <u>03</u>									
Pellet Plant <u>01</u>									
01 Feed Preparation Plant Operator	2	17.912	12.674	2	100	2	100	2	100
Utility Laborer <u>02</u>	1	14.101	14.101	1	100	1	100	1	100
Sinter Plant	2	3.82-25.789	14.805	2	100	2	100	2	100
03 Sinter Plant Opr.	2	3.68-14.074	8.877	2	100	2	100	2	100
04 Sinter Plant Asst.									
SMELTER <u>04</u>									
Blast Furnace <u>0</u>									
01 Blast Furnace Opr.	2	0.183-3.291	1.737	1	50	2	100	2	100
02 Slag Tapper	2	0.722-0.869	0.796	2	100	2	100	2	100
03 Blast Furnace Feeder	1	22.383	22.383	1	100	1	100	1	100
04 Utility Man Opr.	4	1.13-24.21	8.295	4	100	4	100	4	100
05 Overhead Crane Opr.	1	2.919	2.919	1	100	1	100	1	100
Fuming Furnace									
06 Overhead Crane Opr.	3	0.102-0.269	0.282	2	67	2	67	3	100
07 Fuming Furnace Opr.	1	0.487	0.487	1	100	1	100	1	100
Fuming Furnace Operator Helper	2	0.487-7.91	4.1	2	100	2	100	2	100
08 Kiln Operator									
09 Kiln Operator Helper									
11 Baghouse Operator	3	0.174-0.58	0.342	2	67	3	100	3	100
12 Baghouse Opr. Helper	1	0.675	0.675	1	100	1	100	1	100
13 Granulator Operator	2	0.138-0.520	0.329	1	50	1	50	2	100
14 Boiler Operator	1	0.269	0.269	1	100	1	100	1	100
15 Lancer Operator	6	0.226-3.683	1.079	6	100	6	100	6	100
16 Furnace Man Trainee	1	11.152	11.152	1	100	1	100	1	100

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TABLE 6 (Cont)

LEAD SMELTER

Lead Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
03 MATERIALS RECOVERY									
01 Acid Plant Opr.	1	0.059	0.059	0	0	0	0	0	0
02 Baghouse Opr.	3	0.809-1.126	0.965	3	100	3	100	3	100
03 Baghouse Service Attendant	1	1.29	1.29	1	100	1	100	1	100
04 Baghouse Laborer	9	0.387-17.7	5.64	9	100	9	100	9	100
05 Effluent Plant Opr.	1	0.174	0.174	0	0	1	100	1	100
06 Contract Main Baghouse	1	20.16	20.16	1	100	1	100	1	100

TABLE 6 (Cont)

LEAD SMELTER

Lead Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MAINTENANCE <i>06</i>									
01 Blowerhouse Opr. Maintenance S-1	2	0.006-0.068	0.037	0	0	0	0	0	0
02 Mechanic	4	0.238-1.135	0.631	4	100	4	100	4	100
03 Lubeman	1	0.130	0.130	0	0	0	0	1	100
04 Welder Maintenance S-2	1	0.303	0.303	1	100	1	100	1	100
05 Carpenter	2	3.33-12.857	8.094	2	100	2	100	2	100
06 Millwright Maintenance S-3	2	7.023-8.849	7.936	2	100	2	100	2	100
07 Mechanic Maintenance S-4	13	0.421-39.86	8.32	13	100	13	100	13	100
08 Mechanic	15	0.39 -10.74	3.82	15	100	15	100	15	100
09 Lubeman Maintenance S-5	1	0.125	0.125	0	0	0	0	1	100
10 Mechanic Maintenance S-7	4	0.142-11.59	4.039	3	75	3	75	4	100
11 Pipefitter Maintenance S-8	7	0.173-0.602	0.408	6	86	7	100	7	100
12 Painter Maintenance S-10	1	1.30	1.30	1	100	1	100	1	100
13 Electrician	4	0.371-4.13	2.151	4	100	4	100	4	100

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TABLE 7
ELECTROLYTIC ZINC PLANT
Lead Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT <u>01</u>	6			0.032						
Operator-Helper <u>01</u>	5	0.001	0.043	0.026	0	0	0	0	0	0
Foreman <u>02</u>	1			0.061	0	0	0	0	0	0
BAGHOUSE & COTTRELL (1) <u>02</u>	8			5.592						
Operator/Flue Dustman <u>01</u>	6	0.364	20.700	7.287	6	100	6	100	6	100
Maintenance <u>02</u>	1			1.170	1	100	1	100	1	100
Foreman <u>03</u>	1			0.117	0	0	0	0	1	100
CADMIUM PLANT (1) <u>03</u>	11			0.031						
Caster <u>01</u>	3	0.012	0.060	0.032	0	0	0	0	0	0
Shifter/Leadman <u>02</u>	3	0.012	0.060	0.028	0	0	0	0	0	0
Pressman/Operator <u>03</u>	5	0.017	0.069	0.036	0	0	0	0	0	0
CONCENTRATE HANDLING <u>04</u>	13			0.709						
n/ Conc. Handling Opr.	4	0.079	0.989	0.452	2	50	3	75	3	75
<u>02</u> Leader-Helper	3	0.257	1.450	0.824	3	100	3	100	3	100
<u>03</u> Ore Unloader	6	0.074	1.710	0.780	5	83	5	83	5	83
ELECTROLYTIC DEPARTMENT <u>05</u>										
<u>01</u> Anode Shop (1)										
<u>02</u> Fabrication	2	0.155	0.248	0.201	1	50	2	100	2	100
<u>03</u> Cellroom	46			0.047						
<u>04</u> Operator	3	0.007	0.022	0.012	0	0	0	0	0	0

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TABLE 7 (Cont)

ELECTROLYTIC ZINC PLANT

Lead Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
05 Leadman	1			0.059	0	0	0	0	0	0
06 Cell Repair	23	0.005	0.154	0.064	0	0	1	4	8	35
07 Stripper	17	0.003	0.378	0.059	1	6	1	6	1	6
08 Utility Cleanup	2	0.013	0.136	0.074	0	0	0	0	1	50
LEACH DEPARTMENT 06	13			0.036						
01 Leach	8			0.026						
02 Leachman	3	0.001	0.029	0.014	0	0	0	0	0	0
03 Shift Foreman	1			0.016	0	0	0	0	0	0
04 Operator	2	0.037	0.065	0.051	0	0	0	0	0	0
05 Mud Mill Operator	2	0.266	0.312	0.286	2	100	2	100	2	100
06 Burt Filter	5			0.050						
07 Operator	4	N.D.	0.058	0.028	0	0	0	0	0	0
08 Repairman	1			<0.001	0	0	0	0	0	0
MAINTENANCE 07	79									
Z-1 Area	34									
01 Maint. Mechanic	15	0.077	1.750	0.659	12	80	12	80	14	93
02 Maint. Mech. App.	10	0.032	1.147	0.510	7	70	8	80	8	80
03 Maint. Rel. For.	1	0.182	0.182	0.182	0	0	1	100	1	100
04 Oiler	8	0.371	0.994	0.550	8	100	8	100	8	100
Z-2 Area Maintenance	16			0.193						
01 Maint. Mechanic	11	0.049	0.639	0.221	6	50	7	58	7	58
02 Mechanic Helper	4	0.091	0.198	0.197	1	25	2	50	2	50
03 Oiler	1			0.045	0	0	0	0	0	0

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TABLE 7 (Cont)
ELECTROLYTIC ZINC PLANT

Lead Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT 08	11			0.051						
Foreman 01	1			0.025	0	0	0	0	0	0
Pressman 02	3	0.022	0.039	0.030	0	0	0	0	0	0
Operator 03	2	0.001	0.030	0.015	0	0	0	0	0	0
Laborer-Cleanup	4	0.041	0.218	0.122	1	25	2	50	2	50
Tank Hitter 01	1			0.030	0	0	0	0	0	0
ROASTERS (1) 09	18			1.046						
Operator 01	5	0.475	1.640	0.750	5	100	5	100	5	100
Helper 02	3	1.170	3.940	2.057	3	100	3	100	3	100
Lancer 03	4	0.586	1.990	1.191	4	100	4	100	4	100
Boiler Operator 04	3	0.032	0.878	0.481	2	67	2	67	2	67
Wedge Operator 05	2	0.575	0.783	0.679	2	100	2	100	2	100
Pretreatment Opr 06	1			0.063	0	0	0	0	0	0
MAINTENANCE (Summary) 10										
Mechanics (1) 01	54	0.030	1.752	0.357	27	50	31	57	33	61
Oilers 02	10	0.010	0.994	0.446	8	80	8	80	8	80
Carpenters (1) 03	17	0.010	0.074	0.035	0	0	0	0	0	0
Electricians (1) 04	10	0.008	0.703	0.252	4	40	4	40	4	40
Lead Burners 05	9	0.073	1.730	0.361	5	56	6	67	7	78
Yard Crew (1) 06	20	0.050	1.240	0.311	8	40	12	60	13	65
Metalizer 07	1			0.417	1	100	1	100	1	100
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments										

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TABLE 7 (Cont)
ELECTROLYTIC ZINC PLANT
Lead Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³		ACGIH-TLV 0.15 mg/m ³		Proposed OSHA Std. 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
08 Melting Dept. Maint.	5			0.035						
09 Mechanic (1)	4	0.032	0.074	0.035	0	0	0	0	0	0
10 Mechanic Helper (1)	1			0.460	1	100	1	100	1	100
11 Cellroom Maintenance										
12 Carpenter Foreman	1			0.010	0	0	0	0	0	0
13 Oiler	1			0.010	0	0	0	0	0	0
14 Carpenters	10	0.012	0.074	0.033	0	0	0	0	0	0
15 Mechanics	5	0.008	0.060	0.033	0	0	0	0	0	0
16 Machine Shop	8			0.045						
17 Welder	5	0.033	0.066	0.049	0	0	0	0	0	0
18 Blacksmith (1)	1			0.043	0	0	0	0	0	0
19 Machinist Apprentice	2	0.030	0.037	0.034	0	0	0	0	0	0
MELTING DEPARTMENT	11									
01 Casting (1)	26			0.014						
02 Shift Foreman	3	<0.001	0.046	0.023	0	0	0	0	0	0
03 Melting Dept. Opr.	11	<0.001	0.071	0.031	0	0	0	0	0	0
04 Skimming & Ladling	4	<0.001	0.069	0.021	0	0	0	0	0	0
05 Scrap Furnace Opr.	3	<0.001	0.022	0.007	0	0	0	0	0	0
06 Furnacemen	3	<0.001	0.017	0.009	0	0	0	0	0	0
07 Alloyer	2	<0.001	0.017	0.009	0	0	0	0	0	0
08 Shipping	10			0.016						
09 Operator	9	0.009	0.030	0.017	0	0	0	0	0	0
10 Scaleman	1	--	--	0.009	0	0	0	0	0	0

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TABLE 8
MINES PLANT
Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CONCENTRATOR									
Crushing Plant									
Crushing Plant Crew Leader									
Crushing Plant Operator									
Utility Laborer									
Grinding & Flotation									
Flotation Operator Helper	4		<0.001	0	0	0	0	0	0
Concentrate Loader	4		<0.001	0	0	0	0	0	0
Flotation Operator	1		0.002	0	0	0	0	0	0
Ball Mill Operator	1		<0.001	0	0	0	0	0	0
Concentrator Utility	3	<0.001-0.003	0.002	0	0	0	0	0	0
Concentrator Crew Leader									
Concentrate Loader Asst.									
Vacuum Filter Operator									
Maintenance									
Mechanics	8	<0.001-0.004	0.002	0	0	0	0	0	0
Electricians	2		<0.002	0	0	0	0	0	0
Electrician Helper									

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TABLE 9

LEAD SMELTER

Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE ₃ mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CHARGE PREPARATION									
Crane Crew									
Locomotive Engineer									
Conductor									
Asst. Conductor									
Locomotive Crane Operator	5	0.001-0.096	0.022	0	0	1	20		
Locomotive Crane Helper	6	0.004-0.225	0.067	1	17	1	17		
Sampler									
Charge Preparation									
Proportioning Overhead Crane Operator	3	0.000-0.03	0.018	0	0	0	0		
Utility Laborer	2	0.002-0.016	0.012	0	0	0	0		
Helper (Air Lance)	6	0.001-1.204	0.531	5	83	5	83		
Crushing Plant									
Mill Operator	1		0.023	0	0	0	0		
Crusher Operator	3	0.005-1.526	0.513	1	33	1	33		
Belt Crew									
Conveyor Operator	5	0.008-0.908	0.204	1	20	1	20		
Tripper Operator	1		0.354	1	100	1	100		

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TABLE 9 (Cont)

LEAD SMELTER

Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SINTER PLANT									
Pellet Plant									
Feed Preparation Plant Operator	2	0.046-0.362	0.204	1	50	1	50		
Utility Laborer Sinter Plant	1		0.076	0	0	1	100		
Sinter Plant Opr.	2	0.091-0.167	0.29	0	0	2	100		
Sinter Plant Asst.	2	0.181-0.246	0.214	1	50	2	100		
SMELTER									
Blast Furnace									
Blast Furnace Opr.	2	<0.002-0.074	0.038			1	50	0	0
Slag Tapper	3	0.009-0.013	0.012			0	0	0	0
Blast Furnace Feeder	1		0.225			1	100	1	100
Utility Man Opr.	4	0.022-0.304	0.114			3	75	1	25
Overhead Crane Opr.	1		0.037			0	0	0	0
Fuming Furnace									
Overhead Crane Opr.	2	<0.001-0.001	0.001			0	0	0	0
Fuming Furnace Opr.	1		<0.001			0	0	0	0
Fuming Furnace Operator Helper	2	0.005-0.046	0.025			0	0	0	0
Kiln Operator									
Kiln Operator Helper									
Baghouse Operator	3	<0.001-0.004	0.002			0	0	0	0
Baghouse Opr. Helper	1		0.009			0	0	0	0
Granulator Operator	2	0.002-0.003	0.002			0	0	0	0
Boiler Operator	1		0.003			0	0	0	0
Lancer Operator	8	<0.001-0.013	0.005			0	0	0	0
Furnace Man Trainee	1		0.105			1	100	1	100

LEAD SMELTER

Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING									
Lead Refinery									
Reverb Furnace Opr.									
Dross Floor Head Opr	2	<0.001-0.002	0.001			0	0	0	0
Dross Floor Opr.	10	<0.001-0.002	0.002			0	0	0	0
Overhead Crane Opr.									
Kettle Head Opr.	2		<0.001			0	0	0	0
Casting and Loading									
Weigher	2		0.001			0	0	0	0
Casting & Loading Helper	5	<0.001-0.031	0.007			0	0	0	0
Head Loader	2	0.001-0.005	0.003			0	0	0	0
Head Casting Opr.									
Caster & Fork Lift Operator	7	<0.001-0.001	0.001			0	0	0	0
Cadmium & Silver & Electric Furn									
Head Operator (Cd Plt)	2	<0.028-1.34	0.684	1	50	1	50		
Operator (Cd Plt)	2	0.039-5.25	2.645	1	50	1	50		--
Crew Leader (Silver Ref.)	1		0.001	0	0	0	0		
Cupel Operator (Silver Ref.)	2	0.002-0.004	0.003	0	0	0	0		
Retort Operator (Silver Ref.)	3	<0.001-0.002	0.001	0	0	0	0		
Crew Leader (Hard Lead)									
Head Opr. (Hard Lead)									
Operator (Hard Lead)									

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TABLE 9 (Cont)

LEAD SMELTER

Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MAINTENANCE									
Blowerhouse Opr.	2		0.001	0	0	0	0		
Maintenance S-1									
Mechanic	4	0.009-0.018	0.013	0	0	0	0		
Lubeman	1		0.003	0	0	0	0		
Welder	1		0.026	0	0	0	0		
Maintenance S-2									
Carpenter	2	0.016-0.176	0.096	0	0	1	50		
Millwright	2	0.010-0.066	0.038	0	0	1	50		
Maintenance S-3									
Mechanic	13	0.005-1.293	0.158	1	8	9	69		
Maintenance S-4									
Mechanic	15	0.002-0.403	0.066	1	7	7	47		
Lubeman	1		0.001	0	0	0	0		
Maintenance S-5									
Mechanic	4	0.002-0.156	0.052	0	0	1	25		
Maintenance S-7									
Pipefitter	7	0.003-0.007	0.005	0	0	0	0		
Maintenance S-8									
Painter	1		0.025	0	0	0	0		
Maintenance S-10									
Electrician	4	0.010-0.025	0.015	0	0	0	0		

TABLE 9 (Cont)
LEAD SMELTER
Cadmium Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.2 mg/m ³ (dust)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.1 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY									
Acid Plant Opr.	1		0.001	0	0	0	0		
Baghouse Opr.	3	0.005-0.077	0.029			1	33	0	0
Baghouse Service Attendant	1		0.016			0	0	0	0
Baghouse Laborer	9	0.007-0.362	0.265	4	44	5	56		
Effluent Plant Opr.	1		0.005	0	0	0	0		
Contract Main Baghouse	1		1.14	1	100	1	100		

ELECTROLYTIC ZINC PLANT

Cadmium Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE, mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.2 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	6									
Operator-Helper	5			ND			0	0	0	0
Foreman	1			ND			0	0	0	0
BAGHOUSE & COTTRELL(1)	8			0.521						
Operator/Flue Dustman	6	0.027	1.950	0.677	3	50	5	83		
Maintenance	1			0.117	1	100	1	100	0	0
Foreman	1			0.006	0	0	0	0	0	0
CADMIUM PLANT (1)	11			0.060						
Caster	3	0.060	0.131	0.100	2	67	3	100		
Shifter/Leadman	3	0.001	0.029	0.016	0	0	1	33		
Pressman/Operator	5	0.045	0.064	0.063	0	0	2	40		
CONCENTRATE HANDLING	13			0.091						
Conc. Handling Opr.	4	0.007	0.072	0.035			1	25	0	0
Leader-Helper	3	0.017	0.119	0.076			4	100	0	0
Crusher Unloader	6	0.027	0.332	0.136			5	83	1	16
ELECTROLYTIC DEPARTMENT	48									
Anode Shop (1)	2			ND						
Fabrication	2			ND	0	0	0	0	0	0
Cellroom	46			ND						
Operator	3			ND			0	0	0	0

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TABLE 10 (Cont)

ELECTROLYTIC ZINC PLANT

Cadmium Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE ₃ mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.2 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	11			0.010						
Foreman	1			0.003			0	0	0	0
Pressman	3	0.014	0.022	0.018			0	0	0	0
Operator	2	0.001	0.008	0.003			0	0	0	0
Laborer-Cleanup	4	0.004	0.032	0.011			0	0	0	0
Tank Hitter	1			0.003			0	0	0	0
ROASTERS (1)	18			0.151						
Operator	5	0.050	0.192	0.084	1	20	5	100	0	0
Helper	3	0.090	1.000	0.394	1	33	3	100	1	33
Lancer	4	0.022	0.134	0.072	1	25	3	75	0	0
Boiler Operator	3	0.006	0.080	0.046			2	67	0	0
Wedge Operator	2	0.061	0.077	0.069			2	100	0	0
Pretreatment Opr.	1			0.002			0	0	0	0
MAINTENANCE (Summary)										
Mechanics (1)	54	0.001	0.184	0.004			19	35	0	0
Oilers	9	0.007	0.091	0.051			3	33	0	0
Carpenters (1)	17	0.001	0.019	0.006			0	0	0	0
Electricians (1)	10	0.003	0.153	0.036					0	0
Lead Burners	9	0.003	0.063	0.014	0	0				
Yard Crew (1)	20	0.001	0.178	0.039					0	0
Metalizer	1			0.011			0	0	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.										

TABLE 10 (Cont)
ELECTROLYTIC ZINC PLANT
Cadmium Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.2 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	1			ND			0	0	0	0
Cell Repair	23			ND			0	0	0	0
Stripper	17			ND			0	0	0	0
Utility Cleanup	2			ND			0	0	0	0
LEACH DEPARTMENT	8									
Leach	8			0.002						
Leachman	3	0.001	0.003	0.003			0	0	0	0
Shift Foreman	1			ND			0	0	0	0
Operator	2	0.001	0.006	0.003			0	0	0	0
Mud Mill Operator	2	0.004	0.006	0.005			0	0	0	0
Burt Filter				0.002						
Operator	2	0.001	0.003	0.002			0	0	0	0
Repairman	1			0.003			0	0	0	0
MAINTENANCE	78									
Z-1 Area	33			0.046						
Maint. Mechanic	15	0.002	0.184	0.062			11	73	0	0
Maint. Mech. App.	10	0.003	0.118	0.050			6	60	0	0
Maint. Rel. For.	1			0.018			0	0	0	0
Oiler	7	0.038	0.091	0.070			3	43	0	0
Z-2 Area Maintenance	16			0.017						
Maint. Mechanic	11	0.004	0.060	0.047			2	18	0	0
Mechanic Helper	4	0.003	0.030	0.017			0	0	0	0
Oiler	1			0.007			0	0	0	0

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TABLE 10 (Cont.)
ELECTROLYTIC ZINC PLANT
Cadmium Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.05 mg/m ³		OSHA Standard 0.2 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.	5			ND						
Mechanic (1)	4			ND			0	0	0	0
Mechanic Helper (1)	1			ND			0	0	0	0
Cellroom Maintenance	17			0.002						
Carpenter Foreman	1			0.010			0	0	0	0
Oiler	1			0.010			0	0	0	0
Carpenters	10	0.001	0.006	0.001			0	0	0	0
Mechanics	5	0.002	0.006	0.004			0	0	0	0
Machine Shop	8			0.003						
Welder	5	0.003	0.005	0.004	0	0	0	0		
Blacksmith (1)	1			0.003	0	0	0	0		
Machinist Apprentice	2			0.002			0	0	0	0
MELTING DEPARTMENT	36			<0.001						
Casting (1)	26			<0.001						
Shift Foreman	3			ND			0	0	0	0
Melting Dept. Opr.	11	0.001	0.013	0.002			0	0	0	0
Skimming & Ladling	4			ND	0	0	0	0		
Scrap Furnace Opr.	3			ND			0	0	0	0
Furnacemen	3			ND	0	0	0	0		
Alloyer	2			ND	0	0	0	0		
Shipping	10									
Operator	9			ND	0	0	0	0		
Scaleman	1			0.009	0	0	0	0		

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TABLE 11
MINES PLANT
Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CONCENTRATOR							
Crushing Plant							
Crushing Plant Crew Leader							
Crushing Plant Operator							
Utility Laborer							
Grinding & Flotation							
Flotation Operator Helper	3	0.010-0.03	0.02	0	0	0	0
Concentrate Loader	4	0.007-0.035	0.021	0	0	0	0
Flotation Operator	1		0.031	0	0	0	0
Ball Mill Operator	1		0.020	0	0	0	0
Concentrator Utility	3	0.008-0.019	0.013	0	0	0	0
Concentrator Crew Leader							
Concentrate Loader Asst.							
Vacuum Filter Operator							
Maintenance							
Mechanics	3	0.014-0.139	0.049	0	0	0	0
Electricians	3	0.015-0.022	0.018	0	0	0	0
Electrician Helper							

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TABLE 12
LEAD SMELTER
Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CHARGE PREPARATION							
Crane Crew							
Locomotive Engineer							
Conductor							
Asst. Conductor							
Locomotive Crane Operator	3	0.020--3.768	1.292	0	0	0	0
Locomotive Crane Helper	6	0.186-19.817	3.85	1	17	1	17
Sampler							
Charge Preparation							
Proportioning Over-head Crane Operator	1		1.62	0	0	0	0
Utility Laborer	2	.314-12.886	6.60	1	50	1	50
Helper (Air Lance)	4	0.195-42.35	18.35	3	75	3	75
Crushing Plant							
Mill Operator	1		1.535	0	0	0	0
Crusher Operator	2	0.263-0.366	0.315	0	0	0	0
Belt Crew							
Conveyor Operator	3	0.312-5.51	2.085	1	33	1	33
Tripper Operator							

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TABLE 12 (Cont)

LEAD SMELTER
Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SMELTER PLANT							
Pellet Plant							
Feed Preparation Plant Operator	2	1.051-3.5	2.28	0	0	0	0
Utility Laborer	1		1.941	0	0	0	0
Sinter Plant							
Sinter Plant Opr.	2	0.58 -4.053	2.317	0	0	0	0
Sinter Plant Asst.	2	1.593-4.225	2.909	0	0	0	0
SMELTER							
Blast Furnace							
Blast Furnace Opr.	2	0.561-0.566	0.563	0	0	0	0
Slag Tapper	2	0.158-0.197	0.178	0	0	0	0
Blast Furnace Feeder	1		2.936	0	0	0	0
Utility Man Opr.	4	0.407-2.137	1.026	0	0	0	0
Overhead Crane Opr.	1		0.735	0	0	0	0
Fuming Furnace							
Overhead Crane Opr.	3	0.102-0.494	0.245	0	0	0	0
Fuming Furnace Opr.	1		0.075	0	0	0	0
Fuming Furnace Operator Helper	2	0.072-1.05	0.561	0	0	0	0
Kiln Operator							
Kiln Operator Helper							
Baghouse Operator	3	0.151-0.894	0.398	0	0	0	0
Baghouse Opr. Helper	1		1.169	0	0	0	0
Granulator Operator	2	0.33 -1.47	0.90	0	0	0	0
Boiler Operator	1		0.511	0	0	0	0
Lancer Operator	6	0.561-29.167	6.97	2	33	2	33
Furnace Man Trainee							

TABLE 12 (Cont)

LEAD SMELTER
Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING							
Lead Refinery							
Reverb Furnace Opr.							
Dross Floor Head Opr	2	0.111-0.815	0.463	0	0	0	0
Dross Floor Opr.	10	0.010-0.889	0.275	0	0	0	0
Overhead Crane Opr.							
Kettle Head Opr.	2	0.039-0.080	0.056	0	0	0	0
Casting and Loading							
Weigher	0						
Casting & Loading Helper	0						
Head Loader							
Head Casting Opr.	0						
Caster & Fork Lift Operator	0						
Cadmium & Silver & Electric Furn							
Head Operator (Cd Plt)	2	0.065-0.163	0.114	0	0	0	0
Operator (Cd Plt)	2	0.092-0.487	0.290	0	0	0	0
Crew Leader (Silver Ref.)							
Cupel Operator (Silver Ref.)	1		0.814	0	0	0	0
Recort Operator (Silver Ref.)	2	0.035-1.197	0.616	0	0	0	0
Crew Leader (Hard Lead)							
Head Opr. (Hard Lead)							
Operator (Hard Lead)							

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TABLE 12 (Cont)
 LEAD SMELTER
 Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY							
Acid Plant Opr.	1	0.015	0.015	0	0	0	0
Baghouse Opr.	3	0.126-5.46	2.91	1	33	1	33
Baghouse Service Attendant	1		0.175	0	0	0	0
Baghouse Laborer	9	0.024-1.18	0.289	0	0	0	0
Effluent Plant Opr.							
Contract Main Baghouse	1		3.04	0	0	0	0

TABLE 12 (Cont)
LEAD SMELTER
Zinc Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³		ACGIH-TLV 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MAINTENANCE							
Blowerhouse Opr.	1		0.006	0	0	0	0
Maintenance S-1							
Mechanic	4	0.068-0.245	0.139	0	0	0	0
Lubrican	1		0.062	0	0	0	0
Welder	1		0.065	0	0	0	0
Maintenance S-2							
Carcenter	2	0.534-1.821	1.178	0	0	0	0
Millwright	2	1.033-1.141	1.087	0	0	0	0
Maintenance S-3							
Mechanic	11	0.096-12.46	1.806	1	9	1	9
Maintenance S-4							
Mechanic	5	0.067-6.726	1.206	1	20	1	20
Lubrican	1		0.257	0	0	0	0
Maintenance S-5							
Mechanic	4	0.043-0.687	0.368	0	0	0	0
Maintenance S-7							
Pipefitter	7	0.067-0.133	0.105	0	0	0	0
Maintenance S-8							
Painter	1		0.47	0	0	0	0
Maintenance S-10							
Electrician	4	0.118-0.754	0.754	0	0	0	0

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ELECTROLYTIC ZINC PLANT

Zinc Concentrations

Table 13

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
ACID PLANT	6			0.066		
Operator-Helper	5	0.024	0.130	0.075	0	0
Foreman	1			0.134	0	0
BAGHOUSE & COTTRELL(1)	8					
Operator/Flue Dustman	6	3.978	302.900	106.796	5	83
Maintenance	1			15.600	1	100
Foreman	1			1.678	0	0
CADMIUM PLANT (1)				0.0347		
Caster	3	0.012	0.060	0.127	0	0
Shifter/Leadman	3	0.234	2.000	0.826	0	0
Pressman/Operator	2	0.069	0.392	0.192	0	0
CONCENTRATE HANDLING	12			13.374		
Conc. Handling Opr.	4	1.678	10.809	5.750	2	50
Leader-Helper	2	24.137	25.500	24.818	2	100
Ore Unloader	6	3.968	47.400	22.284	5	83
ELECTROLYTIC DEPARTMENT	54					
Anode Shop (1)	2			0.136		
Fabrication	2	0.135	0.232	0.184	0	0
Cellroom	52			0.367	0	0
Operator	3	0.135	0.191	0.115	0	0

ELECTROLYTIC ZINC PLANT

Zinc Concentrations

Table 13 cont.

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
Leadman	1			0.162	0	0
Cell Repair	30	0.131	0.670	0.225	0	0
Stripper	17	0.072	2.667	0.571	0	0
Utility Cleanup	2	0.185	1.297	0.741	0	0
LEACH DEPARTMENT						
Leach						
Leachman	3	0.393	1.300	0.552	0	0
Shift Foreman	1			0.295	0	0
Operator	2	0.393	1.300	0.847	0	0
Mud Mill Operator	2	0.413	0.695	0.554	0	0
Burt Filter						
Operator	4	0.259	0.542	0.362	0	0
Repairman	1			0.472	0	0
MAINTENANCE						
Z-1 Area						
Maint. Mechanic	15	0.155	38.825	14.605	13	87
Maint. Mech. App.	10	0.326	27.070	9.610	7	70
Maint. Rel. For.	1			4.700	0	0
Oiler	8	8.200	21.700	12.832	8	100
Z-2 Area Maintenance						
Maint. Mechanic	11	0.098	12.100	2.237	3	27
Mechanic Helper	4	0.407	7.036	0.211	1	25
Oiler	1			1.157	0	0

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ELECTROLYTIC ZINC PLANT

Zinc Concentrations

Table 13 cont

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.						
Mechanic (1)	3	0.572	27.100	13.991	2	67
Mechanic Helper (1)	1			16.300	1	100
Cellroom Maintenance						
Carpenter Foreman	1			0.102	0	0
Oiler	1			0.356	0	0
Carpenters	11			0.513	0	0
Mechanics	5			0.404	0	0
Machine Shop						
Welder	5	0.275	0.883	0.509	0	0
Blacksmith (1)	1			0.370	0	0
Machinist Apprentice	2	0.102	0.270	0.135	0	0
MELTING DEPARTMENT						
Casting (1)						
Shift Foreman	3	1.345	2.138	1.694	0	0
Melting Dept. Opr.	11	0.949	28.600	11.598	8	73
Skimming & Ladling	4	1.112	4.663	3.565	0	0
Scrap Furnace Opr.	3	5.119	5.978	5.556	3	100
Furnacemen	3	1.400	4.663	3.565	0	0
Alloyer	2	8.524	9.000	8.762	2	100
Shipping						
Operator	9	0.095	0.361	0.189	0	0
Scaleman	1			0.090	0	0

ELECTROLYTIC ZINC PLANT

Zinc Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT						
Foreman	1			0.024	0	0
Pressman	3	0.642	5.592	2.423	1	33
Operator	2	0.225	1.019	0.622	0	0
Laborer-Cleanup	4	0.009	4.340	1.284	0	0
Tank Hitter	1			13.268	1	100
ROASTERS (1)						
Operator	5	6.085	30.200	14.293	5	100
Helper	2	16.485	20.326	18.585	2	100
Lancer	4	11.400	42.140	23.461	4	100
Boiler Operator	3	0.741	15.259	9.083	2	67
Wedge Operator	2	14.177	14.200	14.188	2	100
Pretreatment Opr.	1			0.337	0	0
MAINTENANCE						
(Summary)						
Mechanics (1)	54	0.098	38.825	8.130	35	65
Oilers	10	0.356	21.700	10.416	8	80
Carpenters (1)	17	0.080	0.882	0.422	0	0
Electricians (1)	10	0.043	30.814	3.080	3	30
Lead Burners	9	0.037	0.343	0.182	0	0
Yard Crew (1)	20	0.136	28.095	5.340	4	20
Metalizer	1			1.200	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.						

TABLE 14
MINES PLANT
Arsenic Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CONCENTRATOR									
Crushing Plant									
Crushing Plant Crew Leader	1		0.004	0	0	0	0	0	0
Crushing Plant Operator									
Utility Laborer									
Grinding & Flotation									
Flotation Operator Helper	1		0.001	0	0	0	0	0	0
Concentrate Loader	1		<0.001	0	0	0	0	0	0
Flotation Operator	1		<0.001	0	0	0	0	0	0
Ball Mill Operator	1		0.001	0	0	0	0	0	0
Concentrator Utility	2		<0.001	0	0	0	0	0	0
Concentrator Crew Leader									
Concentrate Loader Asst.									
Vacuum Filter Operator	1		0.001	0	0	0	0	0	0
Maintenance									
Mechanics	4	0.001-0.010	0.004	0	0	0	0	2	50
Electricians	2		<0.001	0	0	0	0	0	0
Electrician Helper	1		0.006	0	0	0	0	1	100

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TABLE 15
DEAD SMELTER
Arsenic Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
CHARGE PREPARATION									
Crane Crew									
Locomotive Engineer									
Conductor									
Asst. Conductor									
Locomotive Crane Operator	2	<0.001-0.002	0.001	0	0	0	0	0	0
Locomotive Crane Helper									
Sampler									
Charge Preparation									
Proportioning Overhead Crane Operator									
Utility Laborer									
Helper (Air Lance)	2	.003-.016	0.010	0	0	0	0	1	50
Crushing Plant									
Mill Operator									
Crusher Operator									
Belt Crew									
Conveyor Operator	1		0.012	0	0	0	0	1	100
Tripper Operator									

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TABLE 15 (Cont)

LEAD SMELTER

Arsenic Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SINTER PLANT									
Pellet Plant									
Feed Preparation Plant Operator	1		0.051	0	0	0	0	1	100
Utility Laborer Sinter Plant	2	0.017-0.040	0.029	0	0	0	0	2	100
Sinter Plant Opr.	3	0.003-0.063	0.023	0	0	0	0	3	100
Sinter Plant Asst.	1		0.003	0	0	0	0	0	0
SMELTER									
Blast Furnace									
Blast Furnace Opr.	1		0.024	0	0	0	0	1	100
Slag Tapper	3	0.001-0.014	0.007	0	0	0	0	2	67
Blast Furnace Feeder	1		<0.001	0	0	0	0	0	0
Utility Man Opr.									
Overhead Crane Opr.	1	0.008	0.008	0	0	0	0	1	100
Fuming Furnace									
Overhead Crane Opr.	1		0.003	0	0	0	0	0	0
Fuming Furnace Opr.	1		<0.001	0	0	0	0	0	0
Fuming Furnace Operator Helper									
Kiln Operator									
Kiln Operator Helper									
Baghouse Operator	1		0.002	0	0	0	0	0	0
Baghouse Opr. Helper	1		0.005	0	0	0	0	1	100
Granulator Operator	1		0.002	0	0	0	0	0	0
Boiler Operator	1		<0.001	0	0	0	0	0	0
Lancer Operator	4	0.002-0.007	0.005	0	0	0	0	3	75
Furnace Man Trainee									

TABLE 15 (Cont)
LEAD SMELTER
Arsenic Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING									
Lead Refinery									
Reverb Furnace Opr.	1		0.200	0	0	0	0	1	100
Dross Floor Head Opr	1		0.06	0	0	0	0	1	100
Dross Floor Opr.	3	0.009-0.047	0.02	0	0	0	0	3	100
Overhead Crane Opr.									
Kettle Head Opr.									
Casting and Loading									
Weigher	1		<0.001	0	0	0	0	0	0
Casting & Loading Helper	3	<0.001-0.005	0.003	0	0	0	0	1	33
Head Loader	2		<0.001	0	0	0	0	0	0
Head Casting Opr.	1		<0.001	0	0	0	0	0	0
Caster & Fork Lift Operator	3	<0.001-0.002	<0.002	0	0	0	0	0	0
Cadmium & Silver & Electric Furn									
Head Operator (Cd Plt)	0								
Operator (Cd Plt)	0								
Crew Leader (Silver Ref.)	0								
Cupel Operator (Silver Ref.)	2	0.001-0.016	0.009	0	0	0	0	1	50
Retort Operator (Silver Ref.)	4	<0.001-0.014	0.008	0	0	0	0	3	75
Crew Leader (Hard Lead)	0								
Head Opr. (Hard Lead)	0								
Operator (Hard Lead)	0								

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LEAD SMELTER
Arsenic Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY									
Acid Plant Opr.	0								
Baghouse Opr.	2	0.039-0.046	0.043	0	0	0	0	2	100
Baghouse Service Attendant	2	0.009-0.011	0.010	0	0	0	0	2	100
Baghouse Laborer	3	0.036-0.066	0.055	0	0	0	0	3	100
Effluent Plant Opr.	0								
Contract Main Baghouse									

ELECTROLYTIC ZINC PLANT

Arsenic Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	2			ND						
Operator-Helper	2			ND	0	0	0	0	0	0
Foreman	0									
BAGHOUSE & COTTRELL(1)	4									
Operator/Flue Dustman	2	ND	0.009	0.005	0	0	0	0	1	50.0
Maintenance	1			0.025	0	0	0	0	1	100.0
Foreman	1			0.003	0	0	0	0	0	0
CADMIUM PLANT (1)	2			ND						
Caster	0									
Shifter/Leadman	1			ND	0	0	0	0	0	0
Pressman/Operator	1			0.001	0	0	0	0	0	0
CONCENTRATE HANDLING										
Conc. Handling Opr.	1			0.001	0	0	0	0	0	0
Leader-Helper	1			0.017	0	0	0	0	1	100.0
Ore Unloader	1			0.010	0	0	0	0	1	100.0
ELECTROLYTIC DEPARTMENT	9			ND						
Anode Shop (1)	4									
Fabrication	4			ND	0	0	0	0	0	
Cellroom				ND						
Operator	0									

TABLE 16 (Cont)
ELECTROLYTIC ZINC PLANT
Arsenic Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.5 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT										
Foreman	0									
Pressman	2	0.010	0.011	0.010	0	0	0	0	2	100.0
Operator	1			0.003	0	0	0	0	0	0
Laborer-Cleanup	2	0.002	0.008	0.005	0	0	0	0	1	50.0
Tank Hitter	1			0.005	0	0	0	0	1	100.0
ROASTERS (1)										
Operator	1			0.011	0	0	0	0	1	100.0
Helper	3	0.016	0.063	0.042	0	0	0	0	3	100.0
Lancer	2	0.009	0.016	0.012	0	0	0	0	2	100.0
Boiler Operator	2	0.001	0.013	0.007	0	0	0	0	1	50.0
Wedge Operator	1			0.002	0	0	0	0	0	0
Pretreatment Opr.	1			ND	0	0	0	0	0	0
MAINTENANCE										
(Summary)										
Mechanics (1)	32	ND	0.027	0.004	0	0	0	0	12	37.5
Oilers	4	ND	0.004	0.002	0	0	0	0	0	0
Carpenters (1)	10	ND	0.005	ND	0	0	0	0	1	10.0
Electricians (1)	5	ND	0.223	0.046	0	0	0	0	2	40.0
Lead Burners	4	ND	0.006	0.003	0	0	0	0	1	25.0
Yard Crew (1)	18	ND	0.037	0.007	0	0	0	0	9	50.0
Metalizer	0									
Pipe Fitter	4	ND	0.005	0.002	0	0	0	0	1	25.0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments										

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ELECTROLYTIC ZINC PLANT

Arsenic Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.05 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	0									
Cell Repair	7	ND	0.001	0.001	0	0	0	0	0	0
Stripper	3			ND	0	0	0	0	0	0
Utility Cleanup	1			ND	0	0	0	0	0	0
LEACH DEPARTMENT	10			0.003						
Leach	5			0.002						
Leachman	0									
Shift Foreman	3			ND	0	0	0	0	0	0
Operator	1			0.007	0	0	0	0	1	100.0
Mud Mill Operator	1			0.003	0	0	0	0	0	0
Burt Filter	4			ND						
Operator	2			ND	0	0	0	0	0	0
Repairman	2			ND	0	0	0	0	0	0
MAINTENANCE										
2-1 Area										
Maint. Mechanic										
Maint. Mech. App.										
Maint. Rel. For.										
Oiler										
2-2 Area Maintenance										
Maint. Mechanic										
Mechanic Helper										
Oiler										

TABLE 16 (Cont)
ELECTROLYTIC ZINC PLANT
Arsenic Concentrations

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.5 mg/m ³		ACGIH-TLV 0.05 mg/m ³		Proposed OSHA Std. 0.004 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.										
Mechanic (1)										
Mechanic Helper (1)										
- Cellroom Maintenance										
Carpenter Foreman										
Oiler										
Carpenters										
Mechanics										
Machine Shop										
Welder	1			ND	0	0	0	0	0	0
Blacksmith (1)	1			ND	0	0	0	0	0	0
Machinist Apprentice	2			ND	0	0	0	0	0	0
MELTING DEPARTMENT	16			ND						
Casting (1)	12			ND						
Shift Foreman	1			ND	0	0	0	0	0	0
Melting Dept. Opr.	6			ND	0	0	0	0	0	0
Skimming & Ladling	2			ND	0	0	0	0	0	0
Scrap Furnace Opr.	1			ND	0	0	0	0	0	0
Furnacemen	1			ND	0	0	0	0	0	0
Alloyer	1			ND	0	0	0	0	0	0
Shipping	4			ND						
Operator	3			ND	0	0	0	0	0	0
Scaleman	1			ND	0	0	0	0	0	0

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TABLE 17
LEAD SMELTER
Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³ (dust)		ACGIH-TLV 0.5 mg/m ³ (dust)		Proposed ACGIH-TLV 0.05 mg/m ³ (dust)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING									
Lead Refinery									
Reverb Furnace Opr.									
Dross Floor Head Opr	2	0.022-0.144	0.083	0	0	0	0	1	50
Dross Floor Opr.	10	<0.012-0.044	0.024	0	0	0	0	0	0
Overhead Crane Opr.									
Kettle Head Opr.	2	<0.012-0.021	0.017	0	0	0	0	0	0
Casting and Loading									
Weigher	0								
Casting & Loading Helper	0								
Head Loader	0								
Head Casting Opr.	0								
Caster & Fork Lift Operator	0								
Cadmium & Silver & Electric Furn									
Head Operator (Cd Plt)	1		0.017	0	0	0	0	0	0
Operator (Cd Plt)	1		0.012	0	0	0	0	0	0
Crew Leader (Silver Ref.)	0								
Cupel Operator (Silver Ref.)	1		<0.010	0	0	0	0	0	0
Retort Operator (Silver Ref.)	2		<0.010	0	0	0	0	0	0
Crew Leader (Hard Lead)	0								
Head Opr. (Hard Lead)	0								
Operator (Hard Lead)	0								

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TABLE 17 (Cont)
LEAD SMELTER
Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³ (dust)		ACGIH-TLV 0.5 mg/m ³ (dust)		Proposed ACGIH-TLV 0.05 mg/m ³ (dust)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SINTER PLANT									
Pellet Plant									
Feed Preparation Plant Operator	2	0.031-0.040	0.036	0	0	0	0	0	0
Utility Laborer	1		0.042	0	0	0	0	0	0
Sinter Plant									
Sinter Plant Opr.	2	0.018-0.060	0.039	0	0	0	0	1	50
Sinter Plant Asst.	2	0.038-0.116	0.077	0	0	0	0	1	50
SMELTER									
Blast Furnace									
Blast Furnace Opr.	2	0.019-0.084	0.052	0	0	0	0	1	50
Slag Tapper	2		<0.010	0	0	0	0	0	0
Blast Furnace Feeder	1		0.064	0	0	0	0	1	100
Utility Man Opr.	4	<0.010-0.397	0.112	0	0	0	0	1	25
Overhead Crane Opr.	1		0.079	0	0	0	0	1	100
Fuming Furnace									
Overhead Crane Opr.	2	<0.010-0.019	0.015	0	0	0	0	0	0
Fuming Furnace Opr.	1		<0.010	0	0	0	0	0	0
Fuming Furnace Operator Helper	2	<0.010-0.40	0.205	0	0	0	0	1	50
Kiln Operator									
Kiln Operator Helper									
Baghouse Operator	3	<0.010-0.032	0.017	0	0	0	0	0	0
Baghouse Opr. Helper	1		0.053	0	0	0	0	1	100
Granulator Operator	2	<0.010-0.105	0.056	0	0	0	0	1	50
Boiler Operator	1		<0.01	0	0	0	0	0	0
Lancer Operator	8	<0.010-0.051	0.02	0	0	0	0	1	13
Furnace Man Trainee									

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TABLE 17 (Cont)

LEAD SMELTER

Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.5 mg/m ³ (dust)		ACGIH-TLV 0.5 mg/m ³ (dust)		Proposed ACGIH-TLV 0.05 mg/m ³ (dust)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY									
Acid Plant Opr.	1		<0.012	0	0	0	0	0	0
Baghouse Opr.	3	0.008-0.018	0.013	0	0	0	0	0	0
Baghouse Service Attendant	1		0.049	0	0	0	0	0	0
Baghouse Laborer	9	<0.005-0.052	0.03	0	0	0	0	1	11
Effluent Plant Opr.	0								
Contract Main Baghouse	1		0.054	0	0	0	0	1	100

ELECTROLYTIC ZINC PLANT
Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³ (fume)		ACGIH-TLV 0.5 mg/m ³ (fume)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	1			ND				
Operator-Helper	1			ND	0	0	0	0
Foreman	0							
BAGHOUSE & COTTRELL(1)	4			0.007				
Operator/Flue Dustman	3	ND	0.035	0.012	0	0	0	0
Maintenance	1			ND	0	0	0	0
Foreman	0							
CADMIUM PLANT (1)	5			ND	0	0	0	0
Caster	2			ND	0	0	0	0
Shifter/Leadman	1			ND	0	0	0	0
Pressman/Operator	2			ND	0	0	0	0
CONCENTRATE HANDLING	5			0.011				
Conc. Handling Opr.	1			0.013	0	0	0	0
Leader-Helper	1			0.023	0	0	0	0
Ops Unloader	3	0.001	0.016	0.006	0	0	0	0
ELECTROLYTIC DEPARTMENT	30							
Anode Shop (1)	2			ND	0	0	0	0
Fabrication	2			ND	0	0	0	0
Callroom	28			ND	0	0	0	0
Operator	3			ND	0	0	0	0

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TABLE 1B (Cont)
ELECTROLYTIC ZINC PLANT
Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.5 mg/m ³ (fume)		ACGIH-TLV 0.5 mg/m ³ (fume)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	1			ND	0	0	0	0
Cell Repair	14			ND	0	0	0	0
Stripper	9			ND	0	0	0	0
Utility Cleanup	1			ND	0	0	0	0
LEACH DEPARTMENT	8							
Leach	4			ND				
Leachman	1	ND	--	ND	0	0	0	0
Shift Foreman	0							
Operator	2			ND	0	0	0	0
Mud Mill Operator	1			ND	0	0	0	0
Burt Filter	4			ND				
Operator	3			ND	0	0	0	0
Repairman	1			ND	0	0	0	0
MAINTENANCE	52							
Z-1 Area	18			<0.010				
Maint. Mechanic	11	0.001	0.017	0.004	0	0	0	0
Maint. Mech. App.	6	0.001	0.017	0.004	0	0	0	0
Maint. Rel. For.	1			ND	0	0	0	0
Oiler								
Z-2 Area Maintenance	13			<0.010				
Maint. Mechanic	9	0.001	0.012	0.012				
Mechanic Helper	3			ND	0	0	0	0
Oiler	1			ND	0	0	0	0

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TABLE 18 (Cont)

ELECTROLYTIC ZINC PLANT

Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.5 mg/m ³ (fume)		ACGIH-TLV 0.5 mg/m ³ (fume)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.	4			ND	0	0	0	0
Mechanic (1)	3			ND	0	0	0	0
Mechanic Helper (1)	1			ND	0	0	0	0
Cellroom Maintenance	13			ND				
Carpenter Foreman	1			ND	0	0	0	0
Oiler	1			ND	0	0	0	0
Carpenters	10			ND	0	0	0	0
Mechanics	1			ND	0	0	0	0
Machine Shop	4			ND				
Welder	2			ND	0	0	0	0
Blacksmith (1)	1			ND	0	0	0	0
Machinist Apprentice	1			ND	0	0	0	0
MELTING DEPARTMENT	1							
CASTING (1)	12			ND				
Shift Foreman	1			ND	0	0	0	0
Melting Dept. Opr.	7			ND	0	0	0	0
Skimming & Ladling	1			ND	0	0	0	0
Scrap Furnace Opr.	1			ND	0	0	0	0
Furnacemen	1			ND	0	0	0	0
Alloyer	1			ND	0	0	0	0
Shipping	1			ND	0	0	0	0
Operator	5			ND				
Scaleman								

hb

TABLE 18 (Cont)
ELECTROLYTIC ZINC PLANT
Antimony Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration - mg/m ³	OSHA Standard 0.5 mg/m ³ (fume)		ACGIH-TLV 0.5 mg/m ³ (fume)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	8			ND	0	0	0	0
Fireman	1			ND	0	0	0	0
Pressman	3			ND	0	0	0	0
Operator	1			ND	0	0	0	0
Laborer-Cleanup	2			ND	0	0	0	0
Tank Hitter	1			ND	0	0	0	0
ROASTERS (1)	6			0.030				
Operator	1			ND	0	0	0	0
Helper	1			0.028	0	0	0	0
Lancer	3	0.001	0.021	0.020	0	0	0	0
Boiler Operator	0							
Wedge Operator	0							
Pretreatment Opr.	1			ND	0	0	0	0
MAINTENANCE (Summary)								
Mechanics (1)	35	0.001	0.017	0.003	0	0	0	0
Oilers	4			ND	0	0	0	0
Carpenters (1)	10	--	--	ND	0	0	0	0
Electricians (1)	5	--	--	ND	0	0	0	0
Lead Burners	5	0.001	0.026	0.013	0	0	0	0
Yard Crew (1)	12			ND	0	0	0	0
Matalizer	1			ND	0	0	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.								

TABLE 19
LEAD SMELTER
Cobalt Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³		ACGIH-TLV 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY							
Acid Plant Opr.	1		<0.002	0	0	0	0
Baghouse Opr.	2		<0.002	0	0	0	0
Baghouse Service Attendant	1		<0.002	0	0	0	0
Baghouse Laborer	6		<0.002	0	0	0	0
Effluent Plant Opr.	0						
Contract Main Baghouse	1		<0.002	0	0	0	0

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TABLE 20
ELECTROLYTIC ZINC PLANT
COBALT CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³		ACGIH-TLV 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	2			ND				
Operator-Helper	2			ND	0	0	0	0
Foreman	0							
BAGHOUSE & COTTRELL(1)	4			0.007				
Operator/Flue Dustman	3	ND	0.024	0.008	0	0	0	0
Maintenance Foreman	1 0			ND	0	0	0	0
CADMIUM PLANT (1)	6			ND	0	0	0	0
Caster	2			ND	0	0	0	0
Shifter/Leadman	2			ND	0	0	0	0
Pressman/Operator	2			ND	0	0	0	0
CONCENTRATE HANDLING	5			0.001				
Conc. Handling Opr.	1			0.004	0	0	0	0
Leader-Helper	1			ND	0	0	0	0
Ore Unloader	3			ND	0	0	0	0
ELECTROLYTIC DEPARTMENT	27			ND				
Anode Shop (1)								
Fabrication	0							
Cellroom								
Operator	2			ND	0	0	0	0

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TABLE 20 (Cont)
ELECTROLYTIC ZINC PLANT
COBALT CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Con- centration mg/m ³	OSHA Standard 0.1 mg/m ³		ACGIH-TLV ₃ 0.1 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	1		ND	0	0	0	0
Cell Repair	14		ND	0	0	0	0
Stripper	9		ND	0	0	0	0
Utility Cleanup	1		ND	0	0	0	0
LEACH DEPARTMENT							
Leach	5		ND				
Leachman	1		ND	0	0	0	0
Shift Foreman	0						
Operator	2		ND	0	0	0	0
Mud Mill Operator	2		ND	0	0	0	0
Burr Filter	4		ND				
Operator	3		ND	0	0	0	0
Repairman	1		ND	0	0	0	0
MAINTENANCE							
Z-1 Area							
Maint. Mechanic							
Maint. Mech. App.							
Maint. Rel. For.							
Oiler							
Z-2 Area Maintenance							
Maint. Mechanic							
Mechanic Helper							
Oiler							

TABLE 20 (Cont)
ELECTROLYTIC ZINC PLANT
COBALT CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³		ACGIH-TLV 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.								
Mechanic (1)								
Mechanic Helper (1)								
Cellroom Maintenance								
Carpenter Foreman								
Oiler								
Carpenters								
Mechanics								
Machine Shop	4			ND				
Welder	2			ND	0	0	0	0
Blacksmith (1)	1			ND	0	0	0	0
Machinist Apprentice	1			ND	0	0	0	0
MELTING DEPARTMENT								
Casting (1)	12			ND				
Shift Foreman	1			ND	0	0	0	0
Melting Dept. Opr.	7			ND	0	0	0	0
Skimming & Ladling	1			ND	0	0	0	0
Scrap Furnace Opr.	1			ND	0	0	0	0
Furnacemen	11			ND	0	0	0	0
Alloyer	1			ND	0	0	0	0
Shipping	5			ND				
Operator	5			ND	0	0	0	0
Scaleman	0							

bb

TABLE 20 (Cont)
ELECTROLYTIC ZINC PLANT
COBALT CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³		ACGIH-TLV 0.1 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	8			ND				
Foreman	1			ND	0	0	0	0
Pressman	3			ND	0	0	0	0
Operator	2			ND	0	0	0	0
Laborer-Cleanup	2			ND	0	0	0	0
Tank Hitter	1			ND	0	0	0	0
ROASTERS (1)	7			0.007				
Operator	2	ND	0.013	0.007	0	0	0	0
Helper	1			0.017	0	0	0	0
Lancer	3	ND	0.006	0.004	0	0	0	0
Boiler Operator	0							
Wedge Operator	1			0.003	0	0	0	0
Pretreatment Opr.								
MAINTENANCE (Summary)								
Mechanics (1)	11	ND	0.003	0.001	0	0	0	0
Oilers	6			ND	0	0	0	0
Carpenters (1)	12			ND	0	0	0	0
Electricians (1)	5			ND	0	0	0	0
Lead Burners	5			ND	0	0	0	0
Yard Crew (1)	12			ND	0	0	0	0
Metalizer	1			ND	0	0	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.								

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TABLE 21

LEAD SMELTER

Manganese Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard* 5.0 mg/m ³		ACGIH-TLV* 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
SINTER PLANT							
Pellet Plant							
Feed Preparation Plant Operator	1		0.039	0	0	0	0
Utility Laborer	1		0.071	0	0	0	0
Sinter Plant							
Sinter Plant Opr.	1		0.140	0	0	0	0
Sinter Plant Asst.	1		0.146	0	0	0	0
SMELTER							
Blast Furnace							
Blast Furnace Opr.	1		0.011	0	0	0	0
Slag Tapper	2		0.003	0	0	0	0
Blast Furnace Feeder	1		0.083	0	0	0	0
Utility Man Opr.	1		0.015	0	0	0	0
Overhead Crane Opr.	1		0.022	0	0	0	0
Fuming Furnace							
Overhead Crane Opr.	1		<0.001	0	0	0	0
Fuming Furnace Opr.	1		<0.001	0	0	0	0
Fuming Furnace Operator Helper	2	<0.001-0.039	0.020	0	0	0	0
Kiln Operator							
Kiln Operator Helper							
Baghouse Operator	2	<0.001-0.003	0.002	0	0	0	0
Baghouse Opr. Helper							
Granulator Operator	1		<0.001	0	0	0	0
Boiler Operator	1		<0.001	0	0	0	0
Lancer Operator	4	<0.001-0.012	0.004	0	0	0	0
Furnace Man Trainee							

* Ceiling value which should not be exceeded

TABLE 21 (Cont)
LEAD SMELTER
Manganese Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard * 5.0 mg/m ³		ACGIH-TLV * 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING							
Lead Refinery							
Reverb Furnace Opr.							
Dross Floor Head Opr	2		< 0.005	0	0	0	0
Dross Floor Opr.	5		<0.005	0	0	0	0
Overhead Crane Opr.							
Kettle Head Opr.	1		<0.005	0	0	0	0
Casting and Loading							
Weigher	0						
Casting & Loading Helper	0						
Head Loader	0						
Head Casting Opr.	0						
Caster & Fork Lift Operator	0						
Cadmium & Silver & Electric Furn							
Head Operator (Cd Plt)	1		<0.005	0	0	0	0
Operator (Cd Plt)	1		<0.005	0	0	0	0
Crew Leader (Silver Ref.)	0						
Cupel Operator (Silver Ref.)	1		<0.001	0	0	0	0
Retort Operator (Silver Ref.)	2	<0.001-0.003	<0.002	0	0	0	0
Crew Leader (Hard Lead)	0						
Head Opr. (Hard Lead)	0						
Operator (Hard Lead)	0						

* Ceiling value which should not be exceeded

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TABLE 21 (Cont)
LEAD SMELTER
Manganese Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard* 5.0 mg/m ³		ACGIH-TLV* 5.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY							
Acid Plant Opr.	1		<0.001	0	0	0	0
Baghouse Opr.	6		<0.005	0	0	0	0
Baghouse Service Attendant	1		<0.001	0	0	0	0
Baghouse Laborer	7	<0.001-0.009	<0.005	0	0	0	0
Effluent Plant Opr.	0						
Contract Main Baghouse	1		0.015	0	0	0	0

* Ceiling value which should not be exceeded

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ELECTROLYTIC ZINC PLANT
Manganese Concentration

Table 22

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
ACID PLANT	6					
Operator-Helper	5			ND	0	0
Foreman	1			ND	0	0
BAGHOUSE & COTTRELL(1)	4			0.751		
Operator/Flue Dustman	3	0.045	1.600	0.316	0	0
Maintenance Foreman	1			0.134	0	0
CADMIUM PLANT (1)	5			0.007		
Caster	2	0.001	0.004	0.002	0	0
Shifter/Leadman	1	0.004	0.011	0.008	0	0
Pressman/Operator	2	0.003	0.033	0.020	0	0
CONCENTRATE HANDLING	5			0.077		
Conc. Handling Opr.	1			0.015	0	0
Leader-Helper	1			0.167	0	0
Ore Unloader	2	0.056	0.089	0.069	0	0
ELECTROLYTIC DEPARTMENT	28					
Anode Shop (1)	1			0.093		
Fabrication	1			0.093	0	0
Cellroom	27			0.055		
Operator	3	0.010	0.035	0.019	0	0

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ELECTROLYTIC ZINC PLANT

Manganese Concentration

Table 22 cont.

JOB TITLE OR AREA	Number of Samples	RANGE, mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
Leadman	1			0.033	0	0
Cell Repair	14	0.008	0.422	0.098		
Stripper	9	0.002	0.051	0.018	0	0
Utility Cleanup	0				0	0
LEACH DEPARTMENT	8			<0.010		
Leach	4			<0.010		
Leachman	1			0.006	0	0
Shift Foreman	0					
Operator	2	0.006	0.012	0.009	0	0
Mud Mill Operator	1			0.022	0	0
Burr Filter	4			<0.010		
Operator	3	0.005	0.012	0.010	0	0
Repairman	1			0.010		
MAINTENANCE	54					
Z-1 Area	22			<0.010		
Maint. Mechanic	11	0.010	0.143	0.067	0	0
Maint. Mech. App.	6	0.001	0.083	0.042	0	0
Maint. Rel. For.	1			0.023	0	0
Oiler	4	0.023	0.097	0.052	0	0
Z-2 Area Maintenance	12			<0.010		
Maint. Mechanic	9	0.005	0.133	0.034	0	0
Mechanic Helper	2	0.010	0.019	0.015	0	0
Oiler	1			0.010	0	0

ELECTROLYTIC ZINC PLANT

Manganese Concentration

Table 22 cont.

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.	3			<0.010		
Mechanic (1)	2	0.003	0.059	0.037	0	0
Mechanic Helper (1)	1			0.050	0	0
Cellroom Maintenance	13			<0.010		
Carpenter Foreman	1			0.010	0	0
Oiler	1			0.010	0	0
Carpenters	10	0.010	0.597	0.075	0	0
Mechanics	1			0.016	0	0
Machine Shop	4			0.010		
Welder	2	0.009	0.036	0.022		
Blacksmith (1)	1			0.019	0	0
Machinist Apprentice	1			0.004	0	0
MELTING DEPARTMENT	17			<0.010		
Casting (1)	12			<0.010		
Shift Foreman	1			0.005	0	0
Melting Dept. Opr.	7	0.006	0.018	0.008	0	0
Skimming & Ladling	1			0.008	0	0
Scrap Furnace Opr.	1			0.012	0	0
Furnacemen	1			0.006	0	0
Alloyer	1			0.005	0	0
Shipping	5			<0.010		
Operator	5	0.001	0.005	0.001	0	0
Scaleman	0			--		

ELECTROLYTIC ZINC PLANT

Manganese Concentration

Table 22 cont.

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 5.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	8					
Foreman	1			0.005	0	0
Pressman	3	0.008	0.046	0.021	0	0
Operator	1			0.003	0	0
Laborer-Cleanup	2	0.005	0.049	0.027	0	0
Tank Hitter	1			0.009	0	0
ROASTERS (1)	7			0.203		
Operator	2	0.076	0.153	0.114	0	0
Helper	1			0.709	0	0
Lancer	3	0.046	0.189	0.132	0	0
Boiler Operator	0					
Wedge Operator	1			0.089	0	0
Pretreatment Opr.						
MAINTENANCE (Summary)						
Mechanics (1)	33	0.010	0.143	<0.1	0	0
Oilers	6	0.010	0.097	<0.1	0	0
Carpenters (1)	0					
Electricians (1)	5	0.005	0.014	<0.1	0	0
Lead Burners	5	0.022	0.065	<0.1	0	0
Yard Crew (1)	12	0.004	0.109	<0.1	0	0
Metalizer	1			<0.1	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.						

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TABLE 23
LEAD SMELTER
Nickel Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³		ACGIH-TLV 1.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY							
Acid Plant Opr.	1		<0.002	0	0	0	0
Baghouse Opr.	2		<0.002	0	0	0	0
Baghouse Service Attendant	1		<0.002	0	0	0	0
Baghouse Laborer	6		<0.002	0	0	0	0
Effluent Plant Opr.	0						
Contract Main Baghouse	1		<0.002	0	0	0	0

TABLE 24
ELECTROLYTIC ZINC PLANT
NICKEL CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³		ACGIH-TLV 1.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	2			ND				
Operator-Helper	2			ND	0	0	0	0
Foreman	0							
BAGHOUSE & COTTRELL(1)	4			0.007				
Operator/Flue								
Dustman	3	0.003	0.026	0.018	0	0	0	0
Maintenance	1			0.004	0	0	0	0
Foreman	0							
CADMIUM PLANT (1)	6			ND				
Caster	2			ND	0	0	0	0
Shifter/Leadman	2			ND	0	0	0	0
Pressman/Operator	2			ND	0	0	0	0
CONCENTRATE HANDLING	4			0.003				
Conc. Handling Opr.	1			ND	0	0	0	0
Leader-Helper	1			ND	0	0	0	0
Ore Unloader	2	0.004	0.006	0.005	0	0	0	0
ELECTROLYTIC DEPARTMENT								
Anode Shop (1)	0							
Fabrication								
Cellroom	27			ND				
Operator	2			ND	0	0	0	0

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TABLE 24 (Cont)

ELECTROLYTIC ZINC PLANT
NICKEL CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³		ACGIH-TLV 1.0 mg/m ³	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	1		ND	0	0	0	0
Cell Repair	1		ND	0	0	0	0
Stripper	9		ND	0	0	0	0
Utility Cleanup	1		ND	0	0	0	0
LEACH DEPARTMENT							
Leach							
Leachman	1		ND	0	0	0	0
Shift Foreman	0						
Operator	2		ND	0	0	0	0
Mud Mill Operator	2		ND	0	0	0	0
Burt Filter							
Operator	3		ND	0	0	0	0
Repairman	1		ND	0	0	0	0
MAINTENANCE							
Z-1 Area							
Maint. Mechanic							
Maint. Mech. App.							
Maint. Rel. For.							
Oiler							
Z-2 Area Maintenance							
Maint. Mechanic							
Mechanic Helper							
Oiler							

TABLE 24 (Cont)
ELECTROLYTIC ZINC PLANT
NICKEL CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³		ACGIH-TLV 1.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint.								
Mechanic (1)								
Mechanic Helper (1)								
Cellroom Maintenance								
Carpenter Foreman								
Oiler								
Carpenters								
Mechanics								
Machine Shop								
Welder	2			ND	0	0	0	0
Blacksmith (1)	1			0.003	0	0	0	0
Machinist Apprentice	1			ND	0	0	0	0
MELTING DEPARTMENT								
Casting (1)								
Shift Foreman	1			ND	0	0	0	0
Melting Dept. Opr.	7			ND	0	0	0	0
Skimming & Ladling	1			ND	0	0	0	0
Scrap Furnace Opr.	1			ND	0	0	0	0
Furnacemen	1			ND	0	0	0	0
Alloyer	1			ND	0	0	0	0
Shipping								
Operator	5			ND	0	0	0	0
Scaleman	0							

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TABLE 24 (Cont)
ELECTROLYTIC ZINC PLANT
NICKEL CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³		ACGIH-TLV 1.0 mg/m ³	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	8			ND				
Foreman	1			ND	0	0	0	0
Pressman	3			ND	0	0	0	0
Operator	1			ND	0	0	0	0
Laborer-Cleanup	2			ND	0	0	0	0
Tank Hitter	1			ND	0	0	0	0
ROASTERS (1)	7			0.003				
Operator	2	ND	0.021	0.006	0	0	0	0
Helper	1			0.099	0	0	0	0
Lancer	3	0.002	0.006	0.005	0	0	0	0
Boiler Operator	0							
Wedge Operator	1			ND	0	0	0	0
Pretreatment Opr.								
MAINTENANCE (Summary)								
Mechanics (1)	11	ND	0.007	0.002	0	0	0	0
Oilers	6			ND	0	0	0	0
Carpenters (1)	12			ND	0	0	0	0
Electricians (1)	5			ND	0	0	0	0
Lead Burners	5	ND	0.004	0.002	0	0	0	0
Yard Crew (1)	12			ND	0	0	0	0
Metalizer	1			ND	0	0	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.								

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TABLE 25
LEAD SMELTER
Copper Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.2 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
REFINING							
Lead Refinery							
Reverb Furnace Opr.							
Dross Floor Head Opr							
Dross Floor Opr.	6	0.001-0.035	0.015	0	0	0	0
Overhead Crane Opr.							
Kettle Head Opr.	1	0.002	0.002	0	0	0	0
Casting and Loading							
Weigher	0						
Casting & Loading Helper	0						
Head Loader	0						
Head Casting Opr.	0						
Caster & Fork Lift Operator	0						
Cadmium & Silver & Electric Furn							
Head Operator (Cd Plt)	0						
Operator (Cd Plt)	0						
Crew Leader (Silver Ref.)	0						
Cupel Operator (Silver Ref.)	0						
Retort Operator (Silver Ref.)	0						
Crew Leader (Hard Lead)	0						
Head Opr. (Hard Lead)	0						
Operator (Hard Lead)	0						

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TABLE 25 (Cont)

LEAD SMELTER

Copper Concentration

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³	OSHA Standard 0.1 mg/m ³ (fume)		ACGIH-TLV 0.2 mg/m ³ (fume)	
				No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
MATERIALS RECOVERY							
Acid Plant Opr.	1		<0.001	0	0	0	0
Baghouse Opr.	1		0.017	0	0	0	0
Baghouse Service Attendant	1		0.004	0	0	0	0
Baghouse Laborer	6	0.002-0.028	0.015	0	0	0	0
Effluent Plant Opr.	0						
Contract Main Baghouse	1		0.047	0	0	0	0

TABLE 26
ELECTROLYTIC ZINC PLANT
COPPER CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³ (dust)		ACGIH-TLV 1.0 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
ACID PLANT	2			0.001				
Operator-Helper	2	ND	0.003	0.001	0	0	0	0
Foreman	0							
BAGHOUSE & COTTRELL(1)	4			0.016				
Operator/Flue Dustman	3	0.074	0.134	0.112	0	0	0	0
Maintenance Foreman	1			0.086	0	0	0	0
Foreman	0							
CADMIUM PLANT (1)	6			0.006				
Caster	2			ND	0	0	0	0
Shifter/Leadman	2	0.005	0.007	0.006	0	0	0	0
Pressman/Operator	2	0.009	0.010	0.009	0	0	0	0
CONCENTRATE HANDLING	5			0.106				
Conc. Handling Opr.	1			0.019	0	0	0	0
Leader-Helper	1			0.148	0	0	0	0
Ore Unloader	3	0.071	0.173	0.121	0	0	0	0
ELECTROLYTIC DEPARTMENT								
Anode Shop (1)								
Fabrication	0							
Cellroom								
Operator	2			ND	0	0	0	0

TABLE 26 (Cont)
ELECTROLYTIC ZINC PLANT
COPPER CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³ (dust)		ACGIH-TLY 1.0 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Leadman	1			ND	0	0	0	0
Cell Repair	14			ND	0	0	0	0
Stripper	9			ND	0	0	0	0
Utility Cleanup	1			ND	0	0	0	0
LEACH DEPARTMENT								
Leach	5			0.005				
Leachman	1			0.002	0	0	0	0
Shift Foreman	0							
Operator	2	0.002	0.004	0.003	0	0	0	0
Mud Mill Operator	2	ND	0.016	0.008	0	0	0	0
Burd Filter	4			0.005				
Operator	3	ND	0.005	0.003	0	0	0	0
Repairman	1			0.010	0	0	0	0
MAINTENANCE								
Z-1 Area								
Maint. Mechanic								
Maint. Mech. App.								
Maint. Rel. For.								
Oiler								
Z-2 Area Maintenance								
Maint. Mechanic								
Mechanic Halper								
Oiler								

TABLE 26 (Cont)
ELECTROLYTIC ZINC PLANT
COPPER CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Con- centration mg/m ³	OSHA Standard 1.0 mg/m ³ (dust)		ACGIH-TLV 1.0 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
Melting Dept. Maint. Mechanic (1)								
Mechanic Helper (1)								
Cellroom Maintenance								
Carpenter Foreman								
Oiler								
Carpenters								
Mechanics								
Machine Shop	4			ND				
Welder	2			ND	0	0	0	0
Blacksmith (1)	1			ND	0	0	0	0
Machinist Apprencice	1			ND	0	0	0	0
MELTING DEPARTMENT								
Casting (1)	12			0.004				
Shift Foreman	1			0.003	0	0	0	0
Melting Dept. Opr.	7	0.002	0.010	0.005	0	0	0	0
Skimming & Lading	1			0.004	0	0	0	0
Scrap Furnace Opr.	1			0.004	0	0	0	0
Furnacemen	1			0.003	0	0	0	0
Alloyer	1			0.003	0	0	0	0
Shipping	5			0.004				
Operator	5	ND	0.005	0.004				
Scaleman	0							

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TABLE 26 (Cont)

ELECTROLYTIC ZINC PLANT
COPPER CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³	OSHA Standard 1.0 mg/m ³ (dust)		ACGIH-TLV 1.0 mg/m ³ (dust)	
					No. Exceed Std.	% Exceed Std.	No. Exceed Std.	% Exceed Std.
PURIFICATION DEPARTMENT	8			0.018				
Foreman	1			0.005	0	0	0	0
Pressman	3	0.015	0.038	0.024	0	0	0	0
Operator	1			0.003	0	0	0	0
Laborer-Cleanup	2	0.005	0.038	0.022	0	0	0	0
Tank Hitter	1			0.007	0	0	0	0
ROASTERS (1)	7			0.196				
Operator	2	0.004	0.073	0.039	0	0	0	0
Helper	1			0.792	0	0	0	0
Lancer	3	0.071	0.230	0.145	0	0	0	0
Boiler Operator	0							
Wedge Operator	1			0.064	0	0	0	0
Pretreatment Opr.								
MAINTENANCE (Summary)								
Mechanics (1)	11	0.012	0.109	0.065	0	0	0	0
Oilers	6	0.022	0.097	0.052	0	0	0	0
Carpenters (1)	12	ND	0.007	0.002	0	0	0	0
Electricians (1)	5	0.005	0.214	0.057	0	0	0	0
Lead Burners	5	0.003	0.017	0.009	0	0	0	0
Yard Crew (1)	12	0.003	0.118	0.035	0	0	0	0
Metalizer	1			0.032	0	0	0	0
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.								

TABLE 27

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	Mn mg/m ³	Sb mg/m ³	Cu mg/m ³	Co mg/m ³	As mg/m ³
Blast Furnace	10:30	.023	<001	.07	<001	.042	<001	<002	
	12:30	.015	<001	.012	<001	<012	<001	<002	
	2:30	.02	<001	.007	<001	<012	<001	<002	
	4:30	.015	<001	.018	<001	<012	<001	<002	
	6:30	.02	<001	.008	<001	<012	<001	<002	
	8:30	.022	<001	.020	<001	<012	<001	<002	
	10:30	.012	<001	<002	<001	<012	<001	<002	
	12:30	.012	<001	.005	<001	<012	<001	<002	
	2:30	.015	<001	.008	<001	<012	<001	<002	
	4:30	.003	<001	<002	<001	<012	<001	<002	
	6:30	.02	<001	.013	<001	<012	<001	<002	
	8:30	.005	<001	.005	<001	<012	<001	<002	

TABLE 27 (Cont.)

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	Mn mg/m ³	Sb mg/m ³	Cu mg/m ³	Co mg/m ³	As mg/m ³
Fuming Furnace	11:30	.005	<001	.005	<001	<012	<001	<002	
	1:30	.037	<001	.018	<001	<012	<001	<002	
	3:30	.325	.005	.102	<001	<012	<001	<002	
	5:30	.312	.007	.272	.013	<012	.003	<002	
	7:30	.187	.01	.162	<001	<012	.003	<002	
	9:30	.03	<001	.055	<001	<012	<001	<002	
	11:30	.03	<001	.062	<001	<012	<001	<002	
	1:30	.887	.003	7.88	.415	<012	.045	.018	
	3:30	.096	.003	.167	<001	<012	<001	<002	
	5:30	.102	<001	.092	<001	<012	<001	<002	
	7:30	.083	<001	.053	<001	<012	<001	<002	
	9:30	.012	<001	.013	<001	<012	<001	<002	

TABLE 27 (Cont.)

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	As mg/m ³
Lead Refinery	11:10 am				0.004
Upstairs	1:10 pm				0.004
11:10 am 11/18	3:10 pm				0.004
11:10 am 11/19	5:10				0.007
	7:10				<0.001
	9:10				<0.001
	11:10				<0.001
	1:10 am				0.003
	3:10				0.010
	5:10				0.005
	7:10				<0.001
	9:10				<0.001

TABLE 27 (Cont.)

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	As mg/m ³
Blast Furnace 11/17/75	11:41 am				<0.001
	1:41 pm				<0.001
	3:41				<0.001
	5:41				0.007
	7:41				Missing
	9:41				0.002
	11:41				<0.001
	1:41 am				<0.001
	3:41				<0.001
	5:41				0.003
	7:41				<0.001
	9:41				0.003

TABLE 27 (Cont.)

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	As mg/m ³
Dryhouse	11:10	.212	.005	.10	
11/16/75	1:18	.046	.002	.035	
	3:10	.062	.002	.048	
	5:10	.254	.004	.426	
	7:10	.041	.001	.016	
	9:10	.427	.007	.168	
	11:10	.029	.002	.021	
	1:10	.311	.005	.1164	
	3:10	.113	.004	.045	
	5:10	.109	.002	.052	
	7:10	.079	.002	.036	

TABLE 27 (Cont.)

SEQUENTIAL

AREA	Time Begin	Pb mg/m ³	Cd mg/m ³	Zn mg/m ³	As mg/m ³
Lead Refinery	11:41				<0.001
Downstairs	1:41 pm	*			<0.001
11:41 am 1/19	3:41				<0.001
	5:41				<0.001
	7:41				<0.001
	9:41				<0.001
	11:41				<0.001
	1:41				<0.001
	3:41				<0.001
	5:41				<0.001
	7:41				<0.001
	9:41				<0.001

TABLE 28
ELECTROLYTIC ZINC PLANT
TOTAL PARTICULATE CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³
ACID PLANT				
Operator-Helper				
Foreman				
BAGHOUSE & COTTRELL(1)				
Operator/Flue Dustman	2	495.000	518.200	506.600
Maintenance Foreman	1			27.200
CADMIUM PLANT (1)				
Caster				
Shifter/Leadman	1			3.870
Pressman/Operator				
CONCENTRATE HANDLING	4			33.175
Conc. Handling Opr.	1			2.810
Loader-Helper	1			35.500
Ore Unloader	2			47.200
ELECTROLYTIC DEPARTMENT				
Anode Shop (1)				
Fabrication				
Callroom				
Operator				

TABLE 28 (Cont)
ELECTROLYTIC ZINC PLANT
TOTAL PARTICULATE CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³	Time Weighted Average Concentration mg/m ³
Leadman			
Cell Repair			
Stripper			
Utility Cleanup			
LEACH DEPARTMENT			
Leach			
Leachman			
Shift Foreman			
Operator			
Mud Mill Operator			
Burt Filter			
Operator			
Repairman			
MAINTENANCE			
Z-1 Area			
Maint. Mechanic			
Maint. Mech. App.			
Maint. Rel. For.			
Oiler			
Z-2 Area Maintenance			
Maint. Mechanic			
Mechanic Helper			
Oiler			

TABLE 28 (Cont)
ELECTROLYTIC ZINC PLANT
TOTAL PARTICULATE CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE mg/m ³		Time Weighted Average Concentration mg/m ³
Melting Dept. Maint.				
Mechanic (1)				
Mechanic Helper (1)				
Cellroom Maintenance				
Carpenter Foreman				
Oiler				
Carpenters				
Mechanics				
Machine Shop				
Welder				
Blacksmith (1)	1			1.830
Machinist Apprentice				
MELTING DEPARTMENT				
Casting (1)	12			10.903
Shift Foreman	1			2.480
Melting Dept. Opr.	7	3.730	32.350	14.347
Skimming & Ladling	1			4.870
Scrap Furnace Opr.	1			10.010
Furnacemen	1			1.920
Alloyer	1			11.130
Shipping				
Operator	5	0.410	1.420	1.072
Scaleman				

TABLE 28 (Cont)
ELECTROLYTIC ZINC PLANT
TOTAL PARTICULATE CONCENTRATION

JOB TITLE OR AREA	Number of Samples	RANGE		Time Weighted Average Concentration
PURIFICATION DEPARTMENT				
Foreman				
Pressman				
MAINTENANCE MECHANIC	1			4.200
Laborer-Cleanup				
Tank Hitter				
ROASTERS (1)	7			77.513
Operator	2	19.600	48.000	33.800
Helper	1			327.750
Lancer	3	14.200	68.640	41.246
Boiler Operator				
Wedge Operator	1			23.500
Pretreatment Opr.				
MAINTENANCE				
(Summary)				
Mechanics (1)	7	1.430	34.100	17.119
Oilers				
Carpenters (1)	3	2.000	4.010	2.673
Electricians (1)				
Lead Burners	4	1.100	4.370	1.970
Yard Crew (1)	2	17.700	19.800	18.75
Metalizer	1			2.790
(1) Both fume and dust exposures are considered likely to occur for these job classifications or departments.				

AIRBORNE CONCENTRATIONS OF METAL CONTAMINANTS
EATING AREAS

DATE SAMPLED	JOB DESCRIPTION (LOCATION)	Pb mg/m ³	Cd mg/m ³	ZnO mg/m ³	Sb mg/m ³	Co mg/m ³	Cu mg/m ³	Mn mg/m ³	Ni mg/m ³
11-15, 16-75	Control Room 11-15 and 11-16-75	.067	.006	1.144					
11-15, 16-75	#5 Roaster - Operators Control Room Sequential Samples collected 11-15, 16-75	.051	.004	.804					
11-15, 16-75	#5 Roaster - Operators Control Room Sequential Samples collected 11-15, 16-75	.038	.004	.606					
11-15, 16-75	#5 Roaster - Operators Control Room Sequential Samples collected 11-15, 16-75	.054	.004	.913					
11-15, 16-75	#5 Roaster - Operators Control Room Sequential Samples collected 11-15, 16-75	.038	.003	.522					
11-15, 16-75	#5 Roaster - Operators Control Room Sequential Samples collected 11-15, 16-75	.041	.004	.606					

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EATING AREAS

DATE SAMPLED	JOB DESCRIPTION (LOCATION)	Pb mg/m ³	Cd mg/m ³	ZnO mg/m ³	Sb mg/m ³	Co mg/m ³	Cu mg/m ³	Mn mg/m ³	Ni mg/m ³
10-08-75	Boiler Room Lunch Room	.105	.013	1.500	ND	ND	.060	.047	ND
10-09-75	Lunch & Operator Room (Leach Department)	ND	ND	.081	ND	ND	.002	.007	ND
10-09-75	Burt Filter Work Desk Area	ND	ND	.237	ND	ND	.004	.005	ND
10-09-75	Burt Filter Repair Dog House	.052	ND	.302	ND	ND	.004	.005	ND
10-09-75	Purification Lunch Room	ND	ND	.129	ND	ND	.004	.002	ND
10-09-75	Purification-Operator Room	.029	ND	.143	ND	ND	.021	ND	ND
10-09-75	Mud Mill Operator Dog House	.322	.009	.894	ND	ND	.020	.041	ND
10-09-75	Cadmium Plant Lunch Room	ND	.004	.015	ND	ND	ND	ND	ND
10-07-75	Melting Department Lunch Room	ND	ND	1.200	ND	ND	.002	.007	ND
10-07-75	Shipping Department Lunch Rm.	ND	ND	.052	ND	ND	.003	.002	ND
10-07-75	Coil Department Lunch Room	ND	ND	.026	ND	ND	ND	.002	ND
10-07-75	Carpenter Shop Lunch Room	ND	ND	.029	ND	ND	ND	ND	ND
10-07-75	Conc. Handling Lunch Room	.126	.008	1.600	ND	ND	.014	.008	ND
10-07-75	#5 Roaster Lunch Room	.337	.031	6.000	ND	ND	.028	.017	ND
10-07-75	Old Roaster Lunch-Tool-Work	.100	.009	2.900	ND	ND	.009	.043	.005
10-07-75	Old Roaster Control Room								
	4th Floor	.096	.009	1.900	ND	ND	.009	.014	ND
10-07-75	Old Roaster Lunchroom								
	3rd Floor	.096	.009	1.700	ND	ND	.009	.016	ND
10-07-75	Pre-treatment Lunch Room	.014	ND	.097	ND	ND	ND	ND	ND
10-07-75	Acid Plant Lunch Room	ND	ND	.120	ND	ND	ND	.002	ND
10-07-75	Lead Shop Lunch Room	ND	ND	.036	ND	ND	ND	ND	ND

AIRBORNE CONCENTRATIONS OF HEAVY METALS
EATING AREAS

DATE SAMPLED	JOB DESCRIPTION (LOCATION)	Pb mg/m ³	Cd mg/m ³	ZnO mg/m ³	Sb mg/m ³	Co mg/m ³	Cu mg/m ³	Mn mg/m ³	Ni mg/m ³
11-14-75	Carpenter Shop Lunch Room	.019	ND	.066					
11-14-75	Pipefitters Lunch Room	.026	.001	.146					
11-14-75	Weighmasters Office	.035	.009	.062					
11-14-75	Zinc Plant Planning Office	.041	.001	.055					
11-14-75	Cell Dept. Tool Room	.074	.001	.050					
11-14-75	Basement of Main Office Bldg.								
	Zinc Plant	.034	.001						
11-19-75	Machine Shop Lunch Room	0.017	ND	.089	.110				
11-19-75	Melting Dept Lunch Room	0.010	ND	435	.540				
11-15,16-75	Old Roaster Lunch Room	.030	.001	.361					
11-15,16-75	Floor 2-Sequential Samples	.022	.002	.274					
11-15,16-75	Collected 11-15 and 11-16-75	.019	.001	.323					
11-15,16-75	Collected 11-15 and 11-16-75	.030	.001	.341					
11-15,16-75	Collected 11-15 and 11-16-75	.022	.001	.512					
11-15,16-75	Collected 11-15 and 11-16-75	.031	.002	.555					
11-15,16-75	Sequential Samples Collected	.030	.001	.0545					
11-15,16-75	in the Old Roaster 4th Floor	.113	.008	1.220					
11-15,16-75	Control Room 11-15 and								
	11-16-75	.030	.002	.427					
11-15,16-75	Control Room 11-15 and								
	11-16-75	.034	.002	.570					
11-15,16-75	Control Room 11-15 and								
	11-16-75	.041	.004	.684					

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TABLE 31
AIRBORNE CONCENTRATIONS OF METAL CONTAMINANTS
(MISCELLANEOUS AREA SAMPLES)

Sample Description	Sample Number	mg/m ³ Lead	mg/m ³ Cadmium	mg/m ³ ZnO	mg/m ³ Sb	mg/m ³ Mn	mg/m ³ Co	mg/m ³ Cu	mg/m ³ Ni	Part ic mg/m ³	mg/m ³ Fe
Lead Melting Area		0.304	ND	0.052	0.024	0.055	ND	0.036	ND		
Lead Melting Area		0.335	ND	0.050	ND	0.050	ND	0.022	ND		
Lead Melting Area		0.518	ND	0.726	0.055	0.077	ND	0.040	ND		
Machine Shop 6 ft. from exhaust ventilated grinder		0.034	0.014	0.184							0.129
Near small tool grinder at East Wall of machine shop		0.048	0.002	0.281							0.341
Near scrap furnace		0.070	ND	8.820							
Near cross mixer		0.066	ND	4.305							
Knock repair Near Shearing Machine		.137	ND	.056	ND	.093	ND	.008	ND		
10-10-75 south end of Dry House		.011	ND	.048	.060	ND	ND	ND	ND		
10-10-75 North end of Dry house		.017	ND	.092	.114	ND	ND	ND	ND		
11-12-75 North end of Dry House		.038	ND	.071	.088						

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ELECTROSTATIC SENSITIVE
AREA SAMPLES COLLECTED WITH A SEQUENTIAL SAMPLER
ARSENIC CONCENTRATION mg/m³

Sample Description:

#5 Roaster Bldg outside operators shack 2nd floor. Samples collected at
2 hr sampling intervals at 4.8 liters per minute 10-6-75

<u>Sample Number</u>	<u>mg/m³ Arsenic</u>
01	0.005
02	0.012
03	0.004
04	0.009
05	0.009
06	0.005
07	0.005
08	0.006
09	0.003
010	0.002
011	0.008
012	0.007

ELECTROLYTIC ZINC PLANT
SULFATE CONCENTRATION mg/m^3

SAMPLE DESCRIPTION	CONCENTRATION mg/m^3	COMMENTS
Acid Plant Lunch Room	ND	7 hr sample
Leach Dept. near control room	0.35	7 hr sample
Burt Filter area	0.18	7 hr sample
Cadmium plant area	0.21	7 hr sample
Purification area	0.30	7 hr sample
#5 Roaster Bldg-outside operators shack 3rd floor		
11-12-75 outside operators shack 3rd floor	0.20	24 hr sample
11-17-75 outside operators shack 3rd floor	0.15	24 hr sample
11-19-75 outside operators shack 3rd floor	0.13	24 hr sample
#5 Roaster Bldg-inside operators shack		
11-11-75 inside operators shack	0.18	24 hr sample
11-15-75 inside operators shack	0.03	24 hr sample
11-18-75 inside operators shack	0.04	24 hr sample
11-20-75 inside operators shack	0.05	24 hr sample
Old Roaster Bldg-4th Floor Operators Shack (outside)		
11-11-75 4th floor Operators Shack (outside)	0.80	24 hr sample
11-12-75 4th floor Operators Shack (outside)	.094	24 hr sample
11-13-75 4th floor Operators Shack (outside)	1.15	24 hr sample
11-17-75 4th floor Operators Shack (outside)	0.84	24 hr sample
Old Roaster Bldg-2nd floor outside Lunch Room		
11-11-75 2nd floor outside lunch room	.042	24 hr sample
11-12-75 2nd floor outside lunch room	0.34	24 hr sample
11-18-75 2nd floor outside lunch room	0.09	24 hr sample

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TABLE 35
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO ₂
11-11-75	TK1	120	Sequential Sampler collected at two hour sampling intervals at one liter per minute at No. 5 Roaster Bldg. Inside Operator's Shack - 3rd floor	0.5
"	TK2	"		2.2
"	TK3	"		0.8
"	TK4	"		0.9
"	TK5	"		0.5
"	TK6	"		0.4
"	TK7	"		0.3
"	TK8	"		0.5
"	TK9	"		0.5
"	TK10	"		0.5
"	TK11	"		0.4
"	TK12	"		0.6
11-13-75	K-1	"	"	1.1
"	K-2	"	"	5.4
"	K-3	"	"	2.9
"	K-4	"	"	1.6
"	K-5	"	"	0.8
"	K-6	"	"	1.0
"	K-7	"	"	0.7
"	K-8	"	"	0.7
"	K-9	"	"	0.7
"	K-10	"	"	0.9
"	K-11	"	"	0.5
"	K-12	"	"	0.7
11-18-75	K2-25	"	"	0.3
"	K2-26	"	"	0.3
"	K2-27	"	"	0.5
"	K2-28	"	"	0.7
"	K2-29	"	"	0.9
"	K2-30	"	"	1.0
"	K2-31	"	"	1.5
"	K2-32	"	"	1.4
"	K2-33	"	"	0.5
"	K2-35	"	"	1.6
"	K2-36	"	"	1.3

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO ₂
11-12-75	K2-1	120	Sequential samples collected at two hour sampling intervals at one liter per minute at No. 5 Roaster Bldg. outside operator's shack - 3rd floor	1.5
"	K2-2	"		1.0
"	K2-3	"		3.5
"	K2-4	"		3.1
"	K2-5	"		3.6
"	K2-6	"		5.7
"	K2-7	"		9.9
"	K2-8	"		47.4
"	K2-9	"		13.7
"	K2-10	"		7.4
"	K2-11	"		54.1
"	K2-12	"		22.6
11-14-76	K2-13	"	"	3.3
"	K2-14	"	"	5.9
"	K2-15	"	"	6.7
"	K2-16	"	"	5.7
"	K2-17	"	"	4.7
"	K2-18	"	"	2.8
"	K2-19	"	"	15.8
"	K2-20	"	"	10.4
"	K2-21	"	"	4.5
"	K2-22	"	"	2.1
"	K2-23	"	"	2.3
"	K2-24	"	"	7.7
11-17-75	K-13	"	"	13.5
"	K-14	"	"	2.8
"	K-15	"	"	11.8
"	K-16	"	"	3.7
"	K-17	"	"	2.9
"	K-18	"	"	3.4
"	K-19	"	"	0.9
"	K-20	"	"	2.3
"	K-21	"	"	0.4
"	K-22	"	"	1.9
"	K-23	"	"	0.7
"	K-24	"	"	1.0

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

11-19-75	C-25	"	"	2.1
"	C-26	"	"	1.9
"	C-27	"	"	11.3
"	C-28	"	"	29.0
"	C-29	"	"	2.2
"	C-30	"	"	9.2
"	C-31	"	"	2.6
"	C-32	"	"	Lost in Shipping
"	C-33	"	"	1.0
"	C-34	"	"	6.5
"	C-35	"	"	0.9
11-20-75	K-37	"	"	0.4
"	K-38	"	"	0.2
"	K-39	"	"	0.4
"	K-40	"	"	0.3
"	K-41	"	"	0.7
"	K-42	"	"	1.1
"	K-43	"	"	0.4
"	K-44	"	"	0.3
"	K-45	"	"	0.4
"	K-46	"	"	0.3

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO ₂
11-12-75	D2-1	120	Sequential samples collected at two hour sampling intervals at the old Roaster Bldg. inside Lunchroom, 2nd floor	3.8
"	D2-2	"		3.2
"	D2-3	"		3.6
"	D2-4	"		4.1
"	D2-5	"		5.0
"	D2-6	"		4.5
"	D2-7	"		9.8
"	D2-8	"		12.3
"	D2-9	"		17.5
"	D2-10	"		15.9
"	D2-11	"		1.7
"	D2-12	"		2.3
11-14-75	D2-13	"	"	0.8
"	D2-14	"	"	1.2
"	D2-15	"	"	1.4
"	D2-16	"	"	1.6
"	D2-17	"	"	1.7
"	D2-18	"	"	1.2
"	D2-19	"	"	1.1
"	D2-20	"	"	1.2
"	D2-21	"	"	3.0
"	D2-22	"	"	1.0
"	D2-23	"	"	0.6
"	D2-24	"	"	0.8
11-17-75	D-13	"	"	0.2
"	D-14	"	"	0.8
"	D-15	"	"	1.5
"	D-16	"	"	0.8
"	D-17	"	"	0.7
"	D-18	"	"	0.6
"	D-19	"	"	0.9
"	D-20	"	"	2.5
"	D-21	"	"	1.1
"	D-22	"	"	0.7
"	D-23	"	"	0.7
"	D-24	"	"	1.0

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO2
11-11-75	TD1	120	Sequential samples collected at two hour sampling intervals at one liter per minute at the Old Roaster Bldg. outside Lunchroom-Operator's Shack complex - 2nd floor	8.8
"	TD2	"		7.1
"	TD3	"		8.7
"	TD4	"		3.6
"	TD5	"		6.6
"	TD6	"		11.4
"	TD7	"		7.7
"	TD8	"		3.2
"	TD9	"		12.2
"	TD10	"		15.6
"	TD11	"		10.2
"	TD12	"		14.9
11-13-75	D-1	"	"	1.6
"	D-2	"	"	14.7
"	D-3	"	"	25.9
"	D-4	"	"	8.4
"	D-5	"	"	7.9
"	D-6	"	"	6.9
"	D-7	"	"	9.9
"	D-8	"	"	11.4
"	D-9	"	"	7.3
"	D-10	"	"	13.4
"	D-11	"	"	33.5
"	D-12	"	"	14.5
11-18-75	D2-25	"	"	< 0.1
"	D2-26	"	"	1.9
"	D2-27	"	"	4.9
"	D2-28	"	"	3.0
"	D2-29	"	"	3.1
"	D2-30	"	"	4.8
"	D2-31	"	"	3.9
"	D2-32	"	"	2.0
"	D2-33	"	"	2.9
"	D2-34	"	"	0.9
"	D2-35	"	"	2.9
"	D2-36	"	"	6.9

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO ₂
11-11-75	TC1	120	Sequential samples collected at two hour intervals at one liter per minute at the Old Roaster Bldg. outside Operator's Shack - 4th floor	6.8
"	TC2	"		2.9
"	TC3	"		2.4
"	TC4	"		6.8
"	TC5	"		17.2
"	TC6	"		39.5
"	TC7	"		3.5
"	TC8	"		39.8
"	TC9	"		9.6
"	TC10	"		17.9
"	TC11	"		14.0
"	TC12	"		30.0
11-12-75	C2-1	"	"	6.2
"	C2-2	"	"	4.4
"	C2-3	"	"	11.4
"	C2-4	"	"	16.8
"	C2-5	"	"	13.8
"	C2-6	"	"	36.8
"	C2-7	"	"	13.6
"	C2-8	"	"	40.8
"	C2-9	"	"	28.6
"	C2-10	"	"	17.8
"	C2-11	"	"	2.8
"	C2-12	"	"	3.0
11-13-75	C-1	"	"	3.6
"	C-2	"	"	11.7
"	C-3	"	"	13.0
"	C-4	"	"	14.6
"	C-5	"	"	51.7
"	C-6	"	"	46.8
"	C-7	"	"	35.2
"	C-8	"	"	36.1
"	C-9	"	"	8.4
"	C-10	"	"	8.3
"	C-11	"	"	32.0
"	C-12	"	"	8.8

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

11-14-75	C2-13	"	"	2.2
"	C2-14	"	"	1.7
"	C2-15	"	"	2.0
"	C2-16	"	"	4.4
"	C2-17	"	"	3.0
"	C2-18	"	"	4.1
"	C2-19	"	"	2.7
"	C2-20	"	"	11.7
"	C2-21	"	"	3.6
"	C2-22	"	"	2.3
"	C2-23	"	"	1.2
"	C2-24	"	"	4.1
11-17-75	C-13	"	"	0.1
"	C-14	"	"	12.9
"	C-15	"	"	31.7
"	C-16	"	"	2.1
"	C-17	"	"	3.3
"	C-18	"	"	7.8
"	C-19	"	"	4.5
"	C-20	"	"	10.5
"	C-21	"	"	4.5
"	C-22	"	"	3.2
"	C-23	"	"	2.1
"	C-24	"	"	4.7
11-18-75	C2-25	"	"	9.5
"	C2-26	"	"	2.8
"	C2-27	"	"	5.5
"	C2-28	"	"	3.2
"	C2-29	"	"	2.8
"	C2-30	"	"	7.6
"	C2-31	"	"	18.0
"	C2-32	"	"	5.0
"	C2-33	"	"	9.1
"	C2-34	"	"	12.0
"	C2-35	"	"	58.0
"	C2-36	"	"	14.9
11-19-75	K-25	"	"	0.3
"	K-26	"	"	0.1
"	K-27	"	"	0.2

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

"	K-28	"	"	0.2
"	K-29	"	"	0.2
"	K-30	"	"	<0.1
"	K-31	"	"	0.5
"	K-32	"	"	<0.1
"	K-33	"	"	<0.1
"	K-34	"	"	0.3
"	K-35	"	"	0.2
11-20-75	C-37	"	"	0.9
"	C-38	"	"	2.4
"	C-39	"	"	1.7
"	C-40	"	"	0.5
"	C-41	"	"	3.4
"	C-42	"	"	1.0
"	C-43	"	"	1.7
"	C-44	"	"	1.0
"	C-45	"	"	1.0
"	C-46	"	"	0.8

TABLE 35 (Cont.)
SULFUR DIOXIDE IN AIR CONCENTRATIONS

DATE	FIELD NUMBER	SAMPLE VOLUME LITERS	DESCRIPTION	PPM SO ₂
11-18-75	A-1	277	Personal Sample - Old Roaster Bldg.	2.3
11-17-75	AS-1	233	Anode Shack near locker	<0.1
11-17-75	MD-1	233	Melting Department near Sheppard P.G. Casting Machine	<0.1
11-17-75	SD-1	198	Shipping Department	<0.1
11-18-75	K90	701	Center of Concentrate Handling Dept.	1.0
"	K91	"	Concentrate Handling Operator's Shack	0.2
"	K92	478	Center Concentrate Handling Building	0.7
11-20-75	106	29	Baghouse Operator - Roaster #5	11.7
11-18-75	101	410	Acid Plant Lunchroom	10.7
"	102	405	Leech Area Near Control	0.5
"	103	400	Burt Filter Area	0.5
"	104	405	Purification Area	3.7
"	105	395	Cadmium Plant Area	0.6
11-20-75	106	30	Baghouse Operator Roaster #5	11.7

TABLE 35 (Cont.)
SULFUR DIOXIDE CONCENTRATIONS*

DATE	TIME	LOCATION	PPM SO ₂
<u>ROASTER #5</u>			
10/7/75	11:25 a.m.	Ground Floor	0
"	11:43 a.m.	2nd Floor	0
"	11:48 a.m.	2.5 Floor, Open Area, Outside Shack	5+
"	11:53 a.m.	2.5 floor, Open Area, Outside Shack	1
"	11:58 a.m.	3rd Floor, General Area	0
"	12:04 p.m.	4th Floor, General Area	0
"	12:10 p.m.	5th Floor, General Area	0
<u>OLD ROASTER BUILDING</u>			
10/7/75	12:30 p.m.	Ground Floor (Bins)	0
"	12:45 p.m.	2nd Floor	2
"	12:50 p.m.	Lansing Floor	20+
"	12:55 p.m.	Lansing Floor	20+**

*SO₂ concentrations were determined with Drager Indicator Tubes.

**Industrial Hygienist had to cease sampling because of extreme eye irritation.

TABLE 35 (Cont.)
SULFUR DIOXIDE CONCENTRATIONS

DATE	TIME	LOCATION	PPM SO ₂
		<u>OLD ROASTER BUILDING:</u>	
10/8/75	12:15 p.m.	Lansing Floor	3
"	12:20 p.m.	4th Floor	10
"	12:25 p.m.	6th Floor - Along Conveyor	20+
"	12:30 p.m.	"	20+
"	12:35 p.m.	"	20+
"	12:41 p.m.	• 4th Floor	12
"	12:47 p.m.	Lansing Floor	9
"	12:52 p.m.	"	175***
"	12:55 p.m.	"	110***
11/18/75	11:45 p.m.	4th Floor.	3
"	11:55 a.m.	"	2
"	12:05 p.m.	"	2
"	12:15 p.m.	"	3
"	12:20 p.m.	"	6
"	12:25 p.m.	"	2
"	12:40 p.m.	"	2
"	12:55 p.m.	"	25+***
"	1:08 p.m.	"	3
"	1:15 p.m.	"	10
***Industrial hygienist wore full facepiece respiratory protection to prevent eye irritation.			

TABLE 36

Air Concentrations of Sulfuric Acid Mist (Area Sampler)

DATE	FIELD NUMBER	DESCRIPTION	H ₂ SO ₄ GZ/M ³
10-08-75	A584	Cell Room - Near Cell SC Unit 3	1.6
	A625	" " " " " " " "	1.5
	A570	" " " " 24 " "	1.4
	A571	" " " " " " " "	1.3
	A586	" " " " 110 " "	1.9
	A576	" " " " " " " "	2.5
	A567	" " " " 136 " "	1.9
	A610	" " " " " " " "	1.3
		Mean = 1.7	

TABLE 37

Air Concentrations of Sulfuric Acid Mist

(Personal Samples)

DATE	FIELD NUMBER	DESCRIPTION	TIME WEIGHTED AVERAGE H ₂ SO ₄ mg/m ³
10-06-75	659	Cell room operator	0.4
	633	Stripper	0.5
	560	Stripper	0.6
	645	Cell repair	0.4
	635	Stripper	0.6
	644	Cell repair	0.5
	594	Stripper	0.6
	587	Stripper	0.4
	583	Stripper	0.3
			Mean = 0.5
11-19-75	1632	Cell repair	1.6
	1783	Cell repair	0.9
	1676	Cell room cleanup	0.4
	1761	Cell repair	0.5
	1771	Stripper	1.1
	1685	Stripper	0.8
	1673	Cell room bagman	0.9
	A1758	Stripper	0.1
	A1777	Cell repair	0.7
	A1653	Stripper	0.8
	A1661	Cell room operator	0.8
	A1774	Cell repair	0.9
			Mean = 0.8

TABLE 38

Air Concentrations of Sulfuric Acid Mist (Sequential Samples)

DATE	FIELD NUMBER	DESCRIPTION	H ₂ SO ₄ mg/M ³
11/11-12/75	A1639	Sequential samples collected near cell 8, unit 5, cell room - sampling started at 11:00 a.m. on 11/11/75 and stopped 11/12/75 at 11:00 a.m.	1.1
	A1665		1.0
	A1641		2.8
	A1643		0.5
	A1644		0.7
	A1647		0.5
11/12-13/75		Samples were lost when workman sprayed sampler with a hose	---
11/13-14/75	A1756	Same location as above	3.0
	A1722		5.2
	A1731		2.2
	A1745		1.5
	A1747		2.1
	A1741		1.8
11/14-15/75	A1727	Same location as above	3.4
	A1622		3.7
	A1615		2.6
	A1729		2.0
	A1625		2.2
	A1737		2.4
11/15-17/75	A1178	Same location as above (NOTE: The power was out November 14th to 6 units and November 16th to 5 units)	3.8
	A1189		2.3
	A1182		2.7
	A1197		1.4
	A1624		2.7
	A1605		1.2
	A1607		1.5
	A1672		1.2
	A1181		0.5
	A1610		0.5
	A1671		Sample missing
	A1666		0.7

TABLE 38 (Cont.)

Air Concentrations of Sulfuric Acid Mist (Sequential Samples)

DATE	FIELD NUMBER	DESCRIPTION	H ₂ SO ₄ mg/M ³
11/17-18/75	A1193	Sequential samples collected near cell 8, unit 5, cell room - sampling started at 11:00 a.m. on 11/11/75 and stopped 11/12/75 at 11:00 a.m.	1.0
	A1172		0.7
	A1190		0.5
	A1184		0.6
	A1195		1.1
	A1192		1.0
11/18-19/75	AD101	Same location as above	2.7
	AD102		3.0
	AD103		1.0
	AD104		1.4
	AD105		2.3
	AD106		3.3
11/19-20/75	A1640	Same location as above	4.2
	A1633		2.3
	A1662		2.2
	A1656		1.0
	A1668		2.5
	A1661		2.6
		Mean for all Sequential Samples = 1.9	

NITROGEN DIOXIDE, OZONE, AND ARSINE CONCENTRATIONS
 (Determined with Draeger Indicator Tubes)

Table 39

DATE	CONTAMINANT	LOCATION	CONCENTRATION PPM
10-16-75	Nitrogen Dioxide	Cottrell Room	1.0
10-18-75	Nitrogen Dioxide	Cottrell Room	1.0
10-19-75	Nitrogen Dioxide	Cottrell Room	1.0
10-19-75	Nitrogen Dioxide	Cottrell Room	1.0
10-18-75	Ozone	Cottrell Room	ND
10-18-75	Ozone	Cottrell Room	ND
10-18-75	Ozone	Cottrell Room	ND
10-19-75	Ozone	Cottrell Room	ND
10-13-75	Arsine	Purification Area	ND
10-13-75	Arsine	Purification Area	ND
10-18-75	Arsine	Purification Area	ND
10-18-75	Arsine	Purification Area	ND
10-18-75	Arsine	Leach Department	ND
10-19-75	Arsine	Leach Department	ND
10-18-75	Arsine	Leach Department	ND
10-18-75	Arsine	Leach Department	ND
10-18-75	Arsine	Burt Filter Area	ND
10-16-75	Arsine	Burt Filter Area	ND
10-13-75	Arsine	Burt Filter Area	ND
10-18-75	Arsine	Burt Filter Area	ND
10-19-75	Arsine	Cadmium Plant	ND
10-18-75	Arsine	Cadmium Plant	ND
10-18-75	Arsine	Cadmium Plant	ND
10-18-75	Arsine	Cadmium Plant	ND

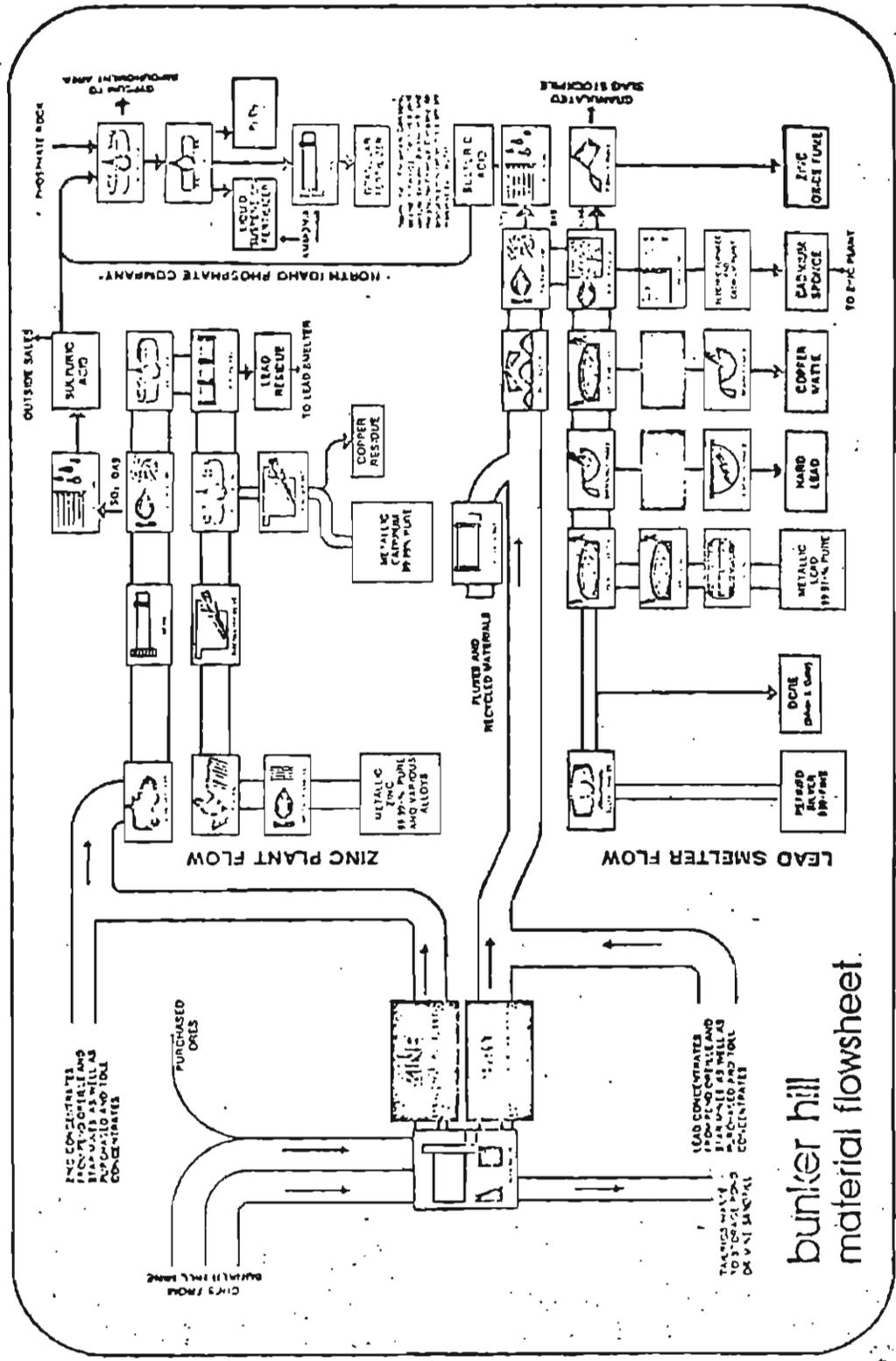
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TABLE 40

LUNCH ROOMS

AREA	Pb mg/m ³	Cd mg/m ³	As mg/m ³	Zn mg/m ³
C & Loading	.228		<0.001	
Silver	.024		<0.001	
Train Crew	.105 .033	.027		.006
High Line	.216 .046	.056		.004
OPP	.234 .211	.067		.004
Materials Recov.	.229 .037	.048		.016
S-4	.133 .049 .158	.041 .012		<002 <002
Cd Plt.	.048			
Lurgi	.165			
Pb Ret.	.075			
Elect.	3.043			
S-5	.466			
Effluent	.126			

Figure 1



bunker hill
material flowsheet.

APPENDIX A
JOB DICTIONARY

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Millman	Flotation Operator Helper	To assist the Flotation Operator
	Concentrate Loader	Concentrate Loader	To load lead and zinc concentrates into rail cars for shipment
		Flotation Operator	To monitor and control the separation and concentration of lead-zinc and silver-copper concentrates from their respective ores by differential flotation process.
		Ball Mill Operator	To regulate the flow of water and crushed ore through a closed circuit grinding system.
	Mill Utility Man	Concentrator Utility	To prepare reagent mixtures, operate the overhead bridge crane and test and adjust weightometer
	Flotation Operator - Leadman	Concentrator Crew Leader	To direct the raw, monitor and control the crushing, grinding, flotation, separation and concentration of ores
	Concentrator Loader Helper-Utility	Concentrate Loader Assistant	To assist the concentrate loader in loading lead and zinc concentrates into rail cars and monitor, lubricate and clean conveyors transporting ore from storage bin to ball mill bins
	Laborer	Utility Laborer	To perform general cleanup work in and about the concentrator
	Crushing Plant Leadman	Crushing Plant Crew Leader	To direct, monitor and control all sampling functions and the crushing operation
		Crushing Plant Operator	To operate crushing plant equipment
		Central Treatment Plant Operator	To monitor, operate and control the central treatment plant
		Mechanics	
		Electrician	
		Vacuum Filter Operator	Vacuum filter operator, zinc loading, rail car moving

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Locomotive Engineer	To operate a standard gauge diesel locomotive
	Head switchman	Conductor	To direct the movement of rail cars and assure that all freight is dispatched to the proper destination
	Switchman	Assistant Conductor	To assist the conductor in the movement of rail cars
	Crane Operator	Locomotive Crane Operator	To operate a diesel powered locomotive rail crane to perform general material handling service throughout the smelter
	Crane Helper	Locomotive Crane Helper	To assist the locomotive crane operator by switching rail cars, cleaning car bottoms and closing rail car doors
		Helper	To perform general unskilled labor and cleanup in and about the High Lines (Air Lance)
	Proportioning Crane Operator	Proportioning Overhead Crane Operator	To operate overhead crane in transporting material from outside bins to proportioning bins
		Conveyor Operator	To operate conveying equipment for the distribution of materials from the High Line receiving bins to the ore preparation plant material bins
	Tripper Man	Tripper Operator	To set up and operate trippers for proper bed laying
	Millman	Mill Operator	To operate the crushing plant
	Helper	Conveyor Helper	To assist the conveyor operator in the distribution of materials from the High Line receiving bins to the ore preparation plant bins
	Crusher Man	Crusher Operator	To assist the Mill Operator in operating the crushing plant
		Utility Laborer	To inventory, repair and replace supplies and equipment and clean lunchrooms and restrooms
		Sampler	

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CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Lurgi Operator	Sinter Plant Operator	To operate the Sinter Plant
	Lurgi Assistant	Sinter Plant Assistant	To monitor equipment operation and assist Sinter Plant Operator
	Pelletizer Operator	Feed Preparation Plant Operator	To operate the Feed Preparation Plant
	Utility Man	Utility Laborer	To perform general cleanup in and about the Feed Preparation Plant or Sinter Plant

160.

Department - Blast Furnace

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Crane Man	Overhead Crane Operator	To operate the overhead bridge crane in the Blast Furnace Area
	Furnace Man	Blast Furnace Operator	To operate the blast furnace
	Slag Tapper and Relief Slag Tapper	Slag Tapper	To tap slag from blast furnace
	Feederman	Blast Furnace Feeder	To supply the blast furnace with the proper amount and ratio of sinter and coke
	Transfer Man	Fuel Transfer Operator	To operate tripper and pan feeders to transfer coal, silica and coke from receiving bins to the blast furnace coke storage bin and fuming plant coal storage bin
	Utility Man	Utility Laborer	To perform general cleanup in and about the blast furnace department

161

Department - Slag Fuming Plant

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Crane-man	Overhead Crane Operator	To operate overhead crane to transport molten slag from pot floor to fuming furnace
	Furnace Operator	Fuming Furnace Operator	To change and tap fuming furnace
	Helper	Fuming Furnace Operator Helper	To assist fuming furnace operator in charging furnace, tapping slag and punching tuyeres
		Kiln Operator	To operate rotary kiln
		Kiln Operator Helper	To assist kiln operator in operating rotary kiln
		Baghouse Operator	To operate fuming plant baghouse
		Baghouse Operator Helper	To load zinc oxide into rail cars and assist baghouse operator in cleaning and repairing baghouse
		Granulator Operator	To granulate molten slag and pump granulated slag to slag dump
		Boiler Operator	To monitor and remotely operate the fuming furnace and boilers
		Lancer Operator	To clean fuming plant boiler tubes

162

PLANT - SHELTON
 Department - Lead Refinery

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Craneman Helper	Crane Operator	To operate the overhead crane in the casting and loading area and work with gold kettle in the lead refinery
	Reverb Operator	Reverb Furnace Operator	To operate and control the reverb furnace in the lead refinery
	Head Operator	Dross Floor Head Operator	To operate the continuous softening furnace and to direct and assist the Dross Floor Operator in decopperizing at the lead refinery
	Kettle Helper	Dross Floor Operator	To operate the lead refinery dross floor to decopperize all blast furnace bullion
	Craneman	Overhead Crane Operator	To operate overhead electric traveling crane to service the lead refinery
	Kettle Operator	Kettle Head Operator	To perform final lead refining and transfer lead bullion to casting kettles
		Kettle Operator	To skim gold and silver kettles

163

PLANT - SMELTER
Department - Casting & Loading

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Caster and Fork Lift Operator	To operate ingot and 2,000 pound casting machine and transport lead products
		Weigher	To weigh and tally lead products for shipment
		Casting and Loading Helper	To wire pig lead and prepare rail cars for loading and shipping
	Head Caster and Loader	Head Loader	To load lead and silver products into rail cars and trucks for shipment
		Head Casting Operator	To operate 100 pound straight line casting machine

164

Departments - Cadmium and Silver and Electric Furnace

CODE	JOB DESCRIPTION	JOB TITLES	FUNCTION
		Head Operator	To operate and control the cadmium plant
		Operator	To assist the cadmium plant head operator
	Leadman	Crew Leader	To direct and work with the silver refinery crew in refining precious metals
	Operator	Cupel Operator	To operate and control silver and gold cupels
	Helper	Retort Operator	To operate the retort furnaces
	Leadman	Crew Leader	To direct and work with the crew in the Electric Furnace Operation
		Head Operator	To operate the Electric Furnace during antimony (hard lead) run
	Helper	Operator	To proportion material for charging the Electric Furnace

165

Department - Materials Recovery

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Acid Plant Operator	To operate the sulfuric acid plant
		Baghouse Operator	To operate the main baghouse main stack fan and norbio baghouse. To operate the wheelabrator baghouse during hard lead and cadmium runs
	Baghouse Serviceman	Baghouse Service Attendant	To direct and assist in servicing all (excluding zinc oxide) baghouses
		Baghouse Laborer	To clean, repair and replace baghouse bags
		Effluent Plant Operator	To operate the effluent treatment plant

166

PLANT - SMELTER
 Department - Regular Yard Crew and Maintenance

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Regular Yard Crew	To operate manual and light mobile equipment to perform smelter cleanup
		Common Labor Pool.	To manually perform general labor and cleanup in and about the smelter
	Trackman	Track Worker	To maintain, repair and replace surface railroad tracks, ties and switches
		Blower House Operator	To monitor and regulate smelter plant compressed air equipment, blast furnace blower air and electrical distribution switch gear
		Journeyman Painter	To perform interior and exterior hand and spray painting for the maintenance and construction of all company facilities and equipment
	Journeyman - Instrument Repairman	Journeyman - Instrument Technician	To install, repair, calibrate, test and adjust any type of integrating, indicating controlling or graphic electrical, mechanical, air or pneumatic instrument
		Journeyman - Maintenance Mechanic	To inspect, layout, repair, replace install, adjust and maintain all mechanical equipment and component parts throughout
	Lubrication Man	Oiler	To lubricate all designated equipment

167

PLANT - SMELTER
Department - Quality Control

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Sampler	To collect representative samples of incoming and outgoing materials
		Head Sampler	To direct and work with the sampling crew in collecting representative samples of incoming and outgoing materials.

DEPARTMENT - PRETREATMENT, CONCENTRATE HANDLING

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Pretreatment Operator	Pretreatment Plant Operator	To operate and control the pretreatment leaching of zinc concentrates.
		Concentrate Loader	To operate and control the stunging, filtering and drying of zinc concentrates
	Concentrate Utility Man	Concentrate Helper	To operate front end loader to keep feed hoppers full and assist the concentrate operator
	Ore Unloader Leadman	Ore Unloader	To direct and assist in the sampling and unloading of all zinc concentrates, manganese dioxide, fume and dross received at the zinc plant
	Ore Unloader	Ore Unloader Helper	To sample and unload all zinc concentrates, manganese dioxide, fume and dross received at the zinc plant

169

DEPARTMENT - ACID PLANT

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Sulfuric Acid Plant man	Sulfuric Acid Plant Operator	To operate and control one 300 tons per day and one 350 tons per day contact sulfuric acid plant
		Sulfuric Acid Treatment Operator	To operate and control the sulfuric acid mercury purification process
	Acid Plant Assistant	Sulfuric Acid Plant Assistant	To assist the sulfuric acid plant operator in the operation of one 300 tons per day and one 350 tons per day contact sulfuric acid plant and to load acid into rail cars and trucks for shipment
	Acid Plant Relief Man	Acid Plant Utility Laborer	To manually perform general cleanup work throughout the acid plant and assist in the loading of acid

DEPARTMENT - ROASTING, WASTE HEAT BOILERS, BAGHOUSE - COTTRELL

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	#5 Roasterman	#5 Roaster Operator	To operate and control #5 flash roaster
		#5 Roaster Helper	To clean #5 flash roaster and to assist #5 Roaster Operator
		#5 Boiler Operator	To operate and control #5 waste heat boiler
		#5 Boiler Helper	To clean #5 waste boiler and assist #5
	Roasterman	Roaster Operator	To operate and control flash roasters #1 through #4
	Wedge Operator Sample Man	Wedge Roaster Operator - Sampler	To operate and control the wedge roaster for the dechlorination of zinc dross and analyze calcine samples for sulfur sulfide content
		Roaster Helper	To clean flash roasters #1 through #4 and assist Roaster Operator
		Boiler Operator	To operate and control waste heat boilers #1 through #4
	Boiler Helper	Boiler Operator Helper	To clean waste heat boilers #1 through #4 and assist the Boiler Operator
	Cottrell Maintenance	Cottrell - Baghouse Maintenance Leader	To inspect, operate and maintain the cottrell, mist precipitators, #5 Baghouse and old roaster dust collecting system
	Cottrell Operator Fuel Dustman	Cottrell - Baghouse Maintenance Assistant	To assist Cottrell - Baghouse Maintenance Leader to operate and maintain the Cottrell, mist precipitators, #5 baghouse and old roaster dust collecting system
	Laborer Handyman	Roaster Utility Laborer	To manually perform general unskilled labor throughout the upper plant

171

DEPARTMENT - LEACH, PURIFICATION AND CADMIUM PLANT

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Burt Filter Repairman	Burt Filter Repairer	To overall filters
	Burt Filter Lead Repairman	Burt Filter Lead Repairer	To direct and perform the overhaul of Burt Filters
	Laborer - Handyman	Utility Laborer	To maintain supplies, clean equipment and manually perform general labor throughout the Leach Dept.
		Burt Filter Operator	To operate the Burt Filters for the production of filtered burt solution
	Residue Dryer and Vacuum filterman	Residue Dryer & Vacuum Filter Operator	To operate nad regulate the thickening, filtering and drying of leach residue and the loading of residue into rail cars or trucks for shipment
	Leachman	Leach Operator	To assist the Senior Leach Operator in operating and controlling the continuous leach process
	Continuous Leach Operator	Senior Leach Operator	To operate and control the continuous leach process
	Laborer Handyman	Utility Laborer	To manually perform general clean-up work throughout the Purification Department
	Pressman	Press Tender	To clean, inspect and to replace paper and cloth on shriver presses
	Continuous Tank Hilter	Purification Operator	To operate the purification process equipment and maintain the movement of purification solutions to satisfy production requirements. Assist the senior purification operator with control of the operations
	Continuous Purification Operator	Senior Purification Operator	To run the necessary analyses and make adjustments to control the purification process

172

DEPARTMENT - LEACH, PURIFICATION AND CADMIUM PLANT

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
	Leadman	Senior Cadmium Plant Operator	To direct the crew in the operation of the zinc plant cadmium plant
	Caster Leadman	Cadmium Caster	To melt, cast, weigh and box the cadmium metal
	Cadmium Caster	Cadmium Caster Helper	To assist cadmium caster to melt, cast, weigh and box cadmium metal
		Cadmium Plant Operator	To manually pull starter sheets (with deposited cadmium) from cells, replace with blank starter sheets, strip cadmium metal from starter sheet and to clean and setup presses

DEPARTMENT - MELTING, SHIPPING

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Melting Department Operator	To stack and transport zinc products, to shovel and transport zinc dust, to remove and process zinc dross from furnaces
	Continuous Caster and Skimmer	Casting Operator	To operate sheppard casting machine, box casting lines, box casting wheel and alloy wheel to cast zinc into commercial shapes
		Zinc dust operator	To charge and dross the scrap furnace and hand ladle molten zinc for the manufacture of zinc dust
	Furnaceman	Furnace Operator	To transport and charge cathode zinc to the melting furnace and to direct the flow of molten metal to the proper casting area
		Alloyer	To operate reverb furnaces and alloy pots and to mix and prepare zinc alloy for casting
	Hand Ladler	Melting Dept. Utility	To cask (hand ladle) special zinc products and sandblast molds
		Shipping Operator	To strap zinc products and prepare rail cars for shipment
	Shipping Operator - First Class	Head Shipping Operator	To load zinc products into rail cars and trucks for shipment
	Head Shipping Scaleman	Weigher	To weigh and tally zinc products for shipment

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DEPARTMENT - ELECTROLYTIC

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Operator 1st Class	To monitor and regulate all solution processed through the cellroom
		Operator 2nd Class	To monitor solution flow to cells and weigh and transport cathode zinc
	Repair Equipment Man	Equipment Repairer	To repair bus bars and associated equipment, maintain an adequate inventory of cellroom supplies and perform minor mechanical repair on stripping trucks
	Cell Repair Leadman	Lead Cell Repairer	To inspect cells and cell components, assist in the cleaning of cells and cell components and oversee the replacement of damaged or worn components and general cell repair quality and quantity
	Cell Repairman	Cell Repairer	To clean cells and cell components, replace damaged or worn components and transport anodes
	Transport Man	Anode Tractor Operator	To transport anodes from the cellroom to the anode cleaning chain and return cleaned anodes to the cellroom
		Stripper	To remove, manually or by hoist, plated cathodes from cells, manually replace with startes cathodes, transport, strip and stack cathode zinc
	Cathode Copper Electrolysis	Cathode Controller	To inventory, dispense, and repair cathodes
		Anode Washer Operator	To operate the anode washer
	Anode Chainman	Anode Chain Operator	To operate the anode cleaning chain and cell and replace conventional anodes
	Anode Repairman	Anode Controller	To prepare new anodes for service, repair damaged anodes, monitor anode usage and dispose of deterioriated anodes

DEPARTMENT - ELECTROLYTIC

CODE	JOB DESCRIPTION	JOB TITLE	FUNCTION
		Anode Fabricator	To cast and trim antimony-lead header bars, silver-lead anodes and mix antimony-lead and silver-lead alloy
		Lead Anode Fabricator	To direct and work with the anode fabricating crew in casting and trimming silver-lead anode webs and to mix silver-lead alloy
	Anode-Cathode Manufacturing	Anode Fabricator Helper	To cast (hand ladle) and trim silver-lead alloy
	Sump Man	Sump Attendant	To clean the cell room basement area and prevent cell box residual from entering the regular cell room circuit during the cell repair cycle
		Cooling Tower Operator	To clean cooling tower, caunders and related equipment
	Laborer Handyman	Utility Laborer	To perform general unskilled labor and clean-up in or about the Electrolytic Department