phelps dodge Corporation Office of General Manager, P. O. Drawer 1238, Douglas, AZ 85607
(602) 364-8451

AP-42 5th ed. Section 12.3 #23

October 18, 1978

Mr. Don R. Goodwin, Director
Emission Standards and Engineering Division
U.S. Environmental Protection Agency
Office of Air Quality Planning & Standards
Research Triangle Park, North Carolina 27711

Dear Mr. Goodwin:

Pursuant to your request of September 13, 1978, I enclose a completed questionnaire with respect to Phelps Dodge Corporation's Hidalgo Smelter at Playas, New Mexico.

Yours very truly,

M. P. Scanlon

M. P. Scanlon
Vice President

MPS:rh
Encl.

I. GENERAL:

A. Name, address, and telephone number of person to contact regarding response to this request for information:

H. E. Dunham, Jr.
P. O. Box 67
Playas, New Mexico
88009

Phone: (505)436-2211
Ext. 211

B. Diagram of general plot plan showing copper smelter process equipment, air pollution control equipment and stack.

See attached drawings

C. Smelter start-up date (month/year):

June, 1976

D. Standard conditions (temperature and pressure) at which values for SCFM reported herein are computed:

$60^{\circ}F$ at 1 atm

II. A. GENERAL:

1. Description of smelter process operations including current process flowsheet.

   For process description see Appendix 1 and Figure 1.

2. Smelter design capacity (ton charge/hour).

   97 tons charge/hour

3. Actual production rate (lbs. blister copper/hour and percent Cu).

   438 TPD of 99 + % Cu

   (36,500 lbs/hr)

4. Provide the following data on the consumption of fuels including oil, gas and coal:

   a. Process(es) to which applied
   b. Heating value
   c. Percent sulfur
   d. Consumption

   See Table 1

5. Source and composition of copper ore concentrates typically processed. Include the average percent and range of percentages for each major chemical constituent and arsenic.

Composition	Tyrone	Bagdad
Wt %		
Cu	20 ± 5	28 ± 6
Fe	30 ± 8	25 ±12
S	40 ± 7	30 ±10
SiO_2	6 ± 2	8 ± 3
As	0.01 ± .005	0.04 ± .02

II. A. GENERAL: (cont.)

6. Percent arsenic in fluxing materials processed.

   Information not available

7. Description of charge preparation and bedding practices.

   See Appendix 1

8. Description of any plans for modifying or expanding existing smelter equipment and/or pollution control equipment over the next five years.

   At present, no plans for modifications or expansion of smelter equipment and/or pollution control equipment are being considered for the next five years.

B. DRYER:

1. Type, manufacturer, and expected service life.

Type:	Rotary kiln
Manufacturer:	Fuller Co.
Expected service life:	20 years

2. Type and quantity of fuel consumed per ton of charge and air/fuel ratio. If not fuel-fired, specify source of drying air including volume and temperature at which supplied.

   Type and quantity: No. 5 fuel oil at 0.4 gals/ton

   Air/Fuel ratio: 1.2

Source	Volume SCFM	Temperature ^oF
Superheater Off-Gas	14,850	600^oF
Process Air Preheaters Off-Gas	10,300	600^oF

II. B. DRYER:

3. Design and actual process feed rate (lbs concentrate/hour, lbs. flux/hour,etc.)

Tons/Hour	Design	Actual
Concentrate	78	84
Flux	10	11
Dust	1.5	2

4. Normal process operating temperature.

   $180^{o}F$ - $220^{o}F$

5. Volume and temperature of process off-gas stream generated and percent SO_2.

   22,400 SCFM at $180^{o}F$ with 0.04 % SO_2

6. Percent arsenic contained in dryer product.

   Information not available

C. FLASH SMELTING FURNACE:

1. Type, manufacturer, and expected service life.

   Type: Outokumpu Oy
   Manufacturer: Outokumpu Oy
   Expected service life: 20 years

2. Diagram of furnace showing overall dimensions and location of charging ports, matte taps, and slag taps.

   See Figure 2 for location and number of matte tap holes and slag skimming holes. The dimensions of the flash furnace are as follows:

   Reaction Shaft: 26' 11" ID x 35' 11-7/8" Height Inside
   Settler: 76' 7" Base x 32" 8" width x 20' 6" Height
   Uptake Shaft: 30' 0" x 21' 6" x 54' 5" Inside Dimension

C. FLASH SMELTING FURNACE: (cont.)

4. Design and actual process feed rates

   (lbs dryer output/hour, lbs flue dust/hour,etc.)

   See II. B - 3

5. Estimate of percent arsenic contained in furnace charge.

   0.03 % As

6. Source, temperature and quantity of preheated air injected per ton of charge.

Source:	Ambient
Temperature:	700^{o}-850^{o}F
Quantity:	52,919 SCF/Ton

7. Furnace operating tempature.

   2460^{o}F

8. Normal draft maintained across furnace (mm of Hg)

   1.0 mm of Hg

9. Design and normal production rate.

   (lbs. matte/hour and lbs. slag/hour) and matte grade (percent Cu).

Tons/Hour	Design	Normal	% Cu
Matte	25	27	55-60
Slag	58	63	

10. Percent arsenic contained in slag and matte.

    Information not available

C. FLASH SMELTING FURNACE: (cont.)

11. Volume and temperature of process off-gas stream generated and percent SO_2

Volume:	86,600 SCFM
Temperature:	2200°F
Percent SO_2:	10%

12. Number and type of waste heat boilers used and quantity of waste heat recovered.

Number:	One
Type:	Forced water circulation
Waste Heat Recovered:	3×10^8 BTU/Hr.

13. Quantity of dust recovered by waste heat boilers per unit time and the percent arsenic contained.

188 tons/day at 0.06 % arsenic

D. CONVERTERS:

1. Number, type and expected service life of converter.

Number:	Three
Type:	Pierce-Smith
Expected Service Life:	20 years

2. Description of converter operation including the number of converters typically on blow; the duration of normal slag and copper (finish) blows; and the quantity of blast air and/or oxygen used for slag and copper blows (SCFM).

See Appendix 2

D. CONVERTERS:

3. Design and actual process feed rates (lbs flash furnace matte/hour, lbs flue dust/hour, lbs flux/hour, lbs precipitates/hour, and lbs slag furnace matte/hour).

Tons/Hour	Actual	Design
Flash Furnace Matte	27	25
Slag Furnace Matte	9.3	8.6
Flux	1.9	1.7
Dust	-	-
Precipitates	-	-

4. Normal converter operating temperatures during slag and copper blows.

   2200 - 2600°F

5. Normal production rate (lbs blister Cu/Hour and lbs slag/hour).

Blister	20.6	Tons/Hr.
Slag	5.5	Tons/Hr.

6. Percent arsenic contained in blister and slag.

   Information not available

7. Volume and temperature of process off-gas stream generated and average percent SO_2.

Volume:	35,000 SCFM
Temperature:	1400°F
% SO_2:	6-7%

D. CONVERTERS: (cont.)

8. Number and type of waste heat boilers used and quantity of waste heat recovered.

Number:	Three
Type:	Forced water circulation
Waste Heat Recovered:	1 x 10^6 BTU/Hour

9. Quantity of dust recovered per unit time and the percent arsenic contained.

3 Tons/Day with .06% arsenic

E. SLAG FURNACE:

1. Manufacturer, type, dimensions and expected service life of slag furnace.

Manufacturer:	Krupp
Type:	Electric
Dimensions: 31' 0" ID x	13' 9-1/16" Height (inside)
Expected Service Life:	20 years

2. Type and quantity of energy consumed per tone of charge. If fuel-fired, provide air to fuel ratio.

Type:	Electric
Energy Consumed per Ton of Charge:	94 KWH

3. Description of charging method.

Flash furnace matte is transferred by launder to the slag cleaning furnace. Converter slag is charged by overhead crane transfer of ladles and poured into side charging launders. Reverts are charged through bin feeds into the top of the furnace.

4. Design and actual process feed rates (lbs converter slag/hour, lbs reverts/hour, etc.)

Tons/Hour	Design	Actual
Flash Furnace	58	63
Converter	5.5	7
Reverts	12	-

E. SLAG FURNACE: (cont.)

5. Percent arsenic contained in reverts and other feed to furnace.

   Information not available

6. Normal furnace operating temperature.

   2250-2400°F

7. Normal production rate (lbs matte/hour and lbs slag/hour) and matte grade produced (percent Cu).

Matte:	8.6 Tons/Hr	60-65% Cu
Slag:	55 Tons/Hr	

8. Percent arsenic contained in slag and matte.

   Information not available

9. Volume and temperature of process off-gas stream generated and percent SO_2

Volume:	3000 SCFM
Temperature:	1100-1200°F
% SO_2:	0.3 - 0.5

F. ANODE FURNACE:

1. Manufacturer, type and expected service life of furnace.

Manufacturer:	Pierce-Smith
Type:	Horizontal
Expected Service Life:	20 years

2. Design and actual process feed rate (lbs blister/hour).

Actual	Design
22.3 tons/Hr.	20.6 Tons/Hr.

F. ANODE FURNACE:

3. Type and quantity of fuel consumed per ton of charge and quantity of air/oxygen consumed.

Type:	Quantity consumed per ton of charge
Kerosene:	2.9 gals
Desulfurized Propane	294 SCF
Air:	7500 SCF

4. Volume and temperature of process off-gas stream generated and percent SO_2.

Volume:	3100 SCFM
Temperature:	1000°F
% SO_2:	trace

5. Normal production rate (lbs anode Cu/hour).

18.25 Tons/Hr.

6. Percent arsenic contained in anode copper.

Information not available

III. EMISSIONS:

A. List of sources of particulate emissions in the plant including fugitive emissions.

1. Main stack (fugitive emissions)
2. Two Acid Plant stacks
3. Power House stack (used only for starting and during a shutdown).

B. Level of uncontrolled mass particulate arsenic emissions by source (lbs/hour)

Information not available

C. Actual particulate and arsenic emissions data available on process sources, associated air pollution control systems, and stacks. If available, enclose actual test reports.

1. Main stack 11 lb/hr particulate
2. Acid Plant stacks (2) <1 lb/hr
3. Power House stack 2.8 lb/hr
   Arsenic information is not available

D. Description of typical types of process fluctuations and/or malfunctions experienced at each process source including the frequency of their occurrence and their resultant impact on emissions, both process and fugitive.

Each process source of emissions can be bypassed into the fugitive gas system upon malfunction. The resultant impact is to increase the emissions from the main stack and/or decrease the acid production. The fugitive gas system has had no failures.

IV. CONTROL SYSTEMS:

A. Rotary dryer electrostatic precipitator (ESP)

1. Manufacturer, type, date installed, and expected service life.

Manufacturer:	S. F. Carborandum
Type:	Plate to wire
Date Installed:	January, 1976
Expected Service Life:	20 years

2. Overall Dimensions:

50' x 40' x 30'

3. Number of banks and number of sections per bank.

Number of banks:	1
Number of section/ banks:	3

4. Number of transformers and rectifier sets.

Number of transformers:	3
Number of rectifiers:	3

5. Design collection efficiency. (Indicate temperature at which specified.)

99.9% at $185^{o}F$ - $320^{o}F$

6. Collection area (square feet).

48,000 ft^2

7. Design and actual values for the following operating parameters:

a. Gas flow rate treated (SCFM) and temperature (^{o}F).

	Design	Actual
Gas Flow SCFM	32,000	22,400
Temperature ^{o}F	185 - 320	180 - 220

IV. CONTROL SYSTEMS: (cont.)

7. Cont.

b. Inlet particulate loading (grain/SCF or lbs/hr).

Design	Actual
50 - 100 gr/SCF	125 gr/SCF

c. Outlet particulate loading

Design	Actual
0.03 gr/SCF	0.04 gr/SCF

d. Resistivity of particulate (ohm-cm), if known.

Information is not available

e. Secondary voltage and current (kilovolts and milliamperes).

	Design	Actual
Kilovolts	Variable	40
Milliamperes	Variable	250

f. Rapping (frequency and duration per section).

	Design	Actual
Frequency	Variable	5 minutes
Duration	Variable	5 minutes

g. Pressure drop (inches of water).

Design	Actual
0.8	Not available

IV. <u>CONTROL SYSTEMS</u>: (cont.)

B. Flash Furnace ESP

1. Manufacturer, type, date installed and expected service life.

Manufacturer:	S. F. Carborandum
Type:	Plate to plate
Date Installed:	January, 1976
Expected Service Life:	20 years

2. Overall Dimensions

74' x 33' x 40' each

3. Number of banks and number of sections per bank.

Number of Banks:	3
Number of Sections/Bank:	4

4. Number of transformer and rectifier sets.

Number of Transformers:	4
Number of Rectifiers:	4

5. Design collection efficiency - (indicate temperature at which specified).

99.9% at 515°F - 575°F

6. Collection area (square feet).

192,000 ft^2

7. Design and actual values for the following operating parameters:

a. Gas flow rate treated (SCFM) and temperature (°F).

	Design	Actual
Gas Flow SCFM	33,000 each	50,000 each
Temperature °F	450-650 each	450-600 each

IV. CONTROL SYSTEMS: (cont.)

B. Flash Furnace ESP (cont.)

7. Cont.

b. Inlet particulate loading (grain/SCF or lbs/hr).

Design	Actual
100-250 gr/SCF	190 gr/SCF

c. Outlet particulate loading

Design	Actual
0.02 gr/SCF	0.02 gr/SCF

d. Resistivity of particulate (ohm-CM), if known.

Information is not available

e. Secondary voltage and current (kilovolts and milliamperes).

	Design	Actual
Kilovolts	variable	40
Milliamperes	variable	250

f. Rapping (frequency and duration per section)

	Design	Actual
Frequency:	variable	5 minutes
Duration:	variable	5 minutes

g. Pressure drop (inches of water)

Design	Actual
12	Not available

IV. CONTROL SYSTEMS: (cont.)

C. Converter ESP

1. Manufacturer, type, date installed, and expected service life.

Manufacturer:	Koppers
Type:	Plate to wire
Date Installed:	January, 1976
Expected Service Life:	20 years

2. Overall dimensions

65' x 30' x 40' each

3. Number of banks and number of sections per bank.

Number of banks:	2
Number of sections/bank:	3

4. Number of transformer and rectifier sets.

Number of transformers:	3
Number of rectifiers:	3

5. Design collection efficiency (indicate temperature at which specified).

98.3% at $450^{o}F$ - $700^{o}F$

6. Collection area (square feet).

42,000 ft^2 each

7. Design and actual values for the following operating parameters.

a. Gas flow rate treated (SCFM) and temperature (^{o}F).

	Design	Actual
Gas Flow SCFM	42,500	35,000
Temperature ^{o}F	450-700	450-600

IV. CONTROL SYSTEMS: (cont.)

C. Converter ESP (cont.)

7. Cont.

b. Inlet particulate loading (grains/SCF or lbs/hr).

Design	Actual
3.0 gr/SCF	1.8 gr/SCF

c. Outlet particulate loading

Design	Actual
.05 gr/SCF	0.02 gr/SCF

d. Resistivity of particulate (ohm-cm), if known

Information is not available

e. Secondary voltage and current (kilovolts and milliamperes).

	Design	Actual
Kilovolts	variable	40
Milliamperes	variable	250

f. Rapping (frequency and duration per sectional

	Design	Actual
Frequency:	variable	5 minutes
Duration:	variable	5 minutes

g. Pressure drop (inches of water)

Design	Actual
12	2

IV. CONTROL SYSTEMS: (cont.)

D. Slag Furnace

1. Are emissions from the slag furnace controlled?

   Yes

2. If controlled, describe controls, particulate and arsenic loading (grain/SCF or lbs/hour), gas volume handled (SCFM), and temperature (°F).

   Slag furnace off-gases are routed to the Acid Plants (2).

   Particulate: 15.5 - 37.5 gr/SCF
   Gas Volume: 3000 SCFM
   Temperature: 1100-1200°F
   Arsenic loading information is not available

E. Acid Plants

For each Acid Plant in service, provide the following information:

1. Process source(s) controlled

   a. Flash Furnace
   b. Slag Furnace
   c. Converters

2. Manufacturer, type and date installed.

	# 1	# 2
Manufacturer:	Chemico	Lurgi
Type:	Double Contact	Double Contact
Date Installed:	July, 1976	November, 1977

3. Manufacturer's guarantees if any.

   Yes, variable depending on individual equipment in the Acid Plants.

IV. CONTROL SYSTEMS: (cont.)

E. Acid Plants (cont.)

4. Brief description of gas-stream pre-cleaning system(s) downstream of ESP's.

See #5 below

5. If scrubbers are used, provide the following:

a. Type of scrubber

#1	#2
Swenco Bubble Contact Scrubber	Venturi Scrubber

b. Pressure drop across scrubber

#1	#2
4 in. water	1 in. water

c. Type and quantity (gpm) of scrubbing media used.

#1	#2
1% weak acid 2000 gpm	1% weak acid 4000 gpm

d. Temperature at inlet and outlet

#1	#2
450°F - 75°F	450°F - 110°F

6. Design and actual values for the following operating parameters:

a. Gas flow rate treated (SCFM)

	#1		#2	
	Design	Actual	Design	Actual
Gas Flow Rate SCFM	90,000	55,350	129,000	79,650

IV. CONTROL SYSTEMS: (cont.)

6. Cont.

b. Acid Production (ton/day)

#1		#2	
Design	Actual	Design	Actual
950 TPD	634 TPD	1800 TPD	1177 TPD

c. Acid Strength Produced

#1		#2	
Design	Actual	Design	Actual
93%	93%	93/98%	93/98%

d. Conversion Rate

#1		#2	
Design	Actual	Design	Actual
99.7%	99.7%	99.7%	99.7%

e. Number of catalyst beds

#1		#2	
Design	Actual	Design	Actual
4	4	4	4

f. Inlet SO_2 concentration (percent SO_2)

#1		#2	
Design	Actual	Design	Actual
7.5%	9%	7.5%	9%

IV. CONTROL SYSTEMS: (cont.)

6. Cont.

g. Outlet SO_2 concentration (ppm).

#1 Design	#1 Actual	#2 Design	#2 Actual
450 ppm	500-650 ppm	450 ppm	500-650 ppm

7. Percent arsenic typically contained in stack discharge, product acid, and scrubber effluents.

Information is not available.

F. FUGITIVE CONTROL SYSTEMS:

1. Secondary converter hoods

a. Manufacturer, type, date installed and expected service life of hoods.

Manufacturer: In-House Design
Type: Sliding door
Date Installed:
Expected Service Life: 10 years

b. Overall dimensions of hoods.

29' x 19' x 18'

c. Total gas volume handled by system (SCFM)

25,000 SCFM

d. Temperature of gas (^{o}F)

300 - 500 ^{o}F

e. Particulate loading (grain/SCF or lbs/Hr.)

11 lbs/Hr.

f. Percent arsenic in flue dust

Information not available

IV. CONTROL SYSTEMS: (cont.)

F. FUGITIVE CONTROL SYSTEMS: (cont.

1. Cont.

g. Brief description of how system is operated including the periods when converter is in a roll-out mode.

The converters are a controlled source when rolled in. In the rolled out mode the converter hood is closed off from the controlled source system and opened to the fugitive gas collection system.

h. Discuss any operating problem in using these hoods, if any.

No major problems have been encountered.

2. Other fugitive control systems.

a. Matte tapping (flash furnace).

Yes

b. Matte tapping (slag furnace)

Yes

c. Slag tapping (flash furnace)

Yes

d. Slag tapping (slag furnace)

Yes

Provide a brief description of how these systems operate, gas volumes handled, hooding of launders and ladles, if any, operating problems, particulate and arsenic loading (grain/SCF or lbs/hour), and any other information pertinent to the control of fugitive emissions from these areas.

All transfer launders are equipped with hinged covers and are collected by the fugitive gas system at the launder exit. Hoods are placed over all of the tapping and skimming ports and collected by the fugitive gas system. All collection points are equipped with pneumatic gate valves that are opened and closed accordingly.

	GAS VOLUME SCFM	PARTICULATE LOADING (gr/SCF)	ARSENIC LOADING (gr/SCF)
Matte Tapping (Flash)		Not available	Not available
Matte Tapping (Slag)		Not available	Not available
Slag Tapping (Flash)		Not available	Not available
Slag Tapping (Slag)		Not available	Not available
TOTAL	40,000 SCFM		

V. STACKS:

A. Identify and list the process and/or control systems exhausted to each stack.

1. Main stack exhausts the following fugitive gases.

   a. Dryer ESP
   b. Flash furnace - tapping and skimming
   c. Slag furnace - tapping and skimming
   d. Converter ground smoke
   e. Anode furnace
   f. Superheater off-gases
   g. Preheater off-gases

2. Acid Plant Stacks (2)

   Off-gases from the following:

   a. Flash furnace
   b. Slag furnace
   c. Converters

3. Power House stack

   Off-gas from steam boiler used only for starting and during a shutdown condition.

B. Provide the following data on stack configuration for each stack:

1. Elevation of base of stack (feet above sea level).

Main	Acid	Power House
4329'	4335'	4324'

2. Height (feet above terrain).

	Main	Acid Plants 1	Acid Plants 2	Power House
Height (ft)	599	200	250	160

V. STACKS: (cont.)

B. Cont.

3. Inside diameter (feet)

	Main	Acid Plants 1	Acid Plants 2	Power House
Inside dia. (feet)	17'11"	7'6"	6'1"	8'6"

4. Exit temperature (^{o}F)

	Main	Acid Plants 1	Acid Plants 2	Power House
Exit temp. (^{o}F)	140	75	110	Not available

5. Exit gas discharge velocity (fpm)

	Main	Acid Plants 1	Acid Plants 2	Power House
Discharge velocity (fpm)	420	2700	3180	900

6. Gas volume discharged (SCFM)

	Main	Acid Plants 1	Acid Plants 2	Power House
Gas volume (scfm)	100,150	120,000		21,630

APPENDIX

1

II. PROCESS:

A. General

1. Description of smelter process operations including current process flowsheet.

The smelter primarily consists of:

1. Concentrate and flux receiving with storage facilities.

2. A dryer unit and flash furnace feed system.

3. Process air preheaters, flash furnace, waste heat boiler and three precipitators in parallel.

4. A sulfur plant.

5. Two acid plants and scrubbers.

6. An electric furnace for the treatment of slags and disposal facilities for cleaned slag.

7. Three 13' x 30' Pierce-Smith Converters with waste heat boilers and two precipitators in parallel.

8. Two anode furnaces, anode casting wheel and an automatic take-off machine.

9. Power plant.

10. Fugitive gas handling system.

The concentrates are received and thorougly blended and stored inside a covered building with four beds. The blended concentrates are then proportionally mixed with flux and fed to the dryer. The blending of the concentrates insures a homogeneous furnace feed that gives steady-state conditions for the flash furnace operation. The steady-state production of dust and SO_2 allows optimum conditions for the pollution control equipment to operate at its maximum efficiency.

The solids circuit consists of a flux crushing and grinding, mixing with concentrate, then dried and fed to the flash furnace. Since a find grind is needed for the flash smelting process, dust precipitatators are used to collect the dust produced from drying, flash smelting and converting. The dust that has high copper content is then returned to the system by two different means. The undersize dust is returned directly to the flash furnace. The oversize dust is carried by bucket back to the bedding plant where it is mixed homogeneously with the concentrate.

The liquid circuit consists of two different paths, one for matte and one for slag. The flash furnace matte (55-60% Cu) is transferred by ladles to the converters which convert the matte into blister copper (94-99% Cu). The blister copper is further treated in the anode furnaces to produce anode copper (99+% Cu). The 99+% copper is then poured into anodes for shipment to the refinery.

The slag circuit consists of flash furnace slag (1.5-5% Cu) that is transferred by launder to the electric slag cleaning furnace where it is joined by ladle transfer of converter slag (5-10% Cu) and bin feed of reverts. The matte (60-65% Cu) is transferred by ladle to the converter. The slag (0.8-1.0% Cu) is taken to the slag dump.

The off-gases produced in flash smelting, electric slag cleaning and converting are then processed in the acid plants and discharge to the atmosphere with 99+% of the dust and over 90% of the sulfur removed. The uncontrolled off-gases (fugitive) are collected at all points of transfer (except ladles), including the off-gases produced from the anode furnace, steam superheaters, process air preheaters and converter ground gases. These fugitive gases are then routed to the main stack for one point of discharge to the atmosphere.

APPENDIX

2

II. D.2.

Flash and slag cleaning furnace matte is transferred by ladle to the converters. Flux is added and air under high pressure is blown through the matte to oxidize the remaining iron sulfide (slag blow). The slag is then transferred to the slag cleaning furnace. The remaining matte (Cu_2S) is blown with high pressure air to reduce Cu_2S into copper (finish blow).

In both blows the off-gases are a controlled source and routed to the acid plant.

	MINUTES		
	BLOWING	NOT BLOWING	TOTAL
Slagging Period	130	110	240
Finish Period to Worm Off	50	20	70
Finish Period After Worm Off	0-10	0	0-10
Preparation for Next Charge	0	75	75
Total Elapsed Time	190	205	395

Slag Blow Air (SCFM) 18,000 SCFM
Finish Blow Air (SCFM) 18,000 SCFM
No oxygen enrichment is used

TABLE 1

FUEL USAGE AND HEAT CONTENT

PROCESS	TYPE	CONSUMPTION	HEAT VALUE	% S
Drying	No. 5 Fuel Oil	0.6 gpm	140,950 BTU/Gal	0.75
Flash Smelting	No. 5 Fuel Oil	17 gpm	140,950 BTU/Gal	0.75
Process Preheaters	No. 5 Fuel Oil	6.5 gpm	140,950 BTU/Gal	0.75
Anode Furnaces	Kerosene	1 gpm	136,720 BTU/Gal	0.5
Gas Reformer	Propane	100 SCFM	96,500 BTU/Gal	trace
Acid Plant Preheaters	No. 5 Fuel Oil	1000 per/ month	140,950 BTU/Gal	0.75
Converters	Kerosene	3 gpm	136,720 BTU/Gal	0.5

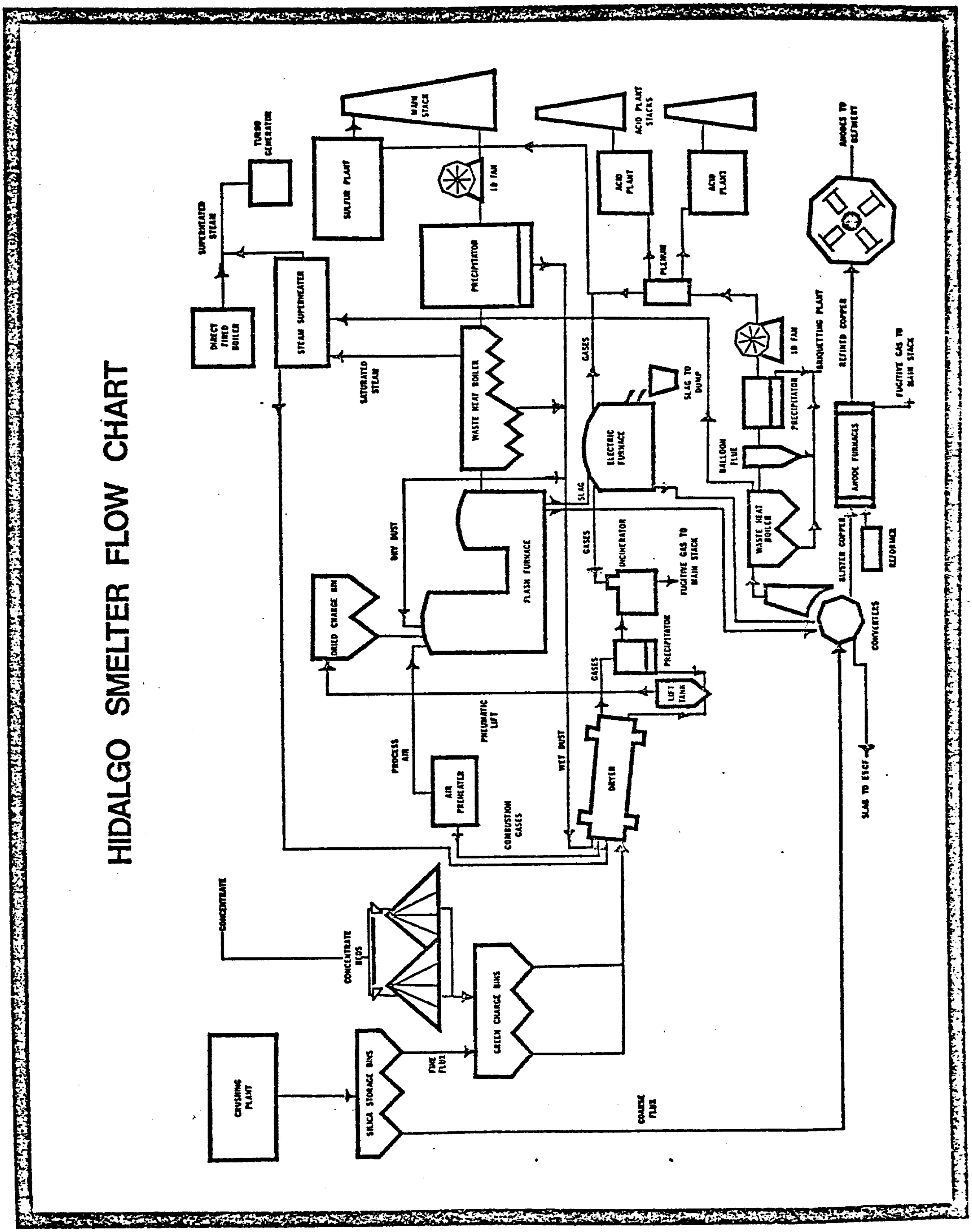
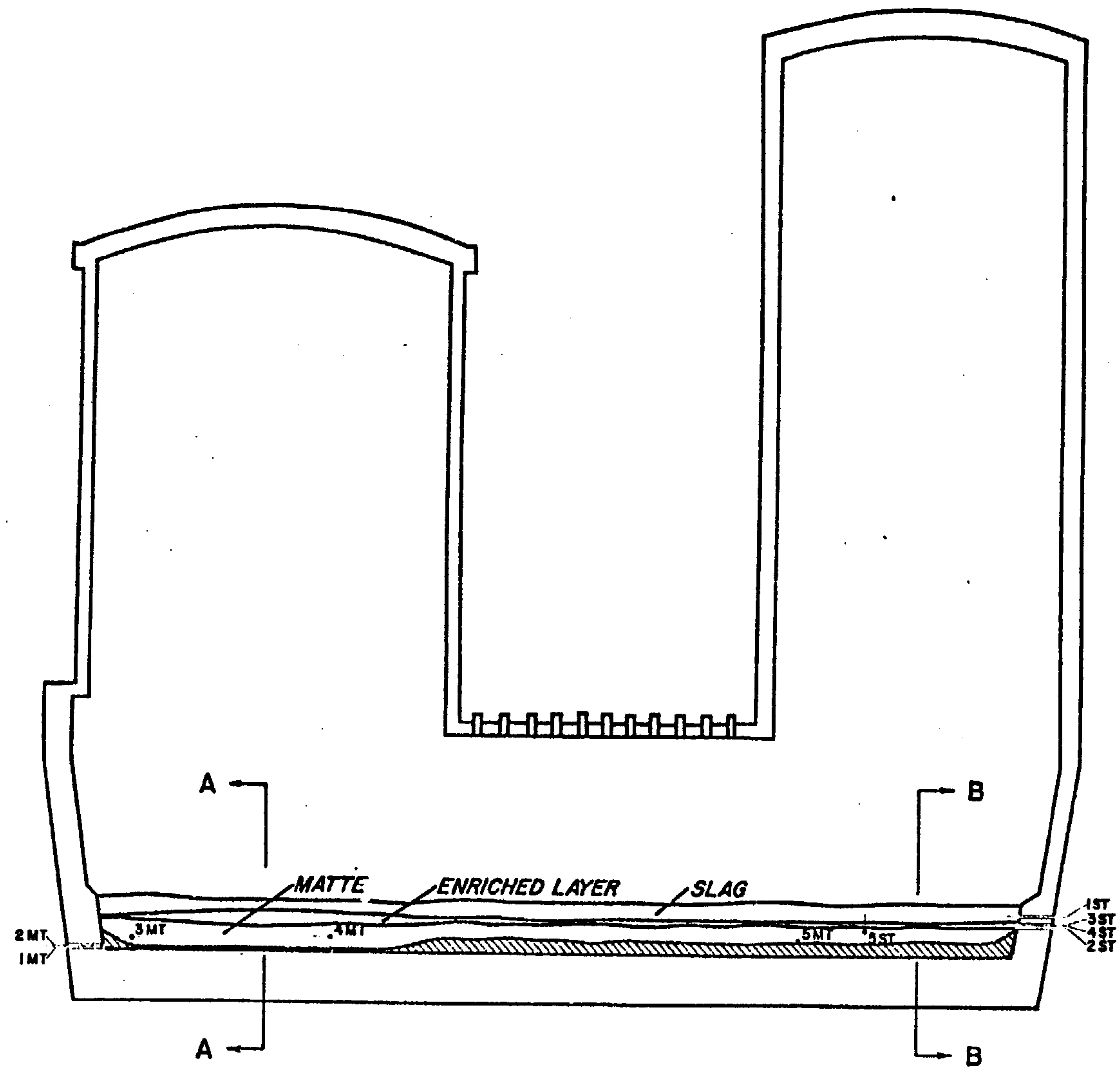

HIDALGO SMELTER FLOW CHART
CRUSHING PLANT
SILICA STORAGE BINS
FINE FLUX
COARSE FLUX
CONCENTRATE
CONCENTRATE BEDS
GREEN CHARGE BINS
COMBUSTION GASES
AIR PREHEATER
PROCESS AIR
PNEUMATIC LIFT
DRYER
WET DUST
LIFT TANK
GASES
PRECIPITATOR
DRIED CHARGE BIN
DRY DUST
FLASH FURNACE
INCINERATOR
FUGITIVE GAS TO MAIN STACK
SLAG
ELECTRIC FURNACE
SLAG TO DUMP
WASTE HEAT BOILER
SATURATED STEAM
STEAM SUPERHEATER
DIRECT FIRED BOILER
SUPERHEATED STEAM
TURBO GENERATOR
SULFUR PLANT
MAIN STACK
ID FAN
PLENUM
ACID PLANT
ACID PLANT STACKS
BALLOON FLUE
BRIQUETTING PLANT
CONVERTERS
BLISTER COPPER
REFORMER
ANODE FURNACES
REFINED COPPER
ANODES TO REFINERY

FIGURE 1



TAP HOLES

Hole No.	Elev. from Bottom
MATTE HOLES	
1	0"
2	1"
3	7"
4	9"
5	9"
SLAG HOLES	
1	25 3/4"
2	18 3/4"
3	20 3/4"
4	23 3/4"
5	15 3/4"

NOTE -

ENRICHED LAYER -
Super saturated magnetite plus copper interface between Matte and Slag

FIGURE 2