LABORATORY DEVELOPMENT TESTWORK

on Cirque Lead Zinc Drill Core Samples
submitted by

CURRAGH RESOURCES LTD.

Volume 2 of 3

005029

Project No. L.R. 3889, 4086, 4123

NOTE:

This report refers to the samples as received.

LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
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DETAILS OF TESTS

ABSTRACT

This report describes the results of the laboratory development testwork conducted on the Cirque ore composite and three individual main ore types. The composite and different ore types were prepared from the drill core samples.

The testwork was concerned with the development of a flowsheet and reagent scheme that would produce high grade lead and zinc concentrates with satisfactory recoveries. Emphasis was placed on development of a treatment procedure that can be used on all ore types. During the laboratory testwork, the flowsheet and reagent scheme for production of high grade concentrates has been developed. The developed procedure was incorporated in a continuous locked cycle test yielding the following results:

TABLE NO. 1 :
Continuous Locked Cycle Test Results

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
84	Composite No. 1	Pb Cleaner Conc	3.9	67.1	2.04	70.7	0.7
		Zn Cleaner Conc	18.3	1.55	54.9	7.6	90.6
		Zn Combined Tail	77.8	1.04	1.23	21.7	8.7
		Feed	100.00	3.73	10.90	100.0	100.0
96	Ore Type 5 (massive sulphide)	Pb Cleaner Conc	4.8	55.3	2.28	72.4	0.8
		Zn Cleaner Conc	22.7	1.38	54.10	8.5	90.3
		Zn Combined Tail	72.5	0.97	1.68	19.1	8.9
		Feed	100.00	3.68	13.6	100.0	100.0

The flowsheet developed in this testwork was a semi-bulk flowsheet with several retreatment stages. From the results obtained in the laboratory development testwork, the following conclusions are made:

- The developed laboratory flowsheet and reagent scheme gave good concentrate grades at satisfactory recoveries. The flowsheet can be used to treat different ore types without any changes.
- Relatively coarse primary grinding and very fine regrinding of the lead (K_{80} = 12 μm) and zinc concentrates (K_{80} = 20 μm) were important parameters in the developed flowsheet.
- Introduction of high intensity conditioning to the lead and zinc cleaner feeds improved both the rates of flotation and concentrate grades of corresponding lead and zinc concentrates.
- Reagent combinations introduced in the lead circuit were modifications of collectors and organic depressant SD200 (as referred to as PKD in this report) which performed well on the Cirque ore.

This report describes the details of the laboratory development testwork.

INTRODUCTION

At a meeting at Faro on April 15, 1990, with Mr. G. McDonald of Curragh Resources Inc., previous testwork carried out on Cirque ore and the continuation of the program to develop a more efficient treatment procedure were discussed. Based upon these discussions, a laboratory development test program was designed for the evaluation of the Cirque ore. The test program also included evaluation of the various ore types.

During the progress of the testwork, details and summaries of the test results were issued. The results of the testwork were also discussed with Mr. McDonald in regular telephone conversations and meetings at Lakefield.

LAKEFIELD RESEARCH

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SUMMARY AND CONCLUSIONS

1. Description of Samples Used in the Laboratory Testwork

The main laboratory development testwork was conducted on a composite sample prepared from drill core samples. The composite was a mixture of two major ore types which included massive sulphide and baritic ores. After development of the laboratory treatment procedure, standard laboratory tests were carried out on various rock types and mixtures of various rock types and hanging wall material. The head assays of the samples used in the laboratory testwork are shown in Table No. 2.

TABLE NO. 2 :
Head Analyses of Laboratory Samples

Element	Assays %, g/t				Hanging Wall
	Composite No. 1	Ore Type 5	Ore Type 4	Ore Type 1	
Lead (Pb), Total	4.25	3.65	2.68	2.64	0.045
Zinc (Zn), Total	11.50	13.70	8.49	6.24	0.13
Lead (Pb), Oxide	-	0.85	0.51	0.42	-
Zinc (Zn), Oxide	-	0.20	0.065	0.044	-
Iron (Fe), Total	16.50	22.20	16.5	3.52	-
Sulphur (S), Total	27.60	36.5	24.0	17.40	-
Barite (Ba)	18.80	10.3	29.8	39.50	-
Carbon (C), Total	-	0.20	0.21	0.17	5.06
Carbon (C), graphitic	-	-	-	-	-
Gold (Au)	<0.02	<0.02	0.07	<0.02	-
Sliver (Ag)	65.30	93.3	56.90	37.1	-

2. Laboratory Development Testwork (Years 1978-1981)

Extensive laboratory development testwork was performed between the years 1978 and 1981 by Kamloops Research and Assay Laboratory and Sachtleben Bergbau GmbH Laboratories (West Germany) in an attempt to develop a treatment procedure for beneficiation of Cirque ore. During this testwork, massive sulphide ore and baritic ore types were included in the evaluation.

In most of the testwork by Kamloops Laboratory, a conventional sequential flowsheet using a soda ash-cyanide-xanthate system was examined.

Sachtleben laboratory examined the standard "Meggen" process which consists of high lime addition along with collector, to the lead grind, conditioning the ground product with ZrO_2, and lead flotation using SO_2. The results obtained using this system were similar to those obtained with the soda ash-cyanide-xanthate system.

Summary - Continued

Typical results obtained in a continuous locked cycle test carried out at Lakefield using a sequential lead-zinc flotation with the soda ash-cyanide-xanthate system developed by Kamloops are shown in Table No. 3.

TABLE NO. 3 :
Metallurgical Results of Laboratory Testwork Using Sequential Flowsheet with a Conventional Reagent Scheme (LR 2491-1981)

Test No.	Sample	Product	Weight %	Assays %, g/t			% Distribution		
				Pb	Zn	Ag	Pb	Zn	Ag
1	"A" (Baritic ore type)	Pb Cleaner Conc	1.37	59.4	3.57	192.1	70.0	0.8	8.4
		Zn Cleaner Conc	9.57	0.35	56.40	107.5	2.9	89.4	33.2
		Pyrite Cleaner Conc	18.38	1.25	2.57	89.0	19.8	7.8	52.5
		Pyrite Flot'n Tail	70.68	0.12	0.17	2.71	7.3	2.0	6.1
		Head (Calc)	100.00	1.16	6.04	31.19	100.0	100.0	100.0
2	"B" (Massive sulphide)	Pb Cleaner Conc	4.32	45.2	3.86	125.1	66.8	1.5	7.6
		Zn Cleaner Conc	15.97	0.63	58.5	133.8	3.4	83.6	29.9
		Pyrite Cleaner Conc	40.96	1.72	3.81	100.70	24.1	14.0	57.8
		Pyrite Flot'n Tail	38.75	0.43	0.28	8.65	5.7	0.9	4.7
		Head (Calc)	100.00	2.92	11.18	71.37	100.0	100.0	100.0

Good results were obtained on the baritic ore type, but on the massive sulphide ore, production of a high grade lead concentrate was not possible. Note that a high grade lead concentrate at satisfactory recovery was not obtained in any of the testwork.

3. Laboratory Development Testwork (Years 1990-1991)

The laboratory development testwork was carried out in several stages in which the following were examined:

- grindability of ore
- sequential lead zinc flotation using various reagent schemes
- semi-bulk flotation with various reagent schemes
- evaluation of various rock types using the developed reagent scheme.

3.1. Grindability of Ore

Standard grindability tests (Table 4) and laboratory grinding tests (Figure 1) were performed on the main composite to; a) determine the ball mill work index of the ore and, b) determine grinding fineness for subsequent laboratory testwork.

In general, the ore is relatively soft and has a laboratory Bond work index of about 10. The power input to grind the ore to about $K_{80} = 80$ µm was only 6 kWh/tonne.

Summary - Continued

TABLE NO. 4 :
Work Index Determinations

Screen Size		Gbp*	K_{80}, µm		Work Index	
mesh	µm		Feed	Product	Short ton	metric tonne
100	147	2.97	1061	113	9.13	10.07
150	104	2.41	1061	78	9.04	9.97
200	74	2.01	1061	65	9.94	10.96

*Net grams of undersize produced per revolution.

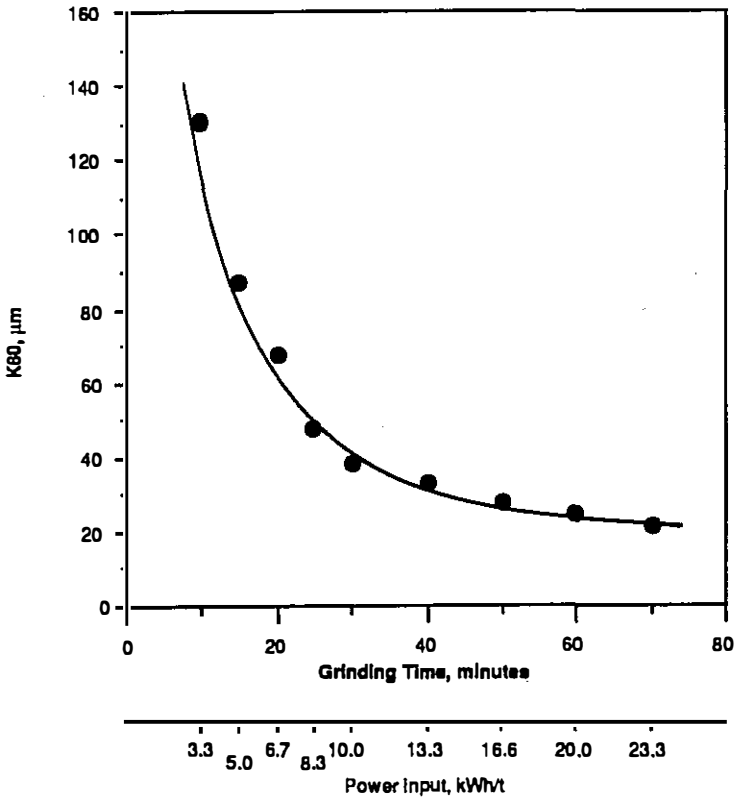


FIGURE NO. 1 : K_{80} versus grinding time

Summary - Continued

3.2. Evaluation of Sequential Flotation Flowsheet

Initial laboratory testwork was conducted to evaluate the sequential lead-zinc flowsheet (Figure 2). Using this flowsheet, several major variables were examined. These included: a) fineness of primary grind, b) lead concentrate regrind and lead depressant systems.

The effects of these variables on the lead and zinc flotation using sequential flowsheet can be described as follows:

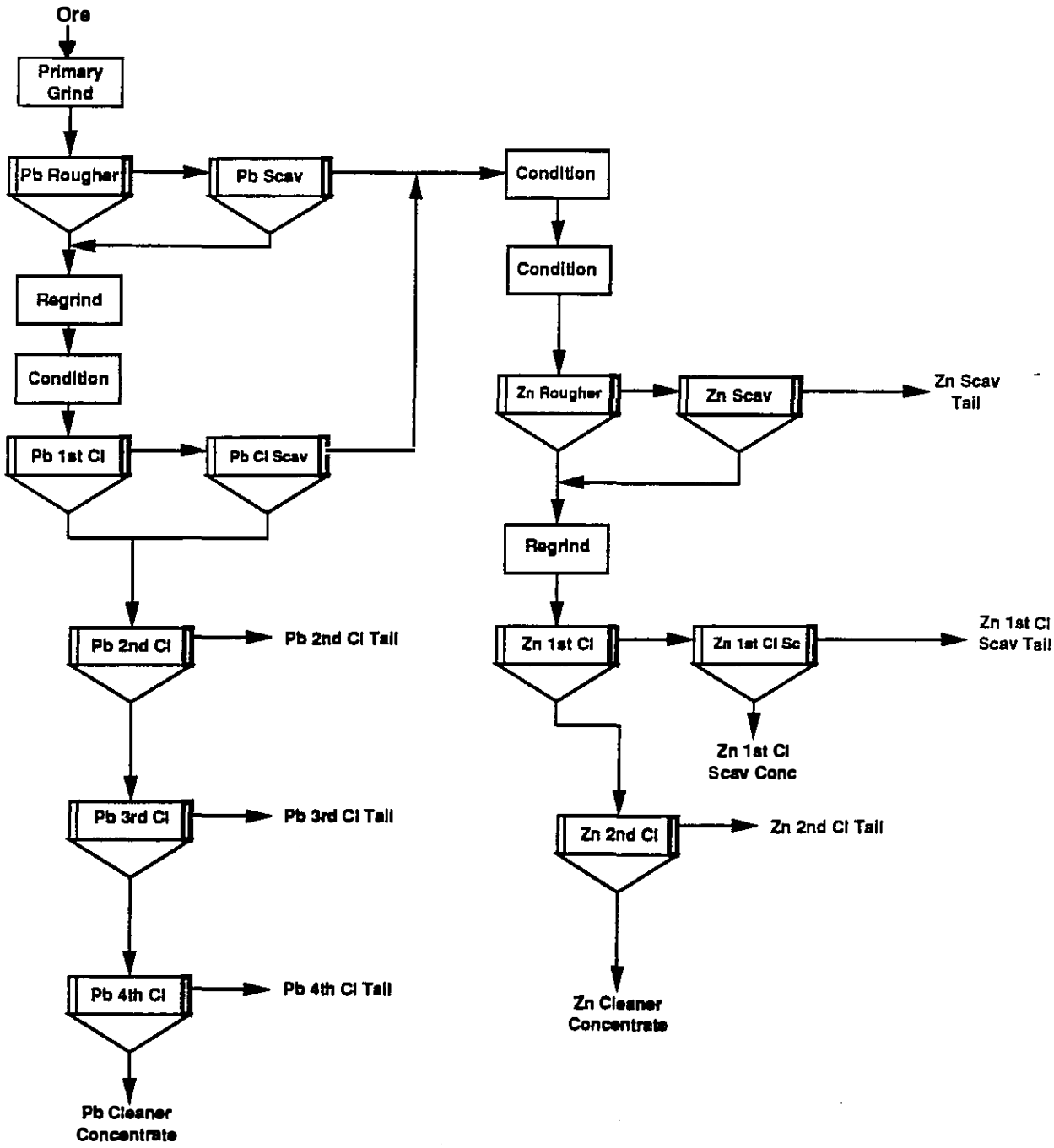


FIGURE NO. 2 : Laboratory sequential flowsheet

Summary - Continued

3.2.1. Primary Grinding Fineness was extensively examined to determine the relationship between lead recovery and fineness of primary grinding. These results are illustrated in Figure No. 3.

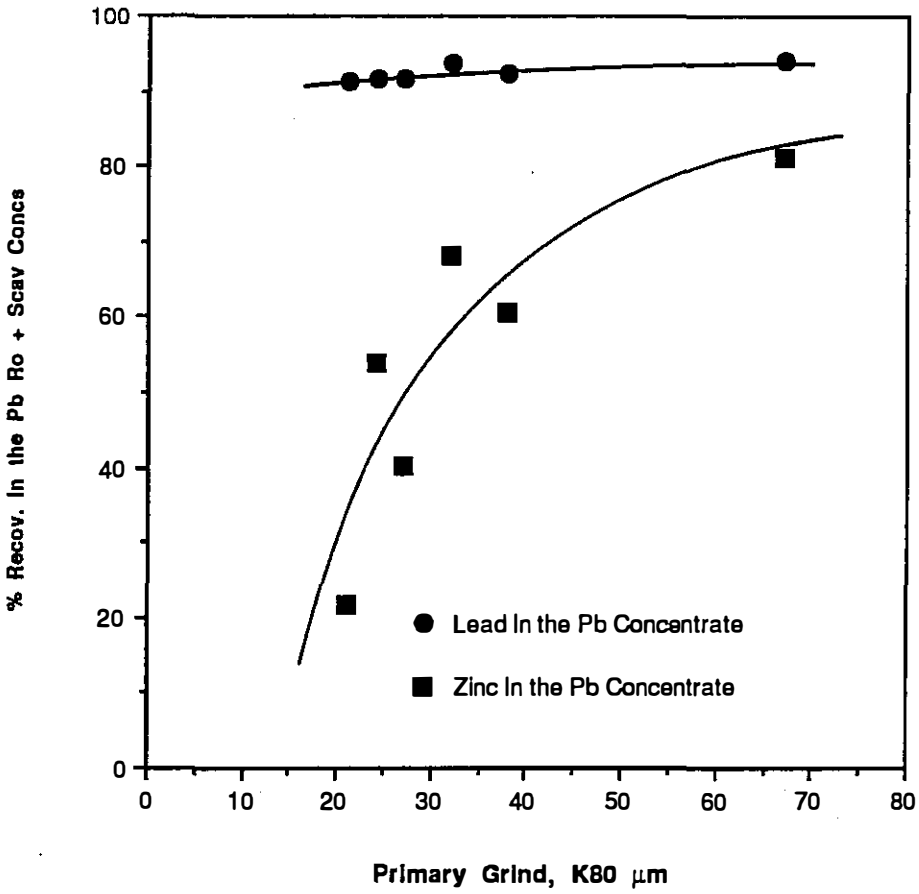


FIGURE NO. 3 : Effect of primary grind fineness on lead and zinc recoveries

From the results obtained, the following conclusions are made:

- The fineness of grind in the range tested had no significant effect on lead recovery.
- The zinc recovery in the lead rougher concentrate was significantly reduced with increase in fineness of primary grinding.

The high lead recovery at coarse primary grinding provided the basis for development of the semi-bulk flowsheet.

Summary - Continued

3.2.2. Effect of Lead Concentrate Regrinding was examined using a primary grinding fineness of about K_{80} = 50 μm. The results obtained (Figure 4) showed the following:

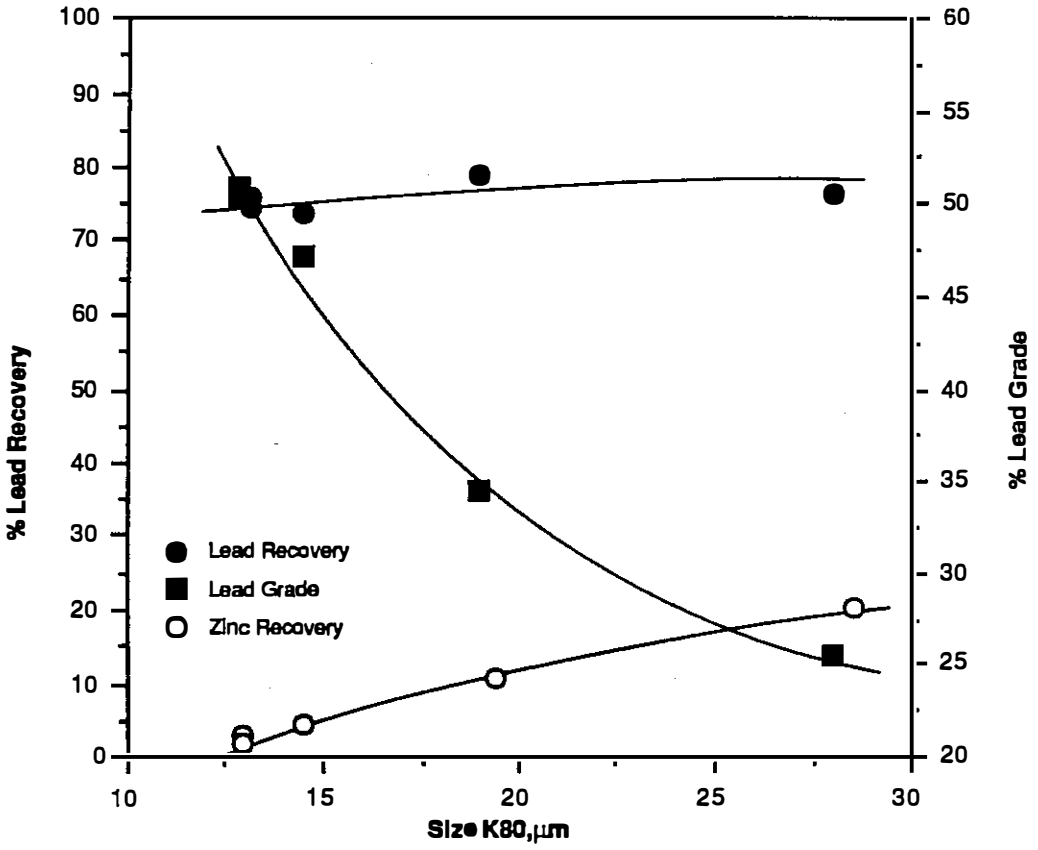


FIGURE NO. 4 : Effect of lead rougher concentrate regrinding

- A maximum lead concentrate grade of about 55% Pb was obtained at a lead rougher concentrate regrind of K_{80} = 12 μm.
- No apparent changes in the lead recovery at different fineness of regrind were obtained.
- Zinc rejection in the lead concentrate improved with finer concentrate regrinding.

Summary - Continued

3.2.3. Depressant Combinations: lime, NaCN, PKD-C, and soda ash were extensively tested in lead roughing and cleaning. Combinations of soda ash-NaCN or soda ash-PKD-C and lime-NaCN or lime-PKD-C were examined (Figure 5).

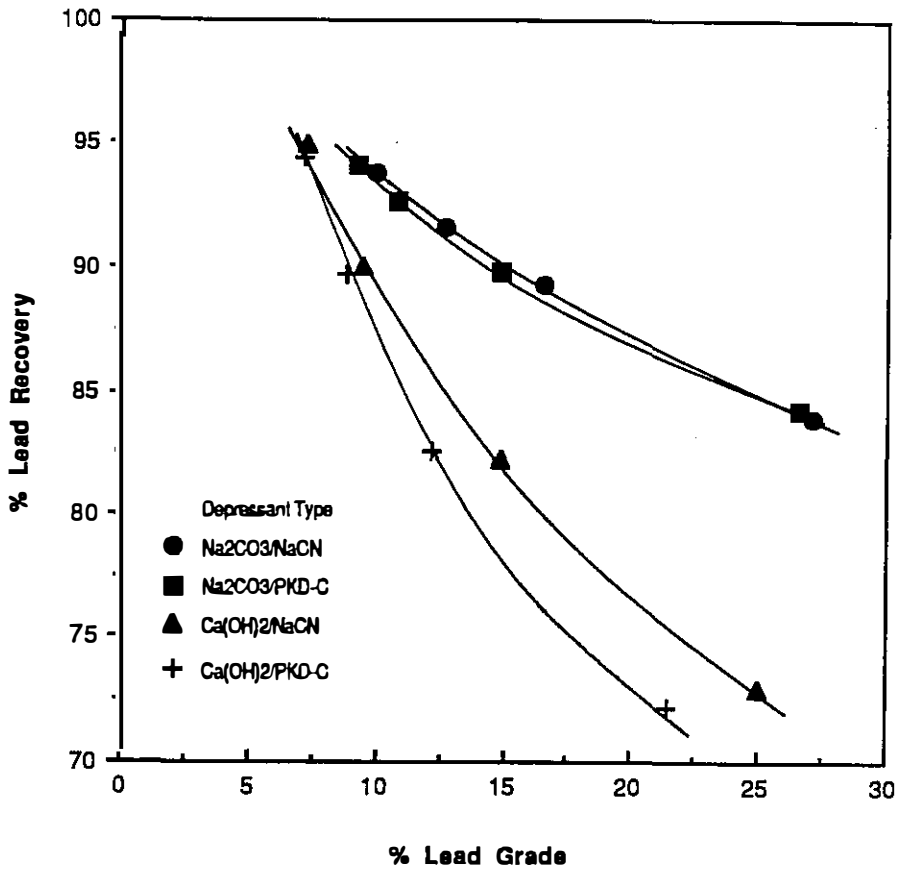


FIGURE NO. 5 : Effect of depressant type

Soda ash used with either NaCN or PKD-C gave much better selectivity than lime used with either NaCN or PKD-C.

Typical metallurgical results obtained in the batch tests using the sequential flotation method are shown in Table No. 5.

As in previous testwork (i.e. 1978-1981), problems were experienced in obtaining a high lead concentrate grade. The lead concentrate was contaminated with fine pyrite and fine carbonaceous shale material.

Summary - Continued

TABLE NO. 5 :
Batch Test Results Using Sequential Flowsheet

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
86	Rock Type 5 (massive sulphide)	Pb Cleaner Conc	2.75	44.7	3.53	33.9	0.7
		Pb Rougher Conc	62.87	5.49	13.6	95.0	62.5
		Zn Cleaner Conc	-	-	-	-	-
		Zn 1st Cl Conc	8.93	0.61	51.1	1.5	33.5
		Zn Rougher Tail	23.24	0.36	1.10	2.3	1.9
		Head (Calc)	100.00	3.63	13.6	100.0	100.0
1	Composite No. 1	Pb Cleaner Conc	5.27	52.5	4.75	72.6	2.3
		Pb Rougher Conc	17.79	18.7	7.35	87.4	11.8
		Zn Cleaner Conc*	16.22	0.82	42.0	3.5	61.5
		Zn 1st Cl Conc	23.73	0.88	39.2	5.5	84.0
		Zn Rougher Tail	56.76	0.44	0.53	6.6	2.7
		Head (Calc)	100.00	3.81	11.1	100.0	100.0

*2nd cleaner concentrate

3.3. Evaluation of Semi-Bulk Flotation Flowsheet

Taking advantage of the mineralogical characteristics of the ore, and the lead flotation behaviour at coarser grinding, a semi-bulk flotation flowsheet was selected for the evaluation. The mineralogical characteristics of the ore influenced flowsheet selection in the following ways:

The pyrite in the ore is represented by two distinct pyrite types. These are "collomorphous" or melnikowite pyrites and carbonaceous pyrite. In addition, appreciable amounts of carbonaceous shale are present in the ore. Most of the galena is associated with the collomorphous pyrite which is friable and softer than the more crystalline carbonaceous pyrite. At coarse primary grinding, middlings of collomorphous pyrite and galena are recovered while the coarser, carbonaceous pyrite fractions are rejected. Therefore, during the final stage of regrinding the lead concentrate is free from carbonaceous pyrite and upgrades much better than with fine primary grind.

At the coarser grind, lead rougher recovery is identical to the lead recovery of the finer primary grind, but a portion of the zinc also floats with the lead.

The semi-bulk flowsheet is shown in Figure No. 6. Using this flowsheet, a detailed evaluation of a number of variables was carried out. The effect of these variables on the metallurgical results can be described as follows:

Summary - Continued

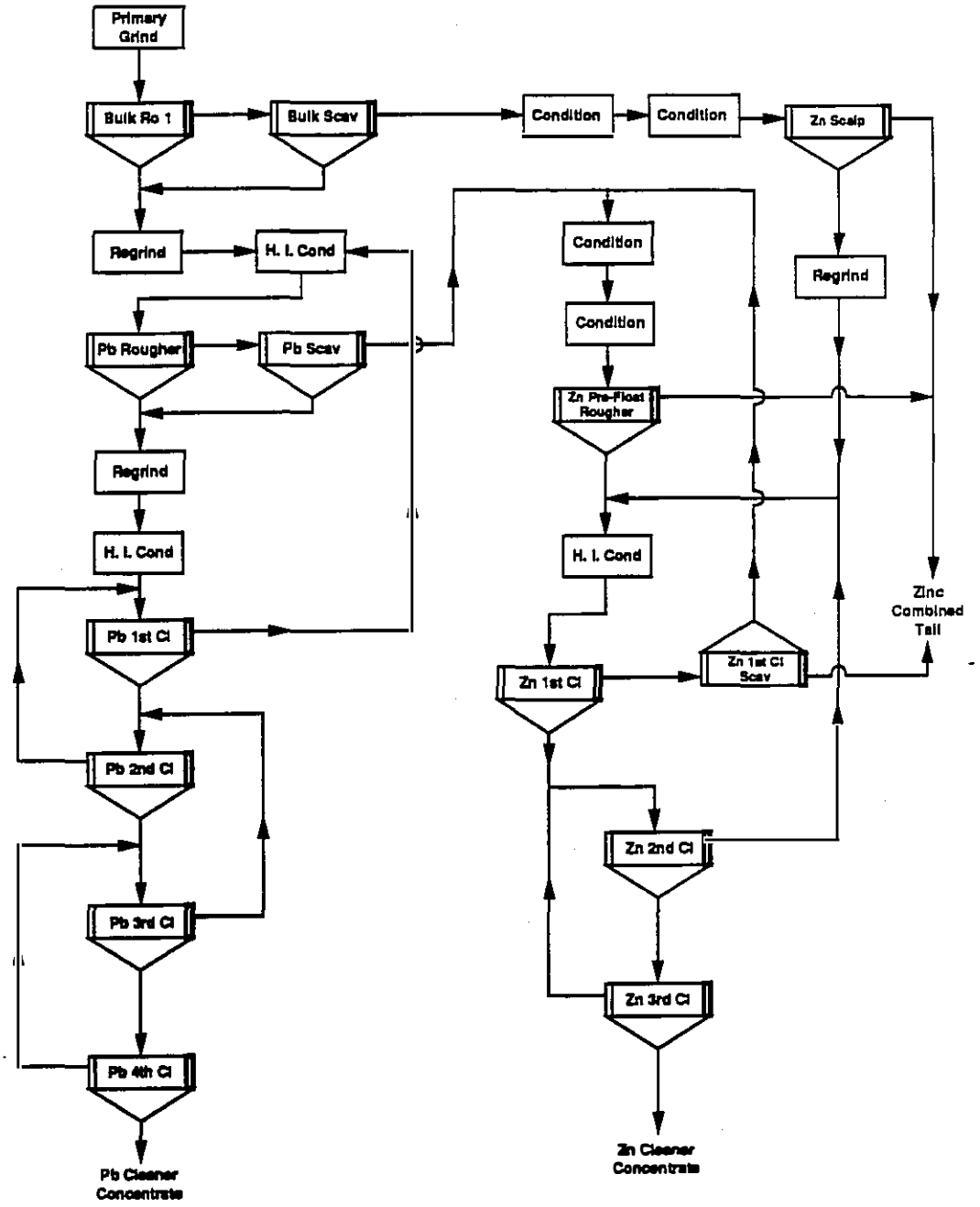


FIGURE NO. 6 : Semi-bulk flowsheet

3.3.1. At Different Finenesses of Primary Grinding using semi-bulk flotation conditions, the flotation behaviour of lead and zinc in the semi-bulk concentrate (Figure 7) was similar to that obtained using the sequential flotation method (Figure 3).

Summary - Continued

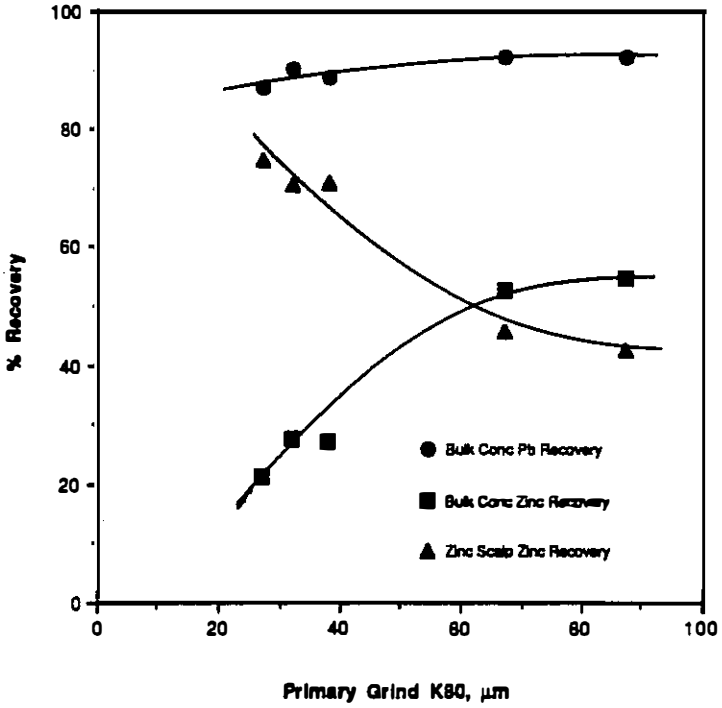


FIGURE NO. 7 : Effect of primary grind fineness on lead and zinc recoveries in the semi-bulk and zinc scalp flotation stages

3.3.2. Additions of Soda Ash to the primary grind (Figure 8) had a significant effect on lead recovery and selectivity.

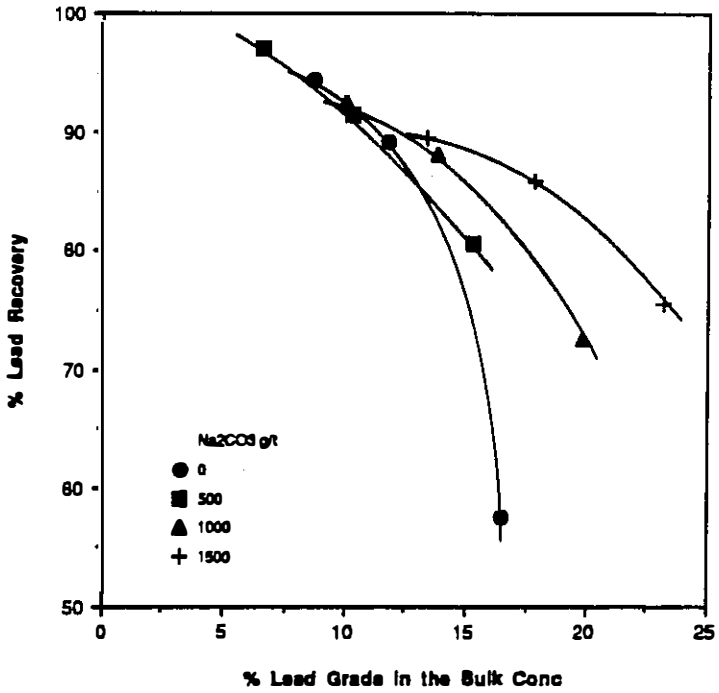


FIGURE NO. 8 : Effect of pH modifier level on semi-bulk flotation

Summary - Continued

With small quantities of soda ash addition (i.e. 500g/t = pH 8.2), the highest lead recovery was achieved (I.e. 96% Pb) but at a very low concentrate grade of 7%. At higher additions of soda ash (I.e. 1000 and 1500), the lead recovery was slightly reduced but the concentrate grade improved significantly.

3.3.3. Type of frother, using a xanthate collector influenced Pb rougher lead selectivity and recovery (Table 9). Frother MIBC was most selective but produced a dry froth which was difficult to remove. A mixture of frother C-7/MIBC (1:1) produced a better froth but was less selective.

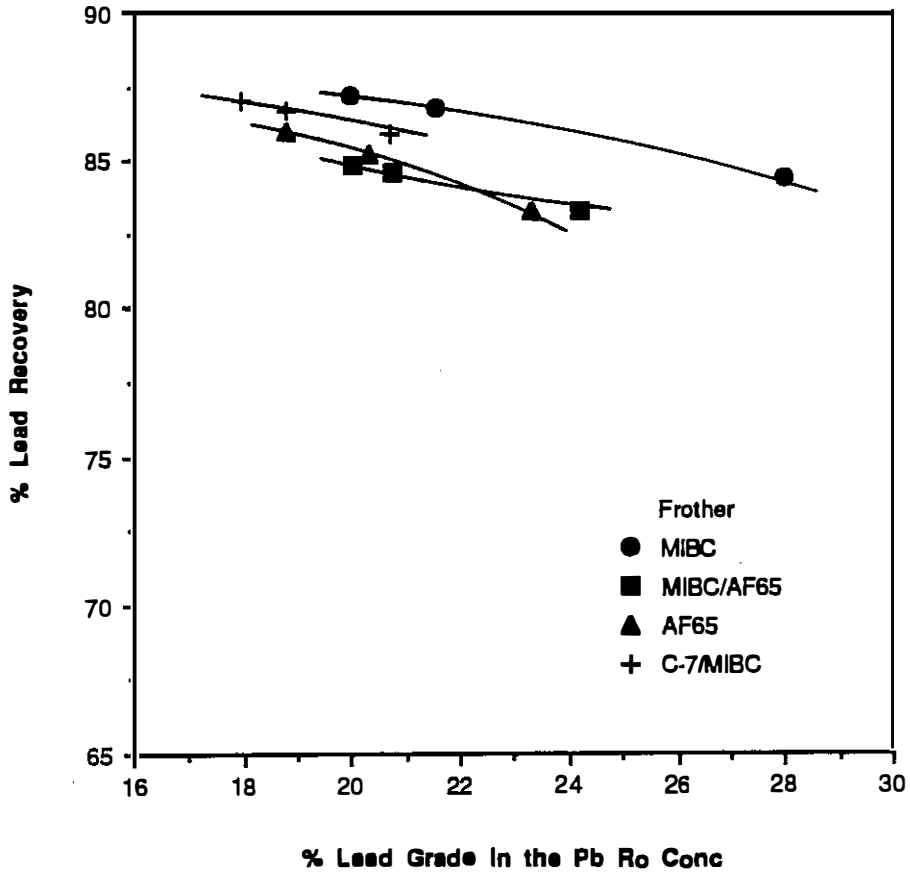


FIGURE NO. 9 : Effect of frother type

3.3.4. Effect of Semi-Bulk Concentrate Regrind on lead rougher flotation was extensively tested. Figure 10 shows the relationship between fineness of lead concentrate regrinding and the lead rougher concentrate grade and recovery. With Increased fineness of regrind, lead rougher recovery changed only marginally, while lead concentrate grade Improved significantly.

Summary - Continued

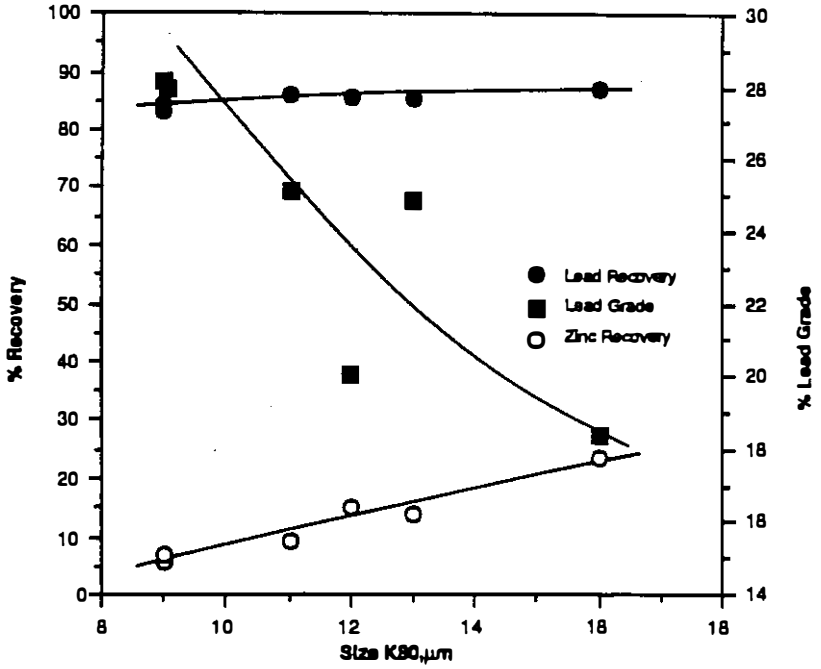


FIGURE NO. 10 : Effect of semi-bulk concentrate regrinding

However, with a single regrinding stage it was not possible to obtain a high grade lead concentrate (Figure 11). Addition of a second regrinding stage for grinding of the lead rougher concentrate increased lead concentrate grade from 55% Pb (single regrind stage) to 70% Pb (two regrind stages). At the same time, the lead cleaner recovery increased significantly.

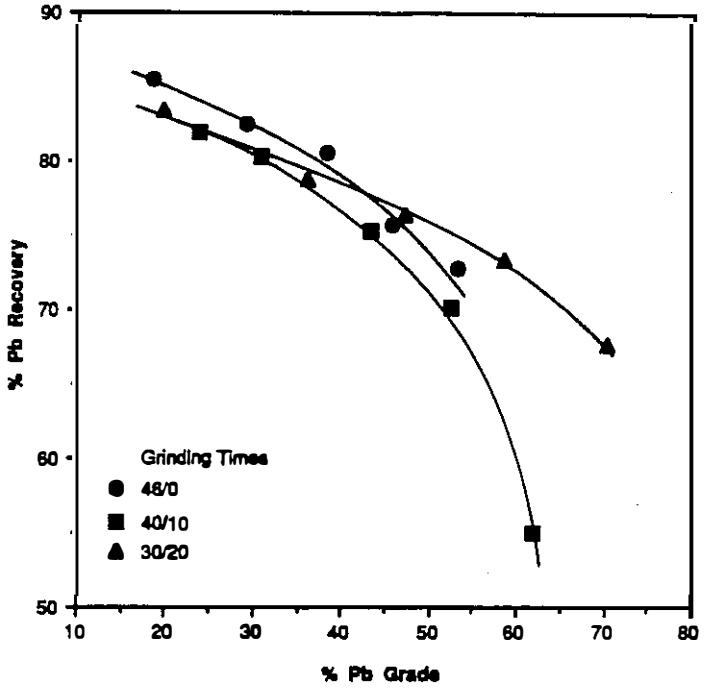


FIGURE NO. 11 : Effect of single and two-stage grinding on lead flotation

Summary - Continued

3.3.5. High Intensity Conditioning was also an important parameter in achieving high concentrate grade and recovery. Figure 12 shows the effect of high intensity conditioning on lead grade and recovery. The best results were obtained at 20 minutes conditioning time. With the use of high intensity conditioning, both concentrate grade and cleaning efficiency improved significantly. A similar effect of high intensity conditioning was observed in the zinc cleaning.

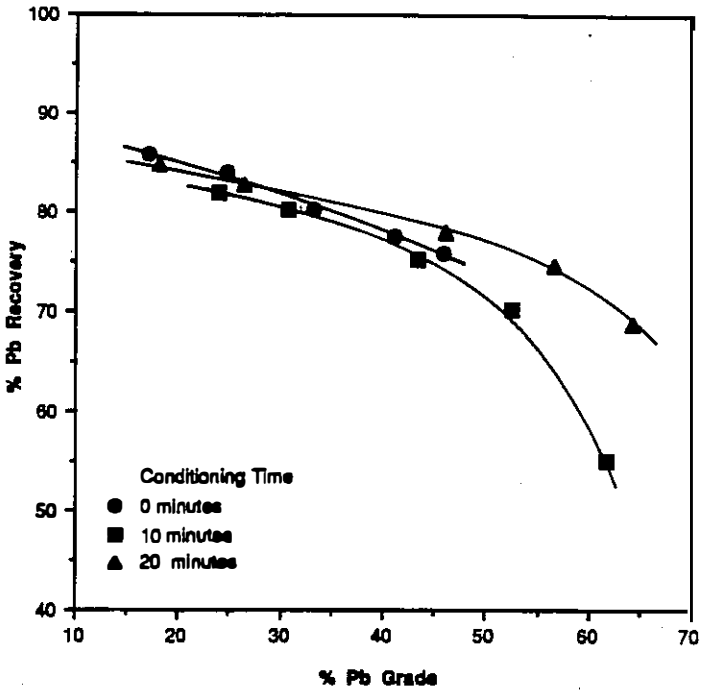


FIGURE NO. 12 : Effect of high intensity conditioning on lead cleaner flotation

3.3.6. Type of Secondary Collector was examined in both lead cleaning and semi-bulk flotation. The effect of several dithlophosphate type of collectors, modified with thiourea, is illustrated in Figure 13. Collector CA830 appeared to provide the highest lead rougher recovery at reasonably good concentrate grade.

Effect of mixing secondary collector with thiourea was examined using collector Aerophine 3418A (Cyanamid brand). it appeared that mixing the collector with thiourea improved cleaning efficiency significantly (Figure 14). Collector CA830 was selected as a secondary collector because it produces a more stable froth than other collectors tested.

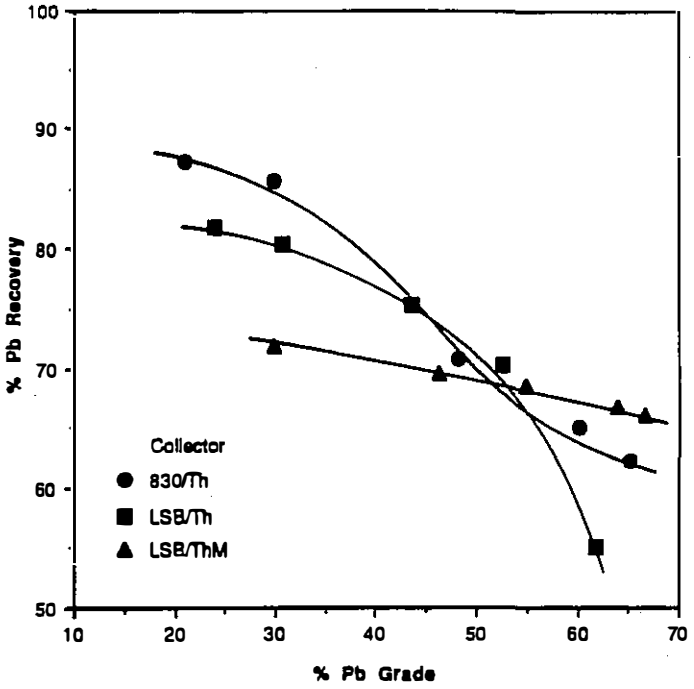


FIGURE NO. 13 : Effect of secondary collector type on lead cleaner flotation

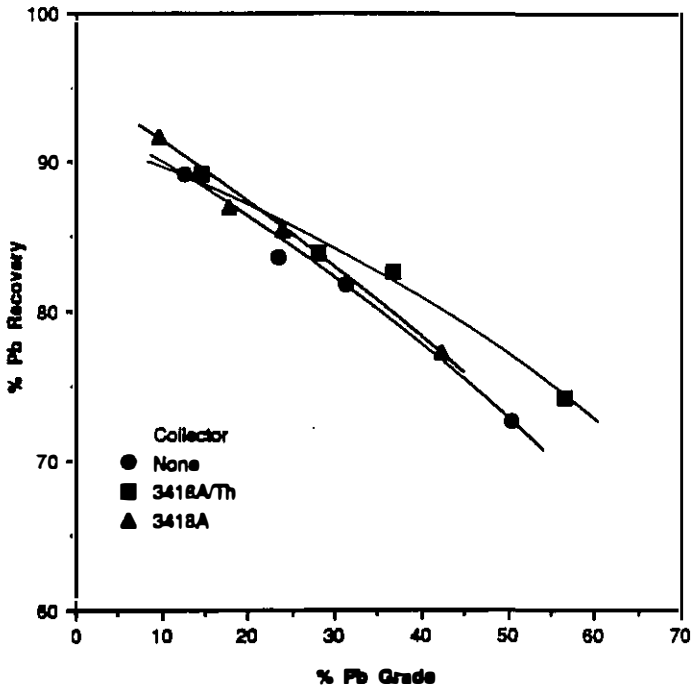


FIGURE NO. 14 : Effect of secondary collector type on lead flotation in semi-bulk and Pb rougher flotation

3.4. Zinc Flotation and Upgrading

In zinc flotation, a conventional lime-$CuSO_4$ reagent system with xanthate as primary collector and Minerec M2030 (thionocarbamate) as secondary collector was used. However, zinc flotation from the semi-bulk rougher tailing and the lead rougher tailing were performed in separate scalp and prefloat circuits. This was because the flotation behaviour of zinc from the semi-bulk tailing and the lead rougher tailing were different, and hence slightly different flotation conditions were used. Fine zinc flotation from the lead rougher tailing required less $CuSO_4$ and floated better at lower pH, since zinc flotation from the semi-bulk tailing (coarser fraction) required higher pH and more $CuSO_4$.

Summary - Continued

4. Comparison of Batch Flotation Results Obtained with Sequential and Semi-Bulk Flotation Methods

Table No. 6 compares the results obtained using sequential and semi-bulk flowsheets, using the composite sample and massive sulphide ore.

Using the sequential flowsheet, the lead concentrate grade was low (i.e. between 44% and 52% Pb). These results resembled the results obtained in the 1978-1981 laboratory testwork. Using the semi-bulk flotation flowsheet, the lead concentrate grade was about 18% higher (62-70% Pb) as compared to the concentrate grade using sequential lead-zinc flowsheet.

TABLE NO. 6 :
Comparison of Semi-Bulk versus Sequential Flowsheets

Test No.	Ore	Flowsheet	Product	Weight %	Assays %		% Distribution	
					Pb	Zn	Pb	Zn
85	Rock Type 5	Semi-bulk	Pb Cleaner Conc	3.80	62.2	1.82	63.9	0.5
			Pb Rougher Conc	20.72	14.2	9.29	79.6	14.2
			Zn Cleaner Conc	18.40	0.95	51.7	4.7	70.3
			Zn 1st Cleaner Conc	24.67	1.08	41.8	7.2	76.3
			Zn Combined Tail	47.78	0.89	2.37	11.5	8.4
			Head (Calc)	100.00	3.70	13.5	100.0	100.0
86	Rock Type 5	Sequential	Pb Cleaner Conc	2.75	44.7	3.53	33.9	0.7
			Pb Rougher Conc	62.87	5.49	13.6	95.0	62.5
			Zn Cleaner Conc	-	-	-	-	-
			Zn 1st Cleaner Conc	8.93	0.61	51.1	1.5	33.5
			Zn Rougher Tail	23.24	0.36	1.10	2.3	1.9
			Head (Calc)	100.00	3.63	13.6	100.0	100.0
80	Composite No. 1	Semi-bulk	Pb Cleaner Conc	3.47	70.3	1.35	67.6	0.4
			Pb Rougher Conc	15.35	19.6	8.85	83.5	12.0
			Zn Cleaner Conc	14.91	0.82	58.8	3.4	77.7
			Zn 1st Cleaner Conc	18.59	1.00	49.6	5.1	81.7
			Zn Combined Tail	51.01	0.52	0.67	7.4	3.0
			Head (Calc)	100.00	3.81	11.1	100.0	100.0
1	Composite No. 1	Sequential	Pb Cleaner Conc	5.27	52.5	4.75	72.6	2.3
			Pb Rougher Conc	17.79	18.7	7.35	87.4	11.8
			Zn Cleaner Conc*	16.22	0.82	42.0	3.5	61.5
			Zn 1st Cleaner Conc	23.73	0.88	39.2	5.5	84.0
			Zn Combined Tail	56.76	0.44	0.53	6.6	2.7
			Head (Calc)	100.00	3.81	11.1	100.0	100.0

*2nd cleaner concentrate

Summary - Continued

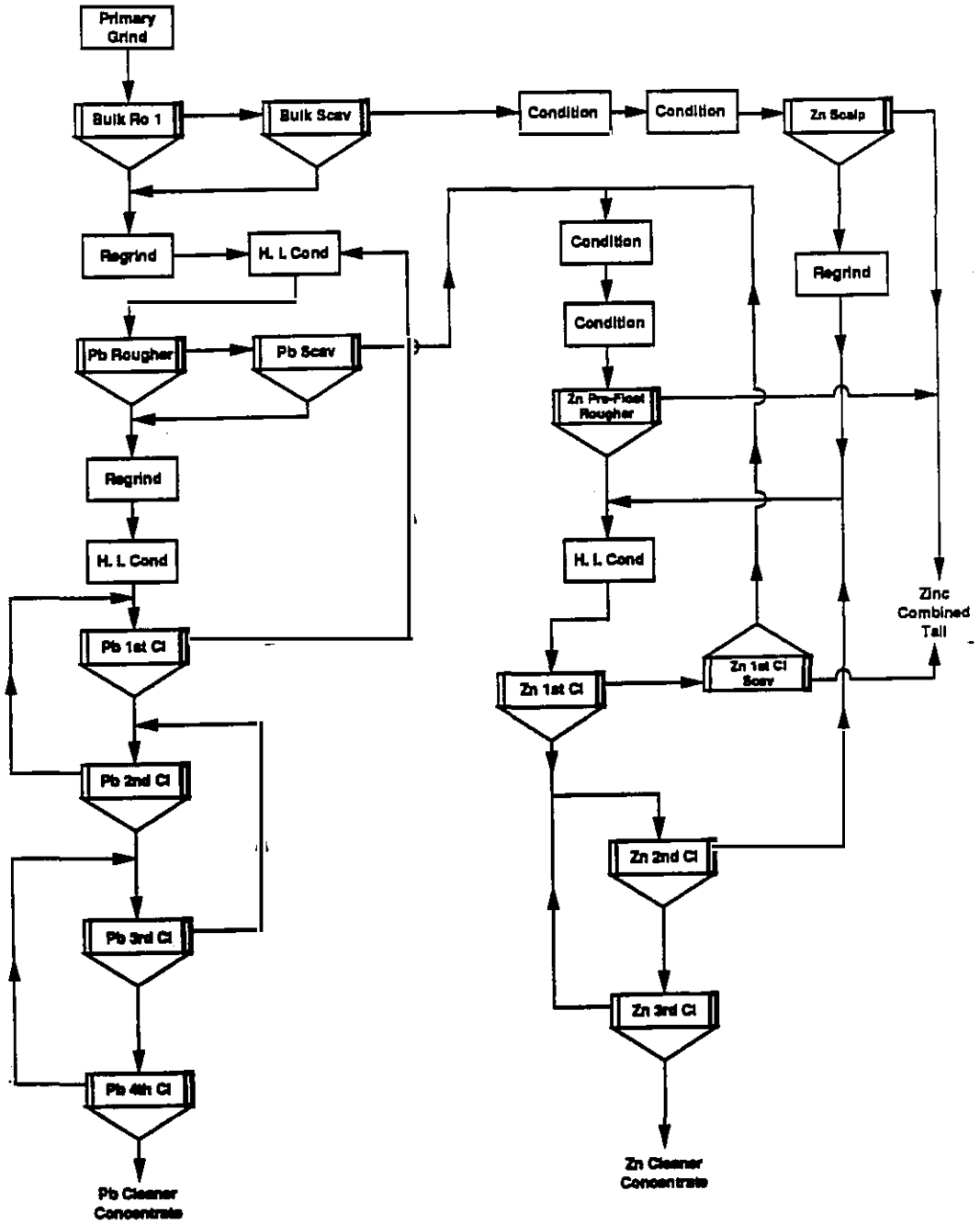


FIGURE NO. 15 : Final flowsheet for treatment of Cirque ore

5. Final Treatment Procedure

5.1. Final Flowsheet

The final flowsheet developed for treatment of the Cirque ore is shown in Figure 15 and consists of the following steps:

Summary - Continued

- Grinding the ore to about 70-80% <200 mesh in the presence of soda ash and collectors, followed by semi-bulk lead flotation with further additions of collector A317 and modified collector CA830.
- The combined semi-bulk concentrate is reground in the presence of PKD-C/NaCN mixture and collectors followed by high intensity conditioning and lead rougher flotation.
- The lead rougher concentrate is reground with the same reagents used in the semi-bulk concentrate regrind, followed by high intensity conditioning in the presence of collectors, and four cleaning stages in closed circuit cleaning.
- The semi-bulk tailing is stage conditioned with additions of lime and $CuSO_4$ followed by zinc flotation and regrinding of zinc concentrate. This circuit is designated as the zinc scalp circuit.
- The lead rougher tailing is treated in the same way as semi-bulk tailing but with lower additions of $CuSO_4$ and lime. This circuit is designated as a zinc prefloat circuit.
- The combined reground zinc scalp concentrate and the zinc prefloat concentrate are conditioned in a high speed conditioner in the presence of collector followed by 3 cleaning stages with an open first cleaner stage. The first cleaner tailing is scavenged and discarded, and the cleaner scavenger concentrate is recirculated to the zinc prefloat first conditioner.

This flowsheet performed much better than the conventional sequential flowsheet and consistent metallurgical results were obtained.

5.2. Reagent Scheme

Table No .7 shows the reagent scheme developed for treatment of Cirque ore.

TABLE NO .7 :
Laboratory Reagent Scheme

Reagent	Additions, g/tonne					
	Semi-bulk	Pb Rougher	Pb Cleaners	Zn Scalp	Zn Prefloat	Zn Cleaners
Modifiers & Depressants						
Na_2CO_3	1500-2500	300	100	-	-	-
$Ca(OH)_2$	-	-	-	600	300	600
$CuSO_4 \times 5\ H_2O$	-	-	-	800	400	-
SD200/NaCN (1:1)	-	300	250	-	-	-
Collectors & Frothers						
A317 (xanthate Cyanamid brand)	70	40	-	-	-	-
CA830/thiourea (80:20)	25	25	-	-	-	-
C7/MIBC (1:1)	20	10	-	-	-	-
A350 (xanthate Cyanamid brand)	-	-	-	60	25	10
M2030	-	-	-	20	10	5
DF250	-	-	-	5	10	5

Summary - Continued

A fairly large number of reagents were tested in this laboratory testwork, to increase Interminerai selectivity and recoveries. Special emphasis was placed on the development of a lead reagent scheme which would produce high grade lead concentrate at satisfactory recovery. Modified collector CA830 appeared to improve selectivity between lead and zinc pyrite.

In general, zinc flotation did not represent a significant problem and extensive reagent evaluation was not required.

5.3. Metallurgical Results

5.3.1. Batch Tests on Various Ore Types

After development of the procedure for treatment of Cirque ore, comparative laboratory batch tests on various ore types and mixtures of ore types and hanging wall material were performed. Note that most of the hanging wall material was represented by carbonaceous shale.

The results for these tests are summarized in Table No. 8.

TABLE NO. 8 :
Results of Flotation of Different Ore Samples

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
80	Composite No. 1	Pb Cleaner Conc	3.47	70.3	1.35	67.6	0.4
		Pb Rougher Conc	15.35	19.6	8.85	83.5	12.0
		Zn Cleaner Conc	14.91	0.82	58.8	3.4	77.7
		Zn 1st Cl Conc	18.59	1.00	49.6	5.1	81.7
		Zn Combined Tail	51.01	0.52	0.67	7.4	3.0
		Head (Calc)	100.00	3.61	11.3	100.0	100.0
85	Rock Type 5 100%	Pb Cleaner Conc	3.80	62.2	1.82	63.9	0.5
		Pb Rougher Conc	20.72	14.2	9.29	79.6	14.2
		Zn Cleaner Conc	18.40	0.95	51.7	4.7	70.3
		Zn 1st Cl Conc	24.67	1.08	41.8	7.2	76.3
		Zn Combined Tail	47.78	0.89	2.37	11.5	8.4
		Head (Calc)	100.00	3.70	13.5	100.0	100.0
88	Rock Type 5 90% + Hanging Wall 10%	Pb Cleaner Conc	3.48	59.5	1.93	63.1	0.5
		Pb Rougher Conc	18.53	13.6	8.48	77.0	12.9
		Zn Cleaner Conc	17.30	0.87	53.5	4.6	75.8
		Zn 1st Cl Conc	22.52	1.03	42.5	7.1	78.3
		Zn Combined Tail	45.52	0.81	1.82	11.3	6.8
		Head (Calc)	100.00	3.28	12.2	100.0	100.0

Summary - Continued

TABLE NO. 8 : Continued

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
93	Rock Type 5 80% + Hanging Wall 20%	Pb Cleaner Conc	2.19	72.7	1.04	55.9	0.2
		Pb Rougher Conc	10.61	19.4	6.72	72.4	6.5
		Zn Cleaner Conc	17.26	1.08	53.0	6.5	83.7
		Zn 1st Cl Conc	20.94	1.24	44.8	9.1	85.9
		Zn Combined Tail	53.36	0.64	1.05	12.1	5.1
		Head (Calc)	100.00	2.85	10.9	100.0	100.0
91	Rock Type 4 100%	Pb Cleaner Conc	2.68	77.6	1.00	80.2	0.3
		Pb Rougher Conc	8.68	26.4	7.40	88.3	7.6
		Zn Cleaner Conc	12.20	0.58	58.1	2.7	83.5
		Zn 1st Cl Conc	14.11	0.66	51.3	3.6	85.1
		Zn Combined Tail	70.46	0.24	0.74	6.6	6.1
		Head (Calc)	100.00	2.59	8.50	100.0	100.0
89	Rock Type 4 90 % + Hanging Wall 10%	Pb Cleaner Conc	2.53	71.0	1.61	80.1	0.5
		Pb Rougher Conc	10.82	18.4	7.89	88.6	11.1
		Zn Cleaner Conc	11.41	0.61	55.8	3.1	82.9
		Zn 1st Cl Conc	14.39	0.65	45.1	4.2	84.5
		Zn Combined Tail	63.90	0.18	0.38	5.0	3.1
		Head (Calc)	100.00	2.24	7.68	100.0	100.0
92	Rock Type 4 80% + Hanging Wall 20%	Pb Cleaner Conc	1.97	75.9	0.95	74.5	0.3
		Pb Rougher Conc	8.74	19.6	6.95	85.3	8.9
		Zn Cleaner Conc	9.67	0.48	57.0	2.3	81.2
		Zn 1st Cl Conc	11.68	0.63	48.6	3.7	83.5
		Zn Combined Tail	72.01	0.24	0.59	8.5	6.2
		Head (Calc)	100.00	2.01	6.79	100.0	100.0

In all tests, high grade lead and zinc concentrates were obtained with satisfactory recoveries. These results demonstrated that the developed flowsheet and reagent scheme worked well on all ore types tested.

5.3.2. Final Locked Cycle Tests

Table No. 9 shows the results of the continuous laboratory locked cycle tests conducted on the composite sample and massive sulphide ore.

In general, the results obtained in the continuous locked cycle tests were satisfactory.

Summary - Continued

TABLE NO. 9 :
Metallurgical Results Obtained in the Laboratory Continuous Tests

Test No.	Ore Type	Product	Weight %	Assays %, g/t			% Distribution		
				Pb	Zn	Ag	Pb	Zn	Ag
81	Laboratory Composite	Pb Concentrate	5.5	57.8	2.55	152	79.5	1.3	14.6
		Zn Concentrate	17.5	0.74	57.4	139	3.2	92.4	41.9
		Zn CombTail	76.9	0.91	0.89	32.7	17.3	6.3	43.5
		Feed	100.0	4.03	10.9	57.9	100.0	100.0	100.0
84	Laboratory Composite	Pb Concentrate	3.9	67.1	2.04	-	70.7	0.7	-
		Zn Concentrate	18.2	1.55	54.9	-	7.6	90.6	-
		Zn CombTail	77.8	1.04	1.23	-	21.7	8.7	-
		Feed	100.0	3.73	11.1	-	100.0	100.0	-
96	Ore Type 5 Massive Sulphides	Pb Concentrate	4.8	55.3	2.28	-	72.4	0.8	-
		Zn Concentrate	22.7	1.38	54.1	-	8.5	90.3	-
		Zn CombTail	72.5	0.97	1.68	-	19.1	8.9	-
		Feed	100.0	3.68	13.6	-	100.0	100.0	-

6. Smelter Impurity Analyses

The concentrates from locked cycle Test 81 were submitted for smelter impurities and the results are shown in Table No. 10.

TABLE NO. 10 :
Concentrate Impurity Analyses (locked cycle Test 81 concentrates)

Element	Assays %, g/t	
	Pb Conc	Zn Conc
Pb	55.0	0.66
Zn	2.78	56.9
Cu	0.005	0.092
Fe	15.6	5.11
Ni	<0.002	<0.002
Bi	<0.002	<0.002
Cd	0.020	0.35
Co	<0.002	<0.002
Cr	<0.002	<0.002
As	<0.001	<0.001
Sb	0.008	<0.002
Sn	<0.001	<0.001
Au g/t	0.05	<0.02
Ag g/t	151	137
F	0.02	<0.01
Cl	0.0062	0.011
S	25.8	33.7
$C_{(T)}$	0.32	0.34
SiO_2	0.23	0.69
MgO	<0.002	0.010
CaO	0.05	0.20
Na_2O	0.002	0.004
K_2O	0.005	0.14
Hg	0.00091	0.0119
Insol	0.33	1.20

Summary - Continued

7. Conclusions

- The Cirque ore belongs to a group of refractory sulphide ores in which the ore composition varies within the orebody and, hence, the processing characteristics of different ore types are different. The most problematic is Ore Type 5, where difficulties were experienced in production of a high grade lead concentrate. This was largely attributed to an extremely fine dissemination of lead and pyrite as well as to the presence of carbonaceous gangue.
- Using a sequential lead-zinc flowsheet with conventional soda ash-cyanide (lead) and lime-$CuSO_4$ (zinc) systems, production of a high grade lead concentrate was not possible on the massive sulphide ore types.
- The semi-bulk flowsheet was developed to improve lead metallurgical results on massive sulphide and mixed ores. Two stage lead regrinding and high intensity conditioning were the key elements of the developed flowsheet.
- The modified reagent scheme in the lead circuit was beneficial in achieving high lead concentrate grade.
- The developed treatment process was successfully applied to treat all ore types from the Cirque deposit.

DISCUSSION

1. Description of Samples Used in the Testwork

Fifty-six individual samples were received on February 20, 1990 (LR #9033746). Each sample was assayed for Pb, Zn, Fe, Ba, Ag and the specific gravity was determined.

The individual sample numbers and assays are presented in Table No. 11.

TABLE NO. 11 :
Assays of Samples Used to Prepare Composite 1

Sample	Assays %, g/t					Specific Gravity
	Pb	Zn	Fe	Ba	Ag	
15651	5.59	13.1	19.2	17.6	80.7	4.64
15652	7.02	16.9	19.5	13.3	106.5	4.67
15654	6.45	15.8	29.0	0.68	106.1	4.67
15657	4.28	14.1	18.7	15.7	96.1	4.47
15658	5.35	15.0	31.7	0.28	93.9	4.66
15659	7.03	11.4	30.8	4.36	73.4	4.72
15660	2.91	6.71	12.2	0.65	40.8	3.52
15661	0.088	0.27	3.04	2.85	3.3	3.49
15664	3.47	11.7	11.6	25.7	61.9	4.30
15665	2.81	12.3	12.4	27.7	69.0	4.48
15668	0.11	0.19	2.24	0.34	<2.0	2.90
15669	1.62	10.7	19.3	3.48	53.3	4.00
15670	6.41	15.5	30.4	0.27	89.2	4.64
15671	7.60	15.2	30.4	1.49	112.9	4.76
15672	4.79	11.0	26.0	4.43	76.5	4.56
15673	0.088	0.25	3.44	3.47	6.8	3.89
15674	0.26	2.29	6.74	2.98	18.9	3.89
15675	6.45	17.3	18.4	2.74	109.8	4.08
15676	3.89	19.2	20.0	4.56	59.7	4.24
15677	2.42	16.2	27.2	6.06	49.2	4.59
15678	2.42	8.83	13.4	28.2	34.8	4.49
15681	2.18	6.36	5.85	38.0	82.8	4.36
15682	0.43	6.51	7.64	39.0	48.7	4.48
15683	2.91	10.1	14.2	29.6	57.9	4.59
15684	2.43	8.56	8.22	34.1	46.0	4.46
15687	3.35	11.0	18.3	22.2	52.8	4.58
15688	3.14	13.5	21.1	16.5	71.0	4.64
15689	4.65	14.4	18.0	18.0	87.7	4.59
15690	6.73	12.1	15.3	23.4	84.1	4.69
15691	4.98	14.5	18.3	17.4	109.9	4.65
15692	4.39	15.4	17.7	17.4	90.6	4.57
15695	4.00	8.51	7.76	32.4	48.4	4.44
15696	3.92	6.69	5.77	41.0	40.4	4.54
15697	3.12	9.46	8.57	34.9	55.4	4.53
15698	4.43	11.9	13.8	23.9	82.9	4.55
15853	4.11	16.2	25.2	6.52	66.9	4.55
15854	3.23	14.7	24.2	11.2	68.9	4.60
15855	3.72	10.4	15.5	23.6	54.6	4.51
15856	2.69	12.1	16.2	16.3	46.0	4.17
15653	0.073	0.68	2.75	0.56	73.4	3.00
15655	4.39	12.4	14.9	23.7	73.6	4.54
15656	5.35	14.9	18.7	13.7	85.9	4.56
15662	4.50	14.4	17.7	2.32	84.0	4.27
15663	5.60	16.0	18.8	7.61	103.2	4.24
15666	5.92	12.9	17.0	16.5	2.3	4.49
15667	6.54	12.0	17.2	12.9	62.7	4.36

Discussion - Continued

TABLE NO. 11 : Continued

Sample	Assays %, g/t					Specific
	Pb	Zn	Fe	Ba	Ag	Gravity
15679	1.76	7.29	8.72	38.5	34.6	4.56
15680	3.22	6.53	11.2	32.6	38.1	4.52
15685	4.46	8.48	8.82	26.7	41.9	4.32
15686	2.85	8.49	12.4	7.34	67.7	4.53
15693	3.88	17.9	24.4	34.4	59.9	4.60
15694	3.23	6.49	5.42	41.8	34.9	4.53
15699	6.97	13.5	15.7	20.5	98.3	4.69
15700	5.98	12.0	15.4	23.2	76.0	4.67
15851	6.70	12.6	19.5	17.8	82.5	4.69
15852	4.30	10.2	13.1	28.9	56.2	4.63

Composite 1 Preparation

Each individual sample was mixed, riffled, and one half was split for the composite. The ore was stage crushed to minus 10 mesh, and riffled into 2 kg charges.

Preparation of Other Ore Composites

Approximately 1975 kg of drill core samples were received on December 12, 1990 (LR #9035769). Each sample was mixed, a representative portion split by riffling (i.e. 750-1200 g/m of core). Each blended composite was mixed, stage crushed to minus 10 mesh, and a representative portion riffled into 2 kg charges. Note that a number of samples intended for each composite were missing, but the missing samples represented a very small percentage of the total weight. Individual sample numbers are not listed in this report. Sample numbers and actual weights used in composite preparation were recorded by Curragh.

In addition, 230 kg of hanging wall material (i.e. shale) was received on December 20, 1990 (LR #9035839). The shale was crushed to -10 mesh and composited with some of Rock Type 4 ore and Rock Type 5 ore.

The following composites were prepared:

Rock Type 1	approx 75 kg	800 g/m of core
Rock Type 4	approx 240 kg	750 g/m of core
Rock Type 4 - shale	90:10	
Rock Type 4 - shale	80:20	
Rock Type 5	approx 250 kg	800 g/m of core
Rock Type 5 - shale	90:10	
Rock Type 5 - shale	80:20	

Discussion - Continued

2. Head Assays

Assay results for each composite are shown in Table No. 12.

TABLE NO. 12 :
Composite Assays

Element	Assays %, g/t				Hanging Wall
	Composite No. 1	Ore Type 5	Ore Type 4	Ore Type 1	
Lead (Pb), Total	4.25	3.65	2.68	2.64	0.045
Zinc (Zn), Total	11.50	13.70	8.49	6.24	0.13
Lead (Pb), Oxide	-	0.85	0.51	0.42	-
Zinc (Zn), Oxide	-	0.20	0.065	0.044	-
Iron (Fe), Total	16.50	22.20	16.5	3.52	-
Sulphur (S), Total	27.60	36.5	24.0	17.40	-
Barite (Ba)	18.80	10.3	29.8	39.50	-
Carbon (C), Total	-	0.20	0.21	0.17	5.06
Carbon (C), graphitic	-	-	-	-	-
Gold (Au)	<0.02	<0.02	0.07	<0.02	-
Silver (Ag)	65.30	93.3	56.90	37.1	-

3. Ore Mineralogy

A sample of Composite 1 was examined by optical microscopy in order to confirm whether the ore was similar in nature to ore samples used in previous testwork prior to 1990.

The results of the examination are discussed below:

Galena:

The results of microscopic examination of 2 polished sections (#s 2871 and 2872) prepared from a head sample of Cirque ore indicate that the general mineralogy is comparable to that described previously[1] by Sachtleben. However, the proportion of coarse grained galena is significantly different. In addition, there are galena/gangue associations, usually quite coarse, which were not described earlier. Since galena grain size and liberation is of current interest, a grain count was made of the galena particles at +50, -50+20, and -20 µm diameter.

Results of the grain count are as follows:

+50 µm diameter	69 % by area
-50+20 µm diameter	17 % by area
-20 µm diameter	14 % by area

About half of the +50 µm galena occur in coarse grains of 100 mesh (~150 µm) and greater. Most of the -20 µm galena occur as 2 to 10 µm wide fracture fillings or interstices in the highly porous pyrite.

Discussion - Continued

Other than sphalerite, galena and pyrite (both massive and colloform), the only other opaque mineral identified in polished section is graphite. Only two small grains of graphite were present and should not affect any metallurgical treatment.

Minute inclusions of pyrite (1-5 µm diameter) are occasionally present in the sphalerite. While they should have no effect on sphalerite flotation, they may account for some of the iron in the zinc concentrate.

(1) Cirque Ore Samples - Microscopic Examination. Internal Report Cyprus Anvil by L.P. Taggart, March 3, 1981.

Sphalerite:

Grain counts were made of sphalerite and estimates were made of particles (at least 90 %) liberated at 75 µm, 50 µm and 20 µm diameter.

Results of the grain count are as follows:

+75 µm diameter (~200mesh)	43 % by area
-75+50 µm diameter	23 % by area
-50+20 µm diameter	25 % by area
-20 µm diameter	9 % by area

No bismuth mineral was observed in the sections. However, in addition to the very fine (1-5 µm) pyrite inclusions noted previously there are "rods" of a grey anisotropic mineral in sphalerite. They are oriented along crystallographic directions in the sphalerite, are generally less than 1 µm diameter and are up to 25 µm long. They are tentatively identified as stannite, $Cu_2Fe\ Sn\ S_4$.

In summary, the ore was essentially similar to ore used in previous testwork descriptions.

4. Grindability

The grindability of Composite 1 was determined at three different mesh sizes. The results are summarized in Table No. 13.

TABLE NO.1 3 :
Work Index Determinations

Screen Size mesh	Screen Size µm	Gbp*	K80 µm Feed	K80 µm Product	Work Index Non metric	Work Index Metric
100	147	2.97	1061	113	9.13	10.07
150	104	2.41	1061	78	9.04	9.97
200	74	2.01	1061	65	9.94	10.96

*Net grams of undersize produced per revolution.

Discussion - Continued

The work index values were between 10 and 11 (metric).

A grinding curve was prepared by grinding 2 kg charges of the ore in the laboratory bail mill from 10 to 70 minutes. The grind curve is shown in Figure No. 16, and the data are summarized in Table No. 14.

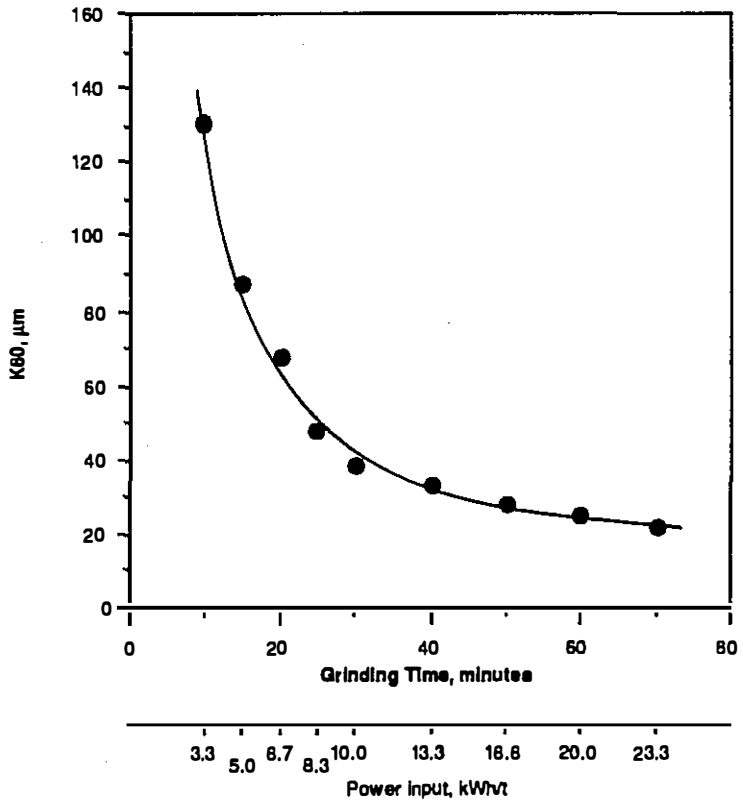


FIGURE NO. 16 : 80% passing size versus grinding time

TABLE NO. 14 :
Primary Grinding Data

Time min	Power kWh/t	K_{80} µm	Cumulative % Passing 200 mesh	400 mesh	18 µm
10	3.3	130	61.4	43.1	27.4
15	5.0	87	74.8	52.1	34.1
20	6.7	67	82.9	58.7	39.2
25	8.3	47	91.7	68.6	47.7
30	10.0	38	95.5	78.4	51.3
40	13.3	32	97.9	85.2	56.2
50	16.6	27	98.7	91.8	62.1
60	20.0	24	99.5	93.1	67.1
70	23.3	21	100.0	94.7	72.7

Discussion - Continued

A grinding time of 15 minutes, used in most semi-bulk tests produced a K_{80} of 87 µm. The % -200 mesh value was 74.8 %. Power consumption was roughly 5.0 kWh/tonne, and calculated Bond Work Index was 6.5 kWh/tonne.

5. Flotation of Composite 1 Ore with a Conventional Flowsheet

Eighteen flotation tests were conducted with Composite 1 ore using the conventional sequential flowsheet shown in Figure No. 17.

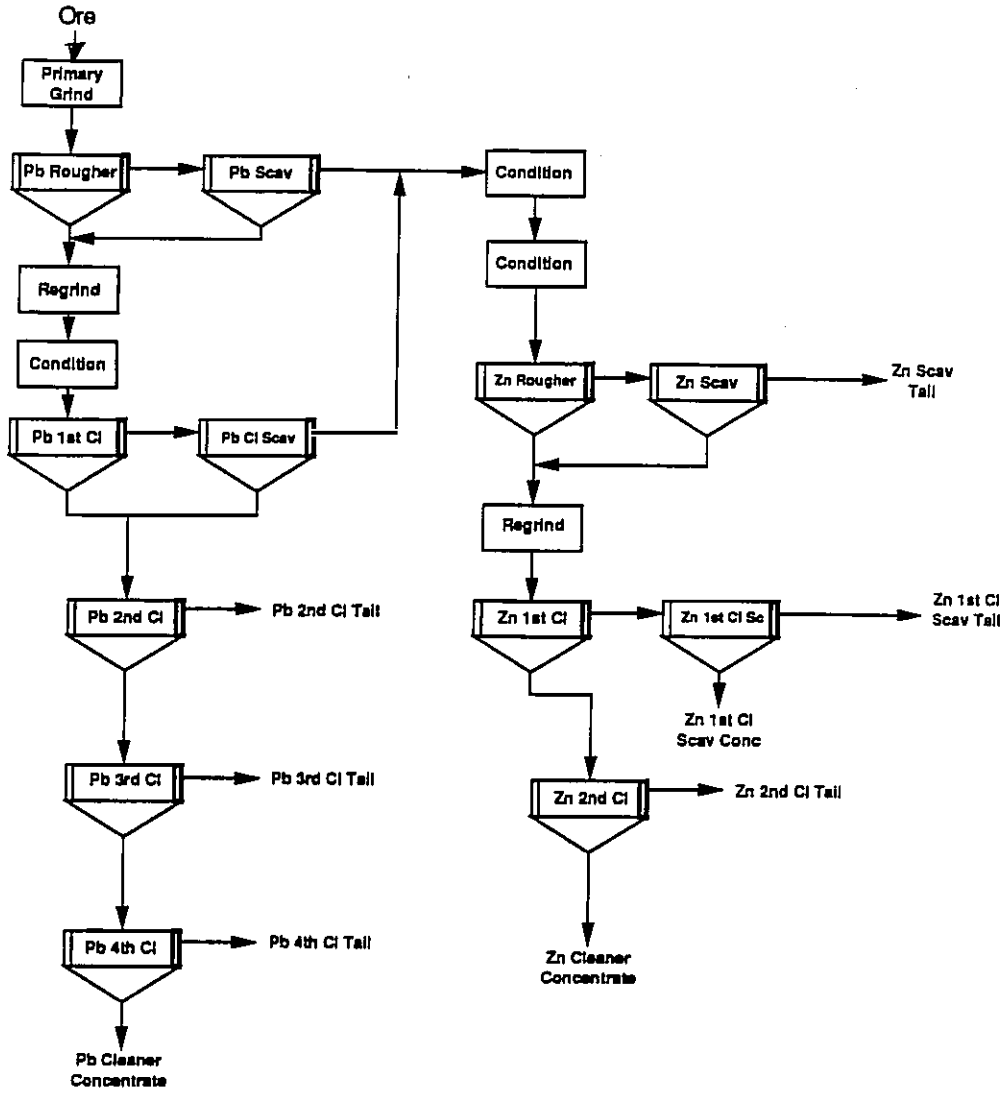


FIGURE NO. 17 : Conventional flowsheet

Discussion - Continued

5.1. Comparison with Previous Test Program Results

In general, the testwork with this flowsheet indicated the following:

- The results of previous testwork by Lakefield Research (1981), Kamloops Research and Assay Laboratories Ltd. and Sachtleben Bergbau GmbH Laboratories (1978-1981) were essentially confirmed. A high grade lead concentrate with suitable recovery could not be obtained from massive sulphide ore due to fine dissemination of galena and pyrite and due to contamination of the concentrate with carbonaceous material.

These data are summarized in Table No. 15, which show typical results of the previous and present testwork. In two tests (Tests 41 and 42) of the present testwork, relatively high Pb grades of 56-59% were achieved with high intensity conditioning of the Pb rougher concentrate. In all other tests, however, Pb grade did not exceed 51% Pb.

TABLE NO. 15 :
Comparison of Present and Past Testwork Results

Test No.	Conditions	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
2	LR Proj 2491(1981) Conventional flow-sheet, massive sulphide	Pb Cleaner Conc	4.32	45.2	3.86	66.8	1.5
		Zn Cleaner Conc	15.97	0.63	58.5	3.4	83.6
		Pyrite Cl Conc	40.96	1.72	3.81	24.1	14.0
		Pyrite Flot Tail	38.75	0.43	0.28	5.7	0.9
		Head (Calc)	100.00	2.92	11.2	100.0	100.0
1	LR Proj 3889 (1990) (PKD-C substituted for NaCN) with A317 /3418A collector	Pb Cleaner Conc	5.27	52.5	4.75	72.6	2.3
		Zn Cleaner Conc*	16.22	0.82	42.0	3.5	61.5
		Zn Combined Tail	56.76	0.44	0.53	6.6	2.7
		Head (Calc)	100.00	3.81	11.1	100.0	100.0
42	Similar to Test 1 but with High Intensity conditioning and R242 collector	Pb Cleaner Conc	4.97	59.3	3.21	72.3	1.3
		Pb Rougher Conc	44.55	8.53	17.95	93.3	67.0
		Pb Scav Tail	55.45	0.49	7.09	6.7	33.0
		Head (Calc)	100.00	4.07	11.9	100.0	100.0

*2 zinc cleaners only.

A number of parameters were investigated in an effort to optimize lead flotation with this flowsheet. These parameters are as follows:

- primary grind fineness
- depressant types
- regrind fineness
- high intensity conditioning of the Pb rougher concentrate
- collector type.

Discussion - Continued

5.2. Effect of Primary Grind Fineness

The effect of grind fineness on Pb rougher flotation was investigated in Tests 15-20. A carbonate-cyanide-R242-A317 reagent scheme was used. The grind was varied between 20 and 70 minutes. The conditions and results are summarized in Table No. 16 and Figure No. 18.

TABLE NO. 16 :
Effect of Primary Grind Fineness

A. Conditions:

Test No.	Primary Grind		Reagent Additions, g/t		
	minutes	K_{80}, µm	Primary Grind	Pb Rougher	Pb Scav
15	20	67	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 22.5	317 = 20
16	30	38	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 17.5	317 = 20
17	40	32	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 20	317 = 20
18	50	27	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 25	317 = 20
19	60	24	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 25	317 = 20
20	70	21	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 25	317 = 20

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
15	Pb Rougher Conc 1	17.69	19.80	16.30	83.5	23.5
	Pb Rougher Conc 1 to 3	44.12	8.76	20.44	92.2	73.4
	Pb Rougher + Scav Concs	50.54	7.81	19.72	94.1	81.1
	Pb Scavenger Tail	49.46	0.50	4.70	5.9	18.9
	Head (Calc)	100.00	4.20	12.29	100.0	100.0
16	Pb Rougher Conc 1	12.98	26.90	9.30	80.2	10.0
	Pb Rougher Conc 1 to 3	30.80	12.79	19.17	90.5	49.0
	Pb Rougher + Scav Concs	36.99	10.85	19.71	92.2	60.5
	Pb Scavenger Tail	63.01	0.54	7.45	7.8	39.5
	Head (Calc)	100.00	4.36	12.06	100.0	100.0

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
17	Pb Rougher Conc 1	13.13	27.10	8.24	83.9	9.1
	Pb Rougher Conc 1 to 3	30.66	12.67	19.76	91.6	50.8
	Pb Rougher + Scav Concs	40.09	9.93	20.24	93.8	68.1
	Pb Scavenger Tail	59.91	0.44	6.35	6.2	31.9
	Head (Calc)	100.00	4.24	11.92	100.0	100.0
18	Pb Rougher Conc 1	9.35	36.30	5.22	78.9	4.1
	Pb Rougher Conc 1 to 3	22.25	17.38	14.35	89.8	27.0
	Pb Rougher + Scav Concs	28.72	13.74	16.50	91.7	40.1
	Pb Scavenger Tail	71.28	0.50	9.92	8.3	59.9
	Head (Calc)	100.00	4.30	11.81	100.0	100.0
19	Pb Rougher Conc 1	8.05	40.2	8.24	75.2	6.5
	Pb Rougher Conc 1 to 3	21.72	17.80	21.17	89.9	45.1
	Pb Rougher + Scav Concs	25.81	15.29	21.27	91.7	53.8
	Pb Scavenger Tail	74.19	0.48	6.35	8.2	46.2
	Head (Calc)	100.00	4.30	10.20	100.0	100.0
20	Pb Rougher Conc 1	6.79	42.30	4.20	67.4	2.3
	Pb Rougher Conc 1 to 3	19.52	19.44	9.05	89.1	14.5
	Pb Rougher + Scav Concs	24.36	15.93	10.85	91.1	21.7
	Pb Scavenger Tail	75.64	0.50	12.60	8.9	78.3
	Head (Calc)	100.00	4.26	12.17	100.0	100.0

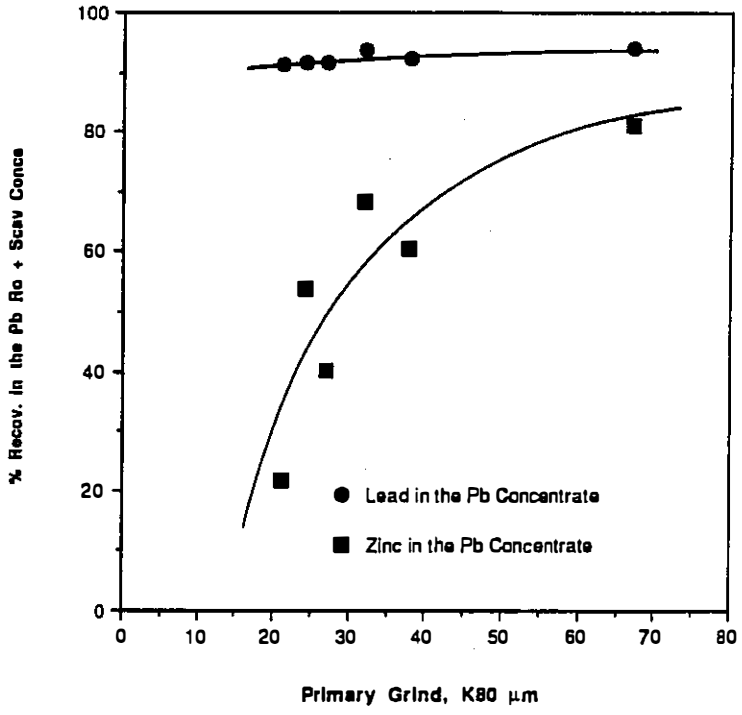


FIGURE NO. 18 : Effect of primary grind fineness

Discussion - Continued

The results indicated the following:

- finer primary grinding resulted in improved Pb rougher concentrate lead grade due to improved selectivity against zinc.
- Pb recovery was 91-94%, and dropped slightly with grinding time in excess of about 30-40 minutes.
- finer grinding resulted in increased size reduction of the black carbonaceous material which readily floated.

Subsequent tests were conducted with a 40 minute (80% -32 µm) grind.

5.3. Effect of pH Modifier and Depressant Types

Various pH modifier-depressant combinations were tested in Tests 17 and 22-24. The depressant included combinations of $Ca(OH)_2/Na_2CO_3$ and NaCN/PKD-C. Test conditions and results are summarized in Table 17 and Figure 19.

TABLE NO. 17 :
Effect of Depressant Types

A. Conditions:

Test No.	Primary Grind		Reagent Additions, g/t		
	minutes	K_{80}, µm	Primary Grind	Pb Rougher	Pb Scav
17	40	32	Na_2CO_3 = 1500 NaCN = 150 242 = 20	317 = 120 MIBC = 20	317 = 20
22	40	32	Na_2CO_3 = 1500 PKD-C = 150 242 = 20	317 = 120 MIBC = 22.5	317 = 20
23	40	32	$Ca(OH)_2$ = 900 NaCN = 150 242 = 20	317 = 120 MIBC = 22.5	317 = 20
24	40	32	$Ca(OH)_2$ = 900 PKD-C = 150 242 = 20	317 = 120 MIBC = 22.5	317 = 20

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
17	Pb Rougher Conc 1	13.13	27.10	8.24	83.9	9.1
	Pb Rougher Conc 1 to 3	30.66	12.67	19.76	91.6	50.8
	Pb Rougher + Scav Concs	40.09	9.93	20.24	93.8	68.1
	Pb Scavenger Tail	59.91	0.44	6.35	6.2	31.9
	Head (Calc)	100.00	4.24	11.92	100.0	100.0
22	Pb Rougher Conc 1	13.06	26.50	7.10	84.2	8.1
	Pb Rougher Conc 1 to 3	35.47	10.74	16.47	92.6	51.1
	Pb Rougher + Scav Concs	41.95	9.22	16.55	94.1	60.8
	Pb Scavenger Tail	58.05	0.42	7.72	5.9	39.2
	Head (Calc)	100.00	4.11	11.42	100.0	100.0
23	Pb Rougher Conc 1	11.29	25.00	16.30	72.9	16.1
	Pb Rougher Conc 1 to 3	37.07	9.40	23.60	90.0	76.8
	Pb Rougher + Scav Concs	50.71	7.25	20.43	94.9	90.9
	Pb Scavenger Tail	49.29	0.40	2.11	5.1	9.1
	Head (Calc)	100.00	3.87	11.40	100.0	100.0
24	Pb Rougher Conc 1	12.52	21.40	20.60	72.2	22.4
	Pb Rougher Conc 1 to 3	37.90	8.78	24.72	89.7	81.5
	Pb Rougher + Scav Concs	48.96	7.15	21.24	94.4	90.5
	Pb Scavenger Tail	51.04	0.41	2.15	5.6	9.5
	Head (Calc)	100.00	3.71	11.50	100.0	100.0

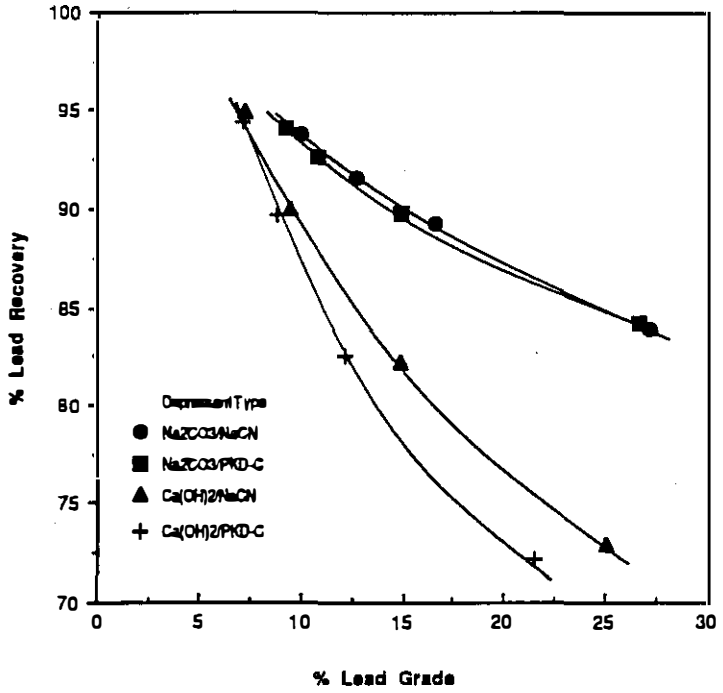


FIGURE NO. 19 : Effect of Pb circuit depressant

Discussion - Continued

Lime was an unsuitable reagent as very poor Pb grades and recoveries were obtained. Selectivity against Zn was decreased with the use of lime. PKD-C and cyanide provided equivalent results.

Subsequent tests were conducted with PKD-C and carbonate.

5.4. Effect of Regrind Fineness

The rougher concentrate was reground in a laboratory ball mill and then cleaned four times. Regrind times in Tests 29-33 were varied from 0-40 minutes. Conditions and results are summarized in Table No. 18 and Figure 20. Figure 20 plots Pb cleaner recoveries and 4th cleaner concentrate grade against 80% passing size.

TABLE NO. 18 :
Effect of Regrinding on Lead Flotation

A. Conditions:**

Test No.	Primary Grind		Reagent Additions, g/t						
	min	K_{80}, µm	Primary Grind	Pb Ro	Pb Scav	Pb Regrind	Pb 1st Cl + Cl Scav	Pb 2nd Cl	Pb 3rd + 4th Cl
30	0	28	Na_2CO_3 =1500 PKD-C=150 242=20	317=90 MIBC=22.5	317=20	Na_2CO_3 =500* PKD-C=50* 242=12*	242=8 317=15 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 242=10 317=5
31	10	19	Na_2CO_3 =1500 PKD-C=150 242=20	317=90 MIBC=22.5	317=20	Na_2CO_3 =500* PKD-C=50* 242=12*	242=8 317=15 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5
32	20	14	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50 242=12	242=8 317=15 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5
33	30	13	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50 242=12	242=8 317=15 MIBC=15	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5
29	40	13	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50 242=12	242=8 317=15 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=50 242=8 317=20

*no regrind; reagents added to conditioning
**with a 40 minute primary grind.

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
30	Pb 4th Cleaner Conc	11.67	25.50	19.60	76.5	20.0
	Pb 1st Cl + Cl Scav Concs	26.75	13.04	19.61	89.6	45.9
	Pb Cl Scav Tail	15.32	0.98	12.0	3.9	16.1
	Pb Ro + Scav Conc	42.07	8.65	16.84	93.5	62.0
	Pb Scavenger Tail	57.93	0.44	7.49	6.5	38.0
	Head (Calc)	100.00	3.89	11.42	100.0	100.0
31	Pb 4th Cleaner Conc	8.95	34.40	12.40	79.1	10.2
	Pb 1st Cl + Cl Scav Concs	24.81	14.36	16.80	91.6	38.2
	Pb Cl Scav Tail	17.18	0.63	17.40	2.8	27.4
	Pb Ro + Scav Conc	41.99	8.74	17.05	94.3	65.7
	Pb Scavenger Tail	58.01	0.38	6.45	5.7	34.3
	Head (Calc)	100.00	3.89	10.90	100.0	100.0
32	Pb 4th Cleaner Conc	6.37	47.20	7.52	73.6	4.2
	Pb 1st Cl + Cl Scav Concs	20.05	17.52	11.65	86.0	20.3
	Pb Cl Scav Tail	20.86	1.53	21.80	7.8	39.5
	Pb Ro + Scav Conc	40.91	9.37	16.83	93.8	59.8
	Pb Scavenger Tail	59.09	0.43	7.84	6.2	40.2
	Head (Calc)	100.00	4.09	11.52	100.0	100.0
33	Pb 4th Cleaner Conc	5.58	52.40	4.46	74.5	2.2
	Pb 1st Cl + Cl Scav Concs	18.67	18.67	10.00	88.8	16.4
	Pb Cl Scav Tail	20.17	0.78	23.70	4.0	42.1
	Pb Ro + Scav Conc	38.83	9.38	17.12	92.8	58.6
	Pb Scavenger Tail	61.17	0.46	7.69	7.3	41.4
	Head (Calc)	100.00	3.92	11.35	100.0	100.0
29	Pb 4th Cleaner Conc	5.84	51.20	5.12	75.9	2.6
	Pb 1st Cl + Cl Scav Concs	21.61	16.47	11.55	90.3	21.9
	Pb Cl Scav Tail	25.07	0.72	22.50	4.6	49.4
	Pb Ro + Scav Conc	46.67	8.01	17.43	94.9	71.4
	Pb Scavenger Tail	53.33	0.37	6.13	5.1	28.6
	Head (Calc)	100.00	3.94	11.40	100.0	100.0

The results indicated the following:

- Flotation of the rougher concentrate without regrinding resulted in a very low grade product, 25% Pb due to poor selectivity against sphalerite and pyrite.
- Finer grinding increased selectivity. Grinding finer than 30 minutes did not result in further selectivity. A grade of greater than 51-52 % was not achieved, in large part due to contamination by carbon.
- Finger regrinding did not result in improved Pb recovery.

Subsequent tests were conducted with a regrind of 30 minutes (80 % - 13 μm).

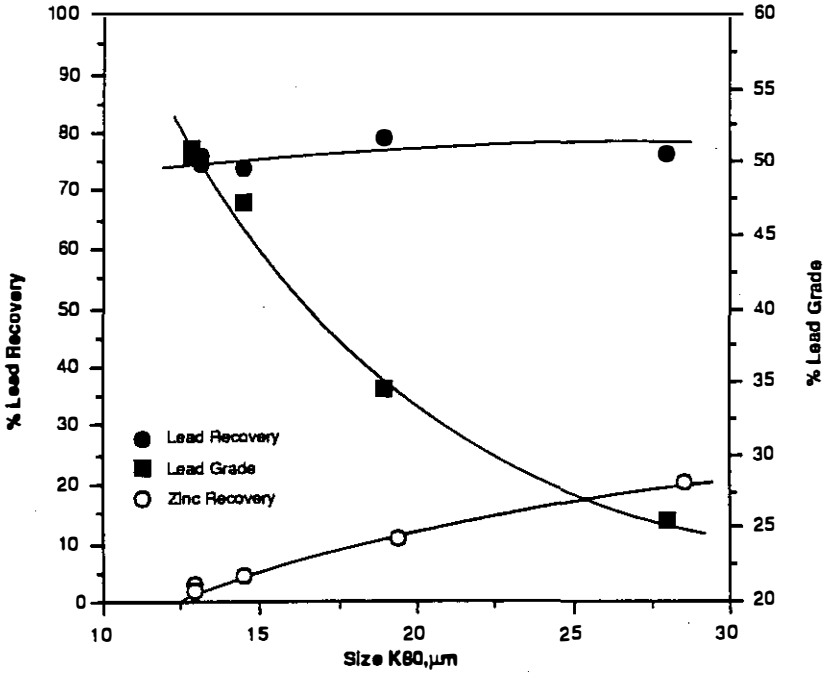


FIGURE NO. 20 : Effect of regrind fineness

5.5. Effect of High Intensity Conditioning

High intensity conditioning of the Pb regrind product was conducted in Tests 33 and 40-42. Conditioning time was varied between 0 and 30 minutes.

Test conditions and results are presented in Table No. 19 and Figure No. 21.

TABLE NO. 19 :
Effect of High Intensity Conditioning on Lead Flotation

A. Conditions:

Test No.	Primary Grind		Reagent Additions, g/t						
	min	kWh/m³	Primary Grind	Pb Ro	Pb Scav	Pb Regrind	H.I. Cond + 1st Cl Scav	Pb 2nd Cl	Pb 3rd + 4th Cl
33	0	0.0	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50 242=12	242=8* 317=15* MIBC=15*	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC =5
40	10	-	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50	242=20 317=15 MIBC=15	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5
41	20	-	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50	242=20 317=10 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5

Discussion - Continued

A. Conditions:

Test No.	Primary Grind		Reagent Additions, g/t						
	min	kWh/m³	Primary Grind	Pb Ro	Pb Scav	Pb Regrind	H.I. Cond + 1st Cl Scav	Pb 2nd Cl	Pb 3rd + 4th Cl
42	30	-	Na_2CO_3 =1500 PKD-C=150 242=20	317=120 MIBC=22.5	317=20	Na_2CO_3 =500 PKD-C=50	242=20 317=10 MIBC=10	PKD-C=30 242=4 317=15 MIBC=5	PKD-C=60 317=15 MIBC=5

*added to the 1st conditioner

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
33	Pb 4th Cleaner Conc	5.58	52.40	4.46	74.5	2.2
	Pb 1st Cl + Cl Scav Concs	18.67	18.67	10.00	88.8	16.4
	Pb Cl Scav Tail	20.17	0.78	23.70	4.0	42.1
	Pb Ro + Scav Conc	38.83	9.38	17.12	92.8	58.6
	Pb Scavenger Tail	61.17	0.46	7.69	7.2	41.4
	Head (Calc)	100.00	3.92	11.35	100.0	100.0
40	Pb 4th Cleaner Conc	6.24	51.60	5.16	78.3	2.7
	Pb 1st Cl + Cl Scav Concs	17.44	21.02	8.49	89.1	12.6
	Pb Cl Scav Tail	25.83	0.82	22.9	5.1	50.3
	Pb Ro + Scav Conc	43.27	8.96	17.09	94.2	62.9
	Pb Scavenger Tail	56.73	0.42	7.70	5.8	37.1
	Head (Calc)	100.00	4.12	11.76	100.0	100.0
41	Pb 4th Cleaner Conc	5.32	56.40	3.28	74.0	1.5
	Pb 1st Cl + Cl Scav Concs	14.77	23.75	6.94	86.5	8.8
	Pb Cl Scav Tail	30.07	1.11	20.5	8.2	52.6
	Pb Ro + Scav Conc	44.84	8.57	16.04	94.7	61.4
	Pb Scavenger Tail	55.16	0.39	8.20	5.3	38.6
	Head (Calc)	100.00	4.06	11.71	100.0	100.0
42	Pb 4th Cleaner Conc	4.97	59.30	3.21	72.3	1.3
	Pb 1st Cl + Cl Scav Concs	15.00	23.04	8.01	84.9	10.1
	Pb Cl Scav Tail	29.54	1.16	23.00	8.4	57.0
	Pb Ro + Scav Conc	44.55	8.53	17.95	93.3	67.0
	Pb Scavenger Tail	55.45	0.49	7.09	6.7	33.0
	Head (Calc)	100.00	4.07	11.93	100.0	100.0

The results indicated the following:

- High intensity conditioning resulted in increased Pb grade in the cleaners at roughly equivalent recoveries. Selectivity against Zn was increased slightly. Selectivity against pyrite was significantly improved.
- The best Pb product grade was 59% with 30 minutes of conditioning. Conditioning for 10 minutes did not result in any improvement in grade.

Discussion - Continued

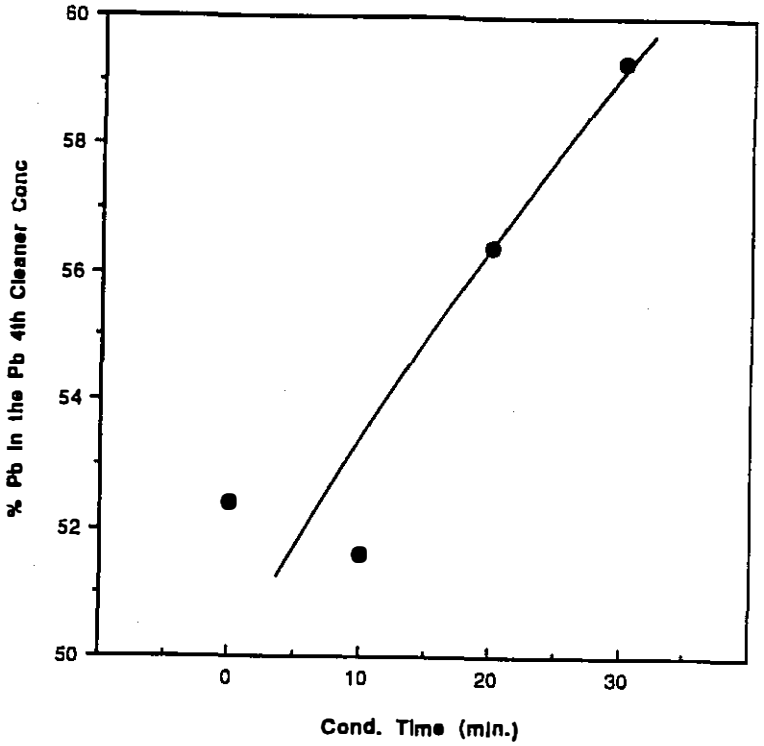


FIGURE NO. 21 : Effect of high intensity conditioning

5.6. Effect of Collector

The collectors levels in the high intensity conditioner were increased in Test 48, with 40 minutes of conditioning. In Test 49, an alternative collector was used. R242 was replaced with LSBM-1 (a modified butyl dithlophosphate), and the LSBM-1 was used as a secondary collector in the cleaning. High intensity conditioning time was also 40 minutes.

Test conditions and results are summarized in Table No. 20.

TABLE NO. 20 :
Effect of Collector (with 40 minutes H.I. Conditioning)

A. Conditions:

Test No.	Secondary Collector	Reagent Additions, g/t						
		Primary Grind	Pb Ro	Pb Scav	Pb Regrind	H.I. Conc + 1st Cl Scav	Pb 2nd Cl	Pb 3rd + 4th Cl
48	242	Na_2CO_3 = 1500 PKD-C=150 242=20	317 = 120 MIBC=22.5	317=20	Na_2CO_3 = 500 PKD-C=50	242=40 317=25 MIBC=15	PKD-C =30 242=4 317=15 MIBC=5	PKD-C =60 317=10 MIBC=7.5
49	LSB-1M	Na_2CO_3 = 1500 PKD-C=150 242=20	317 = 50 LSBM-1 = 50 MIBC=22.5	317=5 LSBM-1 = 5	Na_2CO_3 = 500 PKD-C=50	LSBM-1 = 10 317=45 MIBC=15	PKD-C =30 LSBM-1 = 4 317=15 MIBC=5	PKD-C =60 317=15 MIBC=5

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
48	Pb 4th Cleaner Conc	5.67	52.60	2.98	77.6	1.5
	Pb 1st Cl + Cl Scav Concs	15.85	21.23	6.46	87.5	9.2
	Pb Cl Scav Tail	25.74	0.91	17.3	6.1	39.9
	Pb Ro + Scav Conc	41.59	8.65	13.17	93.6	49.0
	Pb Scavenger Tail	58.41	0.42	9.74	6.4	51.0
	Head (Calc)	100.00	3.84	11.17	100.0	100.0
49	Pb 4th Cleaner Conc	5.40	51.50	4.56	73.2	2.2
	Pb 1st Cl + Cl Scav Concs	18.88	17.38	11.81	86.4	20.1
	Pb Cl Scav Tail	18.48	1.38	20.0	6.7	33.3
	Pb Ro + Scav Conc	37.36	9.47	15.86	93.1	53.3
	Pb Scavenger Tail	62.64	0.42	8.28	6.9	46.7
	Head (Calc)	100.00	3.80	11.11	100.0	100.0

Product grades were not above 52%, which was either an effect of the collector additions and/or of the increased conditioning.

Further testwork was not conducted on this flowsheet as the semi-bulk flowsheet could achieve higher product grades due to rejection of carbonaceous material.

6. Concentrate Assays

Bismuth assays were obtained on several concentrates. Each of the lead concentrates of Tests 40-42, and the zinc concentrate of Test 1 contained <20 ppm bismuth.

7. Flotation of Composite 1 Ore with a Semi-Bulk Flowsheet

Sixty-six flotation tests were conducted on Composite 1 ore with a semi-bulk flowsheet. The flowsheet, illustrated in Figure No. 22, differs from the conventional flowsheet in the following major respects:

- The ore is ground without Zn depressant. The subsequent semi-bulk flotation concentrate therefore floats most of the galena, some of the pyrite, and a fraction of the zinc as middlings.
- Relatively coarse grinding (i.e. 80% -87 µm in most tests, as opposed to 80% -32 µm in the conventional flowsheet testwork) results in rejection of the coarse black carbonaceous material (i.e. carbonaceous pyrite or shale). Size reduction of this material, which renders it readily floatable, results in contamination of the lead concentrate.

In addition, coarser grinding has a secondary advantage of reducing barite sliming.

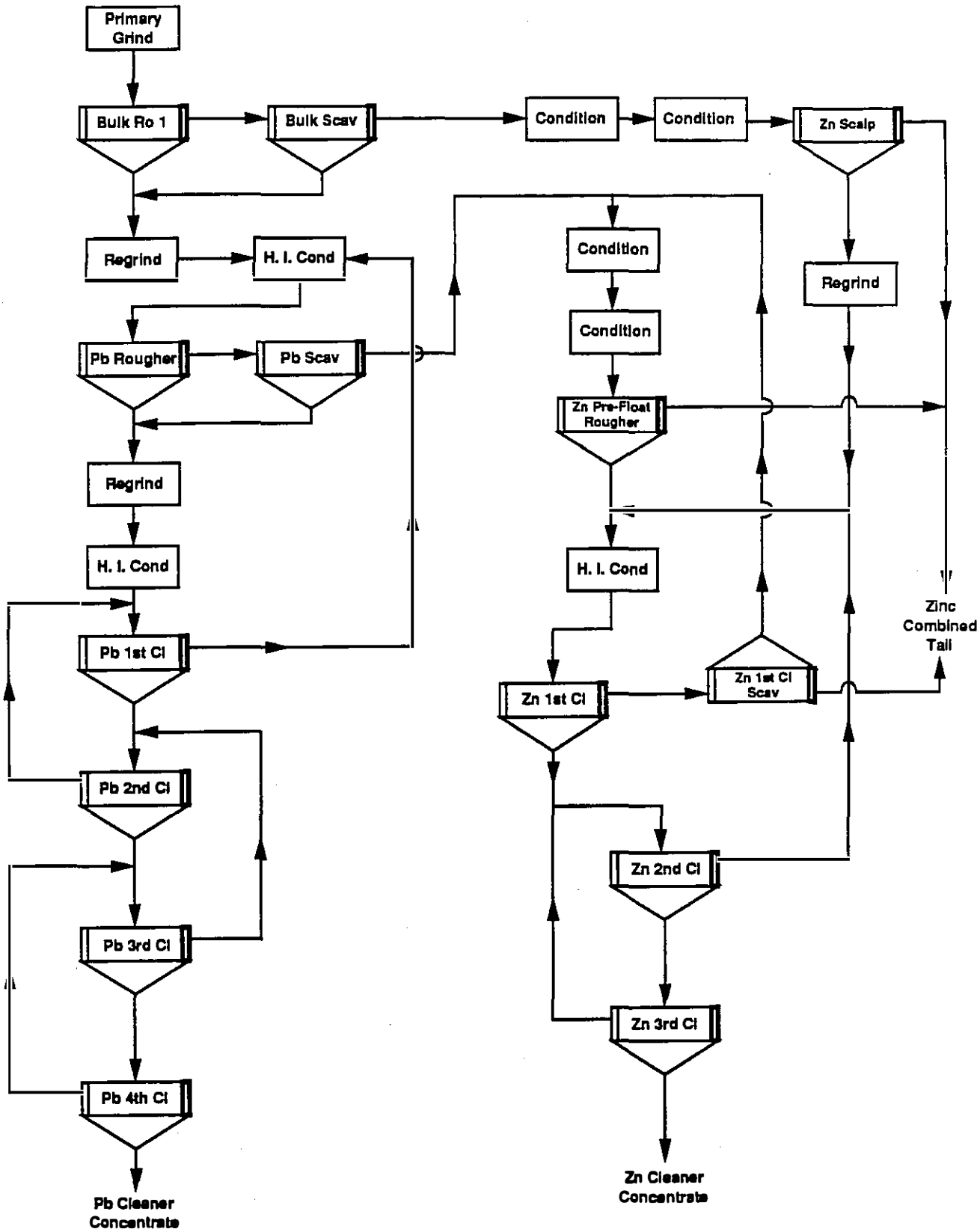


FIGURE NO. 22 : Semi-bulk batch test flowsheet

Discussion - Continued

- Regrinding of the semi-bulk concentrate in the presence of a pyrite-zinc depressant such as PKD-C (or NaCN in some tests) followed by lead rougher flotation results in rejection of most of the rest of the sphalerite.
- In some of the later tests, a 2nd regrind was also performed. Increased liberation from pyrite results in an improved final product grade.
- Two stage zinc flotation is used as the finer zinc in the Pb rougher tail floats more readily at a lower pH and with less $CuSO_4$ than does the zinc in the coarser semi-bulk tail.

Extensive development testwork was conducted on the semi-bulk and lead circuits. The major parameters tested included:

- pH modifier level and type, and depressant type.
- primary grind fineness
- semi-bulk concentrate regrind fineness, and two stage regrinding
- secondary collector
- high intensity conditioning.

Very limited development work was conducted on the zinc circuit. The major parameters that were studied included reagent levels and high intensity conditioning. Flowsheet variations were not studied.

7.1. pH Modifier Level

The level of soda ash on semi-bulk flotation was investigated in Tests 6 and 12-14. Na_2CO_3 was varied from 0 to 1500 g/t. The tests were conducted with a 20 minute grind (K_{80} = 67 µm) with collectors A317 and 3418A/Thiourea. Test conditions and results are summarized in Table No. 21 and Figure No. 23.

TABLE NO. 21 :
Effect of pH Modifier Additions

A. Conditions:

Test No.	Primary Grind		Semi-Bulk	Reagent Additions, g/t		
	minutes	K_{80}, µm	Flot'n pH	Primary Grind	Semi-Bulk Ro	Zn Scalp
6	20	67	7.8	317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$CuSO_4$ = 500 317 = 15 MIBC = 12.5
12	20	67	8.4	Na_2CO_3 = 500 317 = 50 3418A/TH = 20	317 = 50 3418A = 25 MIBC = 52.5	$Ca(OH)_2$ = 300 $CuSO_4$ = 1000 350 = 60 M2030 = 25

Discussion - Continued

A. Conditions: Continued

Test No.	Primary Grind		Semi-Bulk Flot'n pH	Reagent Additions, g/t		
	minutes	K_{80}, µm		Primary Grind	Semi-Bulk Ro	Zn Scalp
13	20	67	9.4	Na_2CO_3 =1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25
14	20	67	9.7	Na_2CO_3 =1500 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 55	$Ca(OH)_2$ = 1000 $CuSO_4$ = 1000 350 = 60 M2030 = 25

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
6	Semi-bulk Rougher Conc 1	14.39	16.50	9.28	57.6	11.8
	Semi-bulk Rougher Conc 1 to 3	44.58	8.72	13.89	94.4	54.6
	Semi-bulk Rougher Tall	55.42	0.42	9.30	5.6	45.4
	Head (Calc)	100.00	4.12	11.34	100.0	100.0
12	Semi-bulk Rougher Conc 1	21.26	15.30	11.10	80.6	20.8
	Semi-bulk Rougher Conc 1 to 3	59.74	6.56	16.11	97.1	84.8
	Zn Scalp Concentrate	12.1	0.84	13.60	2.5	14.5
	Zn Tailing	28.15	0.05	0.29	0.4	0.7
	Head (Calc)	100.00	4.03	11.35	100.0	100.0
13	Semi-bulk Rougher Conc 1	16.47	19.80	9.56	72.5	12.7
	Semi-bulk Rougher Conc 1 to 3	41.69	9.97	15.76	92.4	52.8
	Zn Scalp Concentrate	21.58	1.04	26.40	5.0	45.8
	Zn Tailing	36.73	0.32	0.48	2.6	1.4
	Head (Calc)	100.00	4.50	12.45	100.0	100.0
14	Semi-bulk Rougher Conc 1	14.33	23.20	8.56	75.5	10.5
	Semi-bulk Rougher Conc 1 to 3	29.56	13.32	12.55	89.5	31.8
	Zn Scalp Concentrate	28.61	1.08	26.90	7.0	66.1
	Zn Tailing	41.83	0.37	0.58	3.5	2.1
	Head (Calc)	100.00	4.40	11.65	100.0	100.0

The results showed the following:

- Increased carbonate addition resulted in improved lead grade and increased lead flotation kinetics. Selectivity with respect to zinc did not seen to be affected.
- The weight % floated decreased from over 50 % to 30 % with the highest carbonate addition.

Discussion - Continued

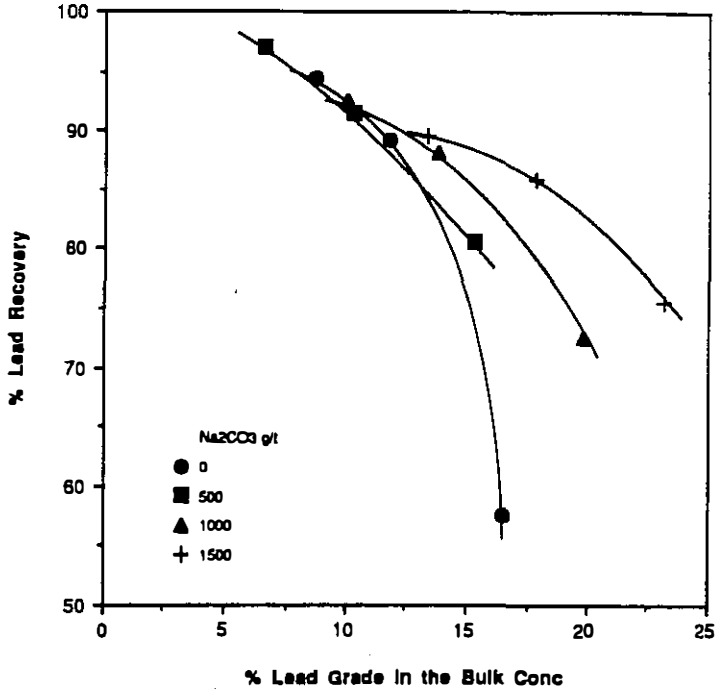


FIGURE NO. 23 : Effect of carbonate level on semi-bulk flotation

7.2. Effect of Primary Grind Fineness

Primary grinding time was varied from 15 to 50 minutes in Tests 13 and 25-28. The 80% passing sizes of these grind products were 87-27 µm. A Na_2CO_3 level of 1000 g/t was used.

Test conditions and results are summarized in Table No. 22 and Figure No. 24.

TABLE NO. 22 :
Effect of Primary Grinding on Semi-Bulk and Zn Scalp Flotation

A. Conditions:

Test No.	Primary Grind		Reagent Additions, g/t		
	minutes	K_{80}, µm	Primary Grind	Semi-bulk Ro	Zn Scav
25	15	87	Na_2CO_3 = 1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25
13	20	67	Na_2CO_3 = 1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25
26	30	38	Na_2CO_3 = 1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25

Discussion - Continued

A. Conditions: Continued

Test No.	Primary Grind		Reagent Additions, g/t		
	minutes	K_{80}, µm	Primary Grind	Semi-bulk Ro	Zn Scav
27	40	32	Na_2CO_3 = 1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25
28	50	27	Na_2CO_3 = 1000 317 = 50 3418A/TH = 20	317 = 50 3418A/TH = 25 MIBC = 52.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 60 M2030 = 25

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
25	Semi-bulk Rougher Conc 1	23.17	14.70	11.10	85.0	22.5
	Semi-bulk Ro Concs 1 to 3	42.18	8.78	14.87	92.4	54.8
	Zn Scalp	17.77	0.94	27.40	4.2	42.5
	Zn Tailing	40.05	0.34	0.76	3.4	2.7
	Head (Calc)	100.00	4.01	11.45	100.0	100.0
13	Semi-bulk Rougher Conc 1	16.47	19.80	9.56	72.5	12.7
	Semi-bulk RoConcs 1 to 3	41.69	9.97	15.76	92.4	52.8
	Zn Scalp	21.58	1.04	26.40	5.0	45.8
	Zn Tailing	36.73	0.32	0.48	2.6	1.4
	Head (Calc)	100.00	4.50	12.45	100.0	100.0
26	Semi-bulk Rougher Conc 1	9.29	19.90	7.18	47.0	5.8
	Semi-bulk Ro Concs 1 to 3	25.97	13.45	12.07	88.8	27.3
	Zn Scalp	29.08	0.91	27.60	6.8	70.9
	Zn Tailing	44.54	0.39	0.47	4.4	1.8
	Head (Calc)	100.00	3.93	11.48	100.0	100.0
27	Semi-bulk Rougher Conc 1	7.96	13.40	7.74	27.3	5.4
	Semi-bulk Ro Concs 1 to 3	27.20	12.94	11.57	90.1	27.7
	Zn Scalp	26.83	0.83	29.90	5.7	70.5
	Zn Tailing	45.98	0.36	0.45	4.2	1.8
	Head (Calc)	100.00	3.91	11.38	100.0	100.0
28	Semi-bulk Rougher Conc 1	5.93	11.00	7.27	16.8	3.8
	Semi-bulk Ro Concs 1 to 3	23.16	14.58	10.49	87.2	21.5
	Zn Scalp	22.20	0.93	38.10	5.3	74.9
	Zn Tailing	54.64	0.53	0.74	7.5	3.6
	Head (Calc)	100.00	3.87	11.29	100.0	100.0

Discussion - Continued

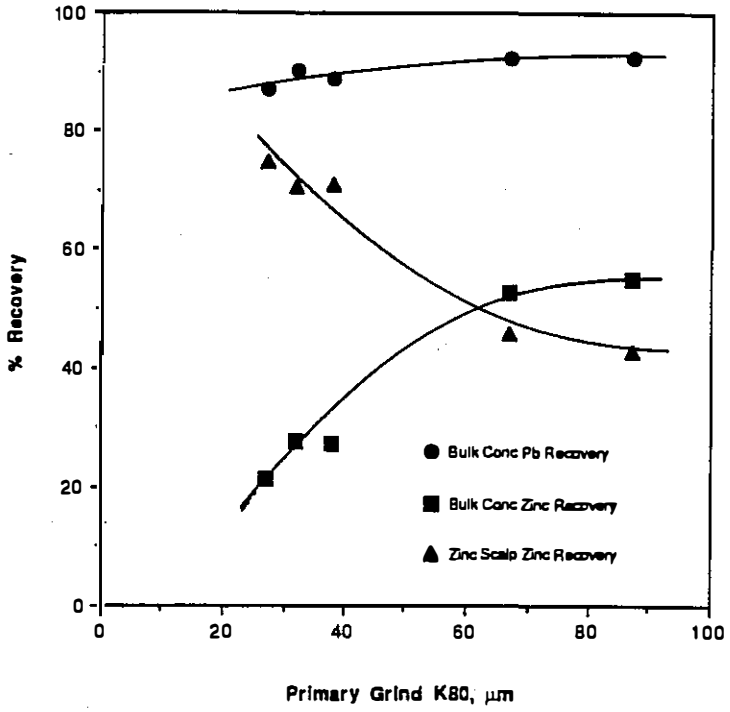


FIGURE NO. 24 : Effect of primary grind fineness on semi-bulk flotation

The results indicated the following:

- Finer grinding results in increased size reduction and flotation of the carbonaceous material. This was evident by visual examination of the semi-bulk or Zn scalp tails. The drop in lead grade of the semi-bulk concentrate from 20 % to 11-13 % in the finest two grinds may have also reflected this, but this may have been in part due to increased pyrite flotation.
- Lead recovery was not affected within the range of grind fineness tested.
- Selectivity against sphalerite increased with finer grinding, as zinc flotation is principally due to flotation of middlings.
- Zinc recovery and grade in the scalp concentrate increased with finer grinding due to increased zinc levels in the semi-bulk tail and due to improved liberation.

All of the above results were also noted in the Pb rougher stage using the conventional flowsheet. Subsequent regrinding tests were conducted with a 30 minute primary grind.

7.3. Effect of Semi-Bulk Concentrate Regrind Fineness on Pb Rougher Flotation

Regrinding tests were conducted in the laboratory rod mill. A primary grinding time of 30 minutes (K_{80} = 38 µm) and 1000 g/t Na_2CO_3 was used (higher carbonate and reduced grinding time to reduce carbon flotation would likely have been more advantageous). Regrinding times of 10 minutes (K_{80} = 16 µm) to 50 minute (K_{80} = 9 µm) were used.

Discussion - Continued

High intensity conditioning (15 minutes) of the regrind products was used. Test conditions and results are summarized in Table No. 23 and Figure 25. Figure 25 plots Pb rougher recoveries and Pb rougher concentrate grade against 80% passing size.

TABLE NO. 23 :
Effect of Regrinding on Lead Cleaning

A. Conditions*:

Test No.	Primary Grind		Reagent Additions, g/t					
	min	K_{80}, µm	Primary Grind	Semi-bulk Ro + Scav	Pb Regrind	Pb H.I. Cond	Pb Ro	Zn Cond + Scalp
35	10	16	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25
36	15	13	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25
34	20	12	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25
37	30	11	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25
38	40	9	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25
39	50	9	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH=25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH = 20 PKD-C = 200	3418A/TH = 20 317=50 MIBC = 20	3418A/TH= = 20 317=40 MIBC=15.5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=60 M2030 = 25

* with a 30 minute primary grind.

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
35	Pb Rougher Conc 1	8.06	39.40	8.77	78.6	6.1
	Pb Rougher Concs 1 to 3	19.21	18.38	13.16	87.3	22.0
	Pb Rougher Tail	7.87	1.13	9.55	2.2	6.5
	Semi-bulk Rougher Conc	27.08	13.37	12.11	89.5	28.5
	Zn Scalp	26.29	0.85	30.30	5.5	69.3
	Zn Tailing	46.63	0.43	0.54	5.0	2.2
	Head (Calc)	100.00	4.04	11.50	100.0	100.0
36	Pb Rougher Conc 1	6.37	50.10	4.97	76.6	2.6
	Pb Rougher Concs 1 to 3	14.30	24.82	11.68	85.3	13.8
	Pb Rougher Tail	9.61	1.35	11.00	3.1	8.8
	Semi-bulk Rougher Conc	23.91	15.39	11.41	88.4	22.6
	Zn Scalp	25.76	0.86	34.70	5.3	74.1
	Zn Tailing	50.33	0.52	0.80	6.3	3.3
	Head (Calc)	100.00	4.16	12.07	100.0	100.0
34	Pb Rougher Conc 1	6.30	45.80	4.60	75.7	2.5
	Pb Rougher Concs 1 to 3	16.28	20.03	10.62	85.6	14.8
	Pb Rougher Tail	8.05	1.19	13.20	2.5	9.1
	Semi-bulk Rougher Conc	24.34	13.80	11.47	88.1	23.9
	Zn Scalp	29.06	0.88	29.80	6.7	74.0
	Zn Tailing	46.60	0.42	0.53	5.1	2.1
	Head (Calc)	100.00	3.81	11.70	100.0	100.0
37	Pb Rougher Conc 1	5.85	54.30	3.88	74.7	1.9
	Pb Rougher Concs 1 to 3	14.53	25.11	7.72	85.7	9.5
	Pb Rougher Tail	12.19	1.33	18.20	3.8	18.8
	Semi-bulk Rougher Conc	26.72	14.26	12.50	89.5	28.4
	Zn Scalp	25.04	0.89	32.50	5.2	69.1
	Zn Tailing	48.25	0.46	0.61	5.2	2.5
	Head (Calc)	100.00	4.25	11.77	100.0	100.0
38	Pb Rougher Conc 1	5.54	56.50	3.61	74.2	1.6
	Pb Rougher Concs 1 to 3	12.71	27.86	6.83	83.9	7.1
	Pb Rougher Tail	13.37	1.64	17.90	5.2	19.7
	Semi-bulk Rougher Conc	26.08	14.42	12.50	89.1	26.9
	Zn Scalp	27.99	0.98	30.90	6.8	71.2
	Zn Tailing	45.93	0.40	0.51	4.6	1.9
	Head (Calc)	100.00	4.22	12.14	100.0	100.0
39	Pb Rougher Conc 1	5.40	56.40	3.24	72.4	1.5
	Pb Rougher Concs 1 to 3	12.46	27.93	5.94	82.7	6.2
	Pb Rougher Tail	15.50	1.60	17.30	5.9	22.4
	Semi-bulk Rougher Conc	27.95	13.33	12.24	88.6	28.5
	Zn Scalp	27.39	0.94	30.30	6.1	69.3
	Zn Tailing	44.66	0.50	0.59	5.3	2.2
	Head (Calc)	100.00	4.21	11.98	100.0	100.0

Discussion - Continued

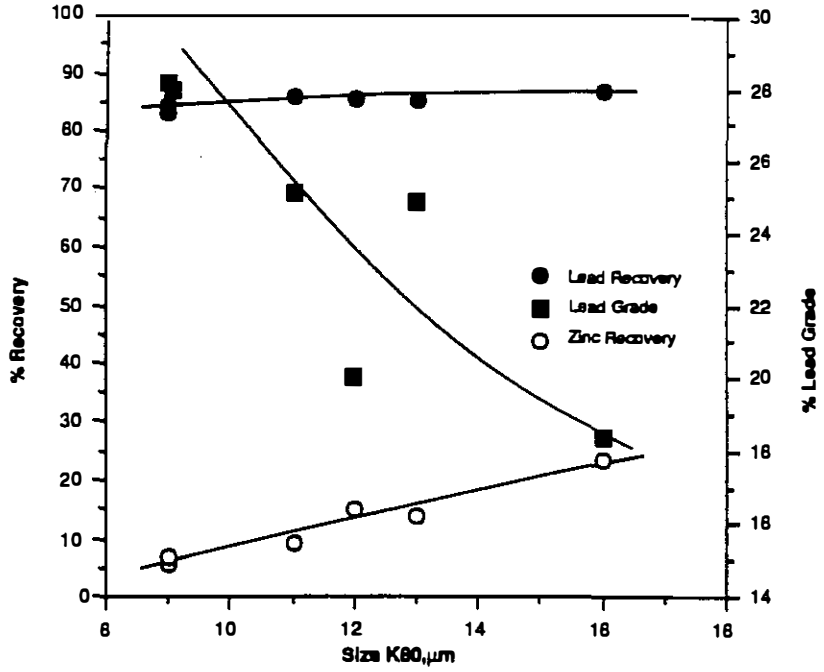


FIGURE NO. 25 : Effect of semi-bulk concentrate regrinding on Pb rougher flotation

The results indicated the following:

- Regrinding for 30-50 minutes yielded lead rougher concentrates of 25-28 % Pb and less than 8% Zn. Shorter regrinds resulted in considerably lower Pb grades and less selectivity against Zn.
- Pb recoveries were essentially unaffected by regrind fineness.

The testwork confirmed that fine regrinding was required to liberate the galena from sphalerite and from pyrite.

7.4. Effect of Secondary Collectors on Pb Rougher Flotation

Different secondary collectors were tested to determine their effect on Pb rougher flotation. Tests 38 and 43-52 were conducted with a 30 minute grind, 1000 g/t Na_2CO_3 and with a 40 minute regrind. Test conditions and results are summarized in Table No. 24.

TABLE NO. 24 :
Effect of Secondary Collectors

A. Conditions:

Test No.	Secondary Collector	Reagent Additions, g/t					
		Primary Grind	Semi-bulk Ro + Scav	Pb Regrind	Pb H.I. Cond	Pb Ro	Zn Cond + Scalp
38	3418A/TH	Na_2CO_3 = 1000 3418A/TH = 20 317=50	3418A/TH =25 317=50 MIBC=52.5	Na_2CO_3 =1200 3418A/TH =20 PKD-C =200	3418A/TH = 20 317=50 MIBC=20	3418A =20 317=40 MIBC =15.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
43	None	Na_2CO_3 = 1000 317=50	317=95 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	317=50 MIBC=20	317=40 MIBC =12.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
44	LSB/THM	Na_2CO_3 = 1000 LSB/THM =20 317=50	LSB/THM =25 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	LSB/THM =20 317=50 MIBC=20	LSB/THM =20 317=40 MIBC =15.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
45	242	Na_2CO_3 = 1000 242=20 317=50	242=28 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	242=20 317=50 MIBC=20	242=20 317=40 MIBC =15.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
46	3418A	Na_2CO_3 = 1000 3418A=20 317=50	3418A=25 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	3418A=20 317=50 MIBC=20	3418A=20 317=40 MIBC =15.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
47	LSB	Na_2CO_3 = 1000 LSB=20 317=50	LSB=28 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	LSB=20 317=50 MIBC=20	LSB=20 317=40 MIBC =15.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
51	SP117GR	Na_2CO_3 = 1000 SP117GR =20 317=50	SP117GR =25 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	SP117GR =20 317=50 MIBC=20	SP117GR =20 317=40 MIBC =12.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25
52	LSB-GR	Na_2CO_3 = 1000 LSB-GR =20 317=50	LSB-GR =27 317=50 MIBC=52.5	Na_2CO_3 =1200 PKD-C =200	LSB-GR =20 317=50 MIBC=20	LSB-GR =20 317=40 MIBC =12.5	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=60 M2030=25

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
38	Pb Rougher Concentrate	5.54	56.50	3.61	74.2	1.6
	Pb Rougher Concs 1 to 3	12.71	27.86	6.83	83.9	7.1
	Pb Rougher Tailing	13.37	1.64	17.90	5.2	19.7
	Semi-bulk Rougher Conc	26.08	14.42	12.50	89.1	26.9
	Zn Scalp	27.99	0.98	30.90	6.8	71.2
	Zn Tailing	45.93	0.40	0.51	4.6	1.9
	Head (Calc)	100.00	4.22	12.14	100.0	100.0
43	Pb Rougher Concentrate	5.55	50.30	3.03	72.6	1.5
	Pb Rougher Concs 1 to 3	13.79	23.32	5.99	83.6	7.2
	Pb Rougher Tailing	13.64	1.56	13.10	5.5	15.5
	Semi-bulk Rougher Conc	27.43	12.50	9.53	89.2	22.6
	Zn Scalp	24.68	0.68	34.60	4.4	73.9
	Zn Tailing	47.89	0.52	0.83	6.5	3.4
	Head (Calc)	100.00	3.85	11.55	100.0	100.0
44	Pb Rougher Concentrate	5.92	47.30	3.62	72.6	1.9
	Pb Rougher Concs 1 to 3	14.37	22.27	7.14	83.0	9.0
	Pb Rougher Tailing	14.50	1.76	14.40	6.6	18.3
	Semi-bulk Rougher Conc	28.87	11.97	10.79	89.6	27.3
	Zn Scalp	25.48	0.80	31.60	5.3	70.5
	Zn Tailing	45.64	0.43	0.57	5.1	2.3
	Head (Calc)	100.00	3.86	11.43	100.0	100.0
45	Pb Rougher Concentrate	6.98	43.20	5.00	75.0	3.1
	Pb Rougher Concs 1 to 3	18.50	18.38	8.00	84.6	13.0
	Pb Rougher Tailing	16.48	1.30	19.90	5.3	28.8
	Semi-bulk Rougher Conc	34.98	10.33	13.60	89.9	41.8
	Zn Scalp	22.92	1.03	28.00	5.9	56.4
	Zn Tailing	42.10	0.40	0.48	4.2	1.8
	Head (Calc)	100.00	4.02	11.38	100.0	100.0
46	Pb Rougher Concentrate	6.92	42.20	4.33	77.2	2.6
	Pb Rougher Concs 1 to 3	18.58	17.69	7.81	86.9	12.8
	Pb Rougher Tailing	17.11	1.06	21.50	4.8	32.4
	Semi-bulk Rougher Conc	35.70	9.72	14.37	91.7	45.2
	Zn Scalp	20.98	0.81	28.80	4.5	53.2
	Zn Tailing	43.33	0.33	0.43	3.8	1.6
	Head (Calc)	100.00	3.78	11.36	100.0	100.0
47	Pb Rougher Concentrate	5.85	51.90	3.96	73.8	2.0
	Pb Rougher Concs 1 to 3	14.23	24.06	7.12	83.3	8.6
	Pb Rougher Tailing	12.98	1.68	15.20	5.3	16.7
	Semi-bulk Rougher Conc	27.21	13.38	10.97	88.6	25.3
	Zn Scalp	27.36	0.99	31.50	6.6	72.9
	Zn Tailing	45.43	0.44	0.47	4.9	1.8
	Head (Calc)	100.00	4.11	11.82	100.0	100.0

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
51	Pb Rougher Concentrate	6.49	43.10	4.62	72.4	2.6
	Pb Rougher Concs 1 to 3	12.86	24.08	7.89	80.2	8.9
	Pb Rougher Tailing	10.84	2.48	12.00	7.0	11.4
	Semi-bulk Rougher Conc	23.70	14.20	9.77	87.1	20.2
	Zn Scalp	27.74	0.95	31.90	6.8	77.2
	Zn Tailing	48.56	0.48	0.60	6.0	2.5
	Head (Calc)	100.00	3.86	11.45	100.0	100.0
52	Pb Rougher Concentrate	5.13	52.90	2.75	70.5	1.2
	Pb Rougher Concs 1 to 3	12.32	24.87	5.84	79.6	6.3
	Pb Rougher Tailing	11.09	2.02	12.20	5.8	11.9
	Semi-bulk Rougher Conc	23.41	14.04	8.85	85.4	18.3
	Zn Scalp	25.85	0.98	34.40	6.6	78.3
	Zn Tailing	50.74	0.61	0.76	8.0	3.4
	Head (Calc)	100.00	3.85	11.35	100.0	100.0

The results indicated the following:

- Several of the collectors performed well, including A317 alone, 3418A and 3418A/TH, LSB and LSB/TH.
- SP117/GR and LSB/GR resulted in relatively low recoveries, and R242 was relatively unselective.
- Subsequent tests were conducted with the LSB and further collector testing was conducted during cleaning testwork.

7.5. Effect of Frother Type

Different semi-bulk and Pb circuit frothers were tested in Tests 54 to 58. These tests included the following modifications:

- primary grind time was reduced to 15 minutes in order to reject more carbonaceous material
- carbonate in the grind was increased from 1000 to 1500 g/t.
- regrind time was increased from 40 to 50 minutes to provide better liberation of lead from sphalerite and pyrite. Carbonate in the regrind was reduced from 1200 to 300 g/t and PKD-C in the regrind was increased to 300 g/t from 200 g/t.

The frothers that were tested included the following:

- MIBC
- MIBC/AF65 (1:1)
- AF65
- C-7/MIBC (1:1)

Test conditions and results are summarized in Table No. 25 and Figure No. 26.

Discussion - Continued

TABLE NO. 25 :
Effect of Frother Type

A. Conditions:

Test No.	Frother	Reagent Additions, g/t					
		Primary Grind	Semi-bulk Rougher	Semi-bulk Regrind	H.I. Cond	Pb Rougher	Zn Scalp
54	MIBC	Na_2CO_3 =1500 LSB=20 317=50	LSB=30 317=55 MIBC=45	Na_2CO_3 =300 PKD-C =150	LSB=20 317=50 MIBC=20	LSB=5 MIBC=10	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=50 M2030=20
56	MIBC/AF65	Na_2CO_3 = 1000 LSB=20 317=50	LSB=20 317=45 MIBC/AF65 =26	Na_2CO_3 =300 PKD-C =150	LSB=20 317=50 MIBC/AF65 =14	LSB=10 MIBC/ AF65=4	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=50 M2030=20
57	AF65	Na_2CO_3 = 1000 LSB=20 317=50	LSB=20 317=45 AF65=24	Na_2CO_3 =300 PKD-C =150	LSB=20 317=50 AF65=14	LSB=10	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=50 M2030=20
58	C-7/MIBC	Na_2CO_3 = 1000 LSB=20 317=50	LSB=20 317=45 C-7/MIBC =24	Na_2CO_3 =300 PKD-C =150	LSB=20 317=50 C-7/MIBC =14	LSB=10	$Ca(OH)_2$ =600 $CuSO_4$ =1000 350=50 M2030=20

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
54	Pb Rougher Concentrate 1	11.63	28.00	7.66	84.4	8.0
	Pb Rougher Concs 1 to 3	16.87	19.96	8.81	87.2	13.4
	Pb Rougher Tailing	18.89	0.79	14.20	3.9	24.2
	Semi-bulk Rougher Conc	35.76	9.83	11.66	91.1	37.6
	Zn Scalp	22.13	0.81	30.20	4.6	60.2
	Zn Tailing	42.11	0.39	0.58	4.3	2.2
	Head (Calc)	100.00	3.86	11.09	100.0	100.0
56	Pb Rougher Concentrate 1	13.32	24.20	7.56	83.3	9.0
	Pb Rougher Concs 1 to 3	16.41	20.01	8.51	84.8	12.5
	Pb Rougher Tailing	17.25	0.95	15.20	4.2	23.5
	Semi-bulk Rougher Conc	33.66	10.24	11.94	89.0	35.9
	Zn Scalp	26.06	0.98	26.50	6.6	61.8
	Zn Tailing	40.28	0.42	0.63	4.4	2.3
	Head (Calc)	100.00	3.87	11.18	100.0	100.0

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
57	Pb Rougher Concentrate 1	14.34	23.30	7.62	83.3	9.6
	Pb Rougher Concs 1 to 3	18.33	18.80	9.29	86.0	15.0
	Pb Rougher Tailing	19.36	1.03	15.70	5.0	26.8
	Semi-bulk Rougher Conc	37.70	9.67	12.58	90.9	41.8
	Zn Scalp	22.24	0.86	28.00	4.8	54.8
	Zn Tailing	40.07	0.43	0.96	4.3	3.4
	Head (Calc)	100.00	4.01	11.35	100.0	100.0
58	Pb Rougher Concentrate 1	16.47	20.70	8.27	85.9	12.1
	Pb Rougher Concs 1 to 3	19.19	17.97	9.44	87.0	16.2
	Pb Rougher Tailing	18.33	0.86	16.70	4.0	27.3
	Semi-bulk Rougher Conc	37.52	9.61	12.99	90.9	43.5
	Zn Scalp	21.95	0.90	27.50	5.0	53.8
	Zn Tailing	40.53	0.40	0.75	4.1	2.7
	Head (Calc)	100.00	3.97	11.21	100.0	100.0

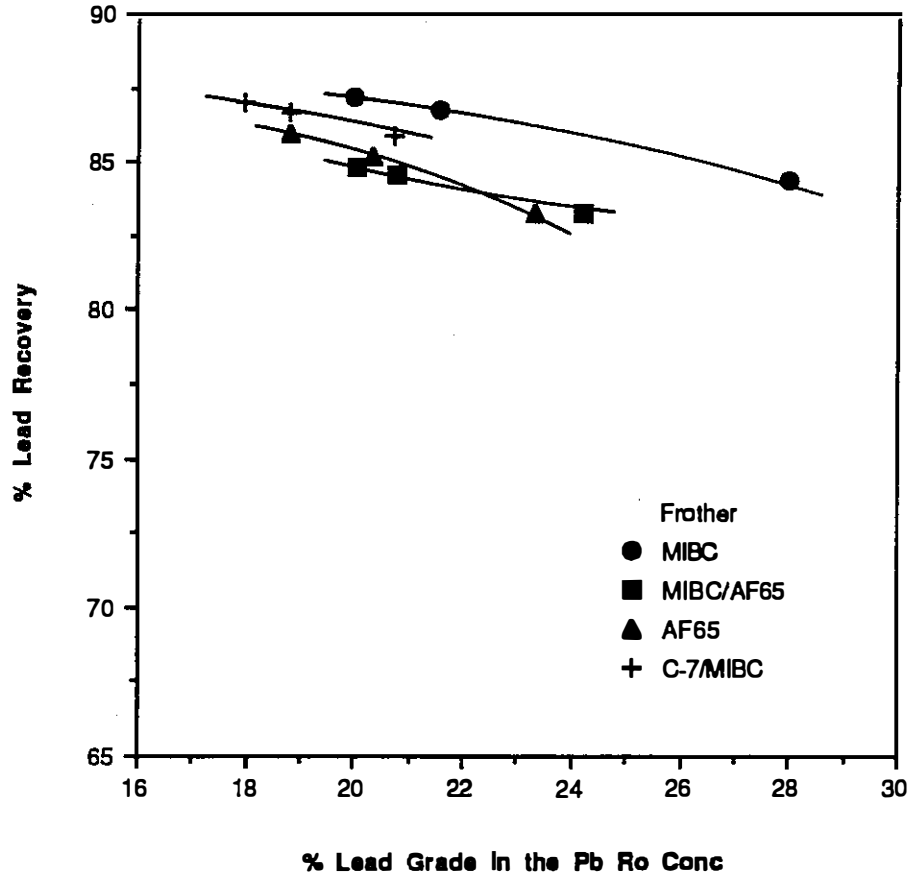


FIGURE NO. 26 : Effect of frother type or Pb rougher flotation

Discussion - Continued

The results indicated that MIBC provided the best Pb grade and recovery. C-7/MIBC provided relatively low grade and recoveries with AF65 and MIBC/AF65 were relatively low. However, the MIBC froth was quite dry.

Comparison of Test 54 with Test 47 (MIBC) indicated that with the revised grinding and reagents, a lower grade Pb rougher concentrate was obtained, but at a higher recovery.

Subsequent tests were conducted with the C-7/MIBC mixture due to the fact that it produces better, less dry froth.

7.6. Effect of Lead Circuit pH Modifier and Depressant

Modifiers (Na_2CO_3 versus $Ca(OH)_2$) and depressants (PKD-C, NaCN, Na_2S/PKD-C and PQ4/NaCN) were evaluated in Tests 58 to 63. The test conditions were as in the frother series tests, with a short primary grind and with the C-7/MIBC frother.

Test conditions and results are summarized in Table No. 26.

TABLE NO. 26 :
Effect of Lead Circuit Depressant Types

A. Conditions:

Test No.	Depressants	Reagent Additions, g/t					
		Primary Grind	Semi-bulk Rougher	Semi-bulk Regrind	H.I. Cond	Pb Rougher	Zn Scalp
58	Na_2CO_3 PKD-C	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=22 317=47 C-7/MIBC=31	Na_2CO_3=300 PKD-C=150	LSB=20 317=50 C-7/MIBC=14	LSB=10 317=5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=23
59	Na_2CO_3 NaCN	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=20 317=45 C-7/MIBC=31	Na_2CO_3=300 NaCN=150	LSB=20 317=50 C-7/MIBC=14	LSB=10 317=5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=20
60	$Ca(OH)_2$ NaCN	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=20 317=45 C-7/MIBC=31	$Ca(OH)_2$=300 NaCN=150	LSB=20 317=50 C-7/MIBC=14	LSB=10	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=20
61	$Ca(OH)_2$ PKD-C	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=22 317=47 C-7/MIBC=31	$Ca(OH)_2$=300 PKD-C=150	LSB=20 317=50 C-7/MIBC=14	LSB=10 317=5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=20
62	Na_2CO_3 NaCN Na_2S	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=22 317=47 C-7/MIBC=31	Na_2CO_3=300 NaCN=150 Na_2S=350	LSB=20 317=50 C-7/MIBC=14	LSB=10 317=5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=20
63	Na_2CO_3 PQ4/NaCN	Na_2CO_3=1500 LSB=20 C-7/MIBC=50	LSB=22 317=47 C-7/MIBC=31	Na_2CO_3=300 PQ4/NaCN =150	LSB=20 317=50 C-7/MIBC=14	LSB=10 317=5	$Ca(OH)_2$=600 $CuSO_4$=1000 350=50 M2030=20

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
58	Pb Rougher Concentrate 1	16.47	20.70	8.27	85.9	12.1
	Pb Rougher Concs 1 to 3	19.19	17.97	9.44	87.0	16.2
	Pb Rougher Tailing	18.33	0.86	16.70	4.0	27.3
	Semi-bulk Rougher Conc	37.52	9.61	12.99	90.9	43.5
	Zn Scalp	21.95	0.90	27.50	5.0	53.8
	Zn Tailing	40.53	0.40	0.75	4.1	2.7
	Head (Calc)	100.00	3.97	11.21	100.0	100.0
59	Pb Rougher Concentrate 1	13.07	25.10	6.63	83.1	7.4
	Pb Rougher Concs 1 to 3	16.12	20.65	7.83	84.3	10.8
	Pb Rougher Tailing	16.11	1.05	13.80	4.3	19.1
	Semi-bulk Rougher Conc	32.23	10.85	10.81	88.6	29.9
	Zn Scalp	27.15	0.90	28.90	6.2	67.3
	Zn Tailing	40.62	0.51	0.82	5.2	2.9
	Head (Calc)	100.00	3.95	11.67	100.0	100.0
60	Pb Rougher Concentrate 1	12.84	19.60	7.91	65.5	9.4
	Pb Rougher Concs 1 to 3	17.17	16.66	9.53	74.5	15.2
	Pb Rougher Tailing	15.54	3.62	14.00	14.6	20.2
	Semi-bulk Rougher Conc	32.71	10.47	11.65	89.2	35.4
	Zn Scalp	26.82	0.98	25.10	6.8	62.6
	Zn Tailing	40.46	0.38	0.52	4.0	2.0
	Head (Calc)	100.00	3.84	10.76	100.0	100.0
61	Pb Rougher Concentrate 1	13.66	22.90	9.30	81.6	11.1
	Pb Rougher Concs 1 to 3	18.20	17.69	11.17	84.0	17.7
	Pb Rougher Tailing	15.09	1.24	10.60	4.9	13.9
	Semi-bulk Rougher Conc	33.30	10.23	10.91	88.9	31.6
	Zn Scalp	28.60	0.95	26.70	7.1	66.5
	Zn Tailing	38.10	0.40	0.58	4.0	1.9
	Head (Calc)	100.00	3.83	11.49	100.0	100.0
62	Pb Rougher Concentrate 1	16.24	20.30	7.92	85.5	11.4
	Pb Rougher Concs 1 to 3	20.59	16.32	9.16	87.2	16.7
	Pb Rougher Tailing	21.71	0.84	15.90	4.7	30.6
	Semi-bulk Rougher Conc	42.30	8.37	12.62	91.9	47.3
	Zn Scalp	12.18	0.55	35.70	1.7	38.6
	Zn Tailing	45.52	0.54	3.49	6.4	14.1
	Head (Calc)	100.00	3.86	11.28	100.0	100.0
63	Pb Rougher Concentrate 1	16.41	19.60	7.92	84.5	11.0
	Pb Rougher Concs 1 to 3	19.24	16.90	9.26	85.4	15.1
	Pb Rougher Tailing	12.94	0.97	14.10	3.3	15.5
	Semi-bulk Rougher Conc	32.18	10.49	11.21	88.7	30.6
	Zn Scalp	26.00	0.91	30.20	6.2	66.7
	Zn Tailing	41.82	0.46	0.75	5.1	2.7
	Head (Calc)	100.00	3.81	11.77	100.0	100.0

Discussion - Continued

The results indicated the following:

- As in the conventional flowsheet testwork, the lime-NaCN metallurgy was poor. However, the lime-PKD-C combination, while providing lower recovery than did the carbonate, did not perform too badly.
- Carbonate with PKD-C, PKD-C/Na_2S, and PQ4/NaCN performed similarly. Carbonate with NaCN gave higher grades.

Based on this testwork, subsequent tests continued to be performed with the Na_2CO_3 and PKD-C, principally on the basis of minimizing cyanide consumption.

7.7. Preliminary Cleaning Tests

Preliminary Pb cleaning tests were conducted in Tests 64 to 71. The testwork involved the parameters developed in the previous two tests series but with the following varied:

- Use of frothers MIBC or C-7/MIBC in various tests.
- Use of secondary collectors LSB or LSB/TH in various tests.
- Test 71 reagent scheme was varied considerably.

Preliminary zinc cleaning tests were conducted in Tests 66 and 70-71. Three cleaners were completed, with the following conditions:

- Zinc scalp flotation of the semi-bulk tail with lime and $CuSO_4$ conditioning with A350 and M2030 collectors, with DF250 frother.
- Zinc prefloat flotation of the Pb rougher tail with the same reagent.
- Regrinding of the scalp concentrate with lime, cyanide and collector followed by three stages of cleaning.

Test conditions and results are summarized in Table No .27.

The results indicated the following:

Pb Circuit:

- Lead grades of 53-55% were achieved in most tests with recoveries of 73-77% Pb. In Tests 66 and 73, higher grade products were achieved but at a very low recovery (note that the Pb circuit of Test 66 was a duplicate of that in Test 65).
- A higher Pb product grade of 67% Pb was achieved in Test No. 71 at 66% recovery. This was with a revised reagent scheme (I.e. no carbonate in the primary grind, higher carbonate in the regrind, with a finer primary grind).
- Increased PKD-C in the regrind, and use of PZ-3/CN did not improve product grades.

Discussion - Continued

Zn Circuit:

- Zn 3rd cleaner concentrates of over 52% were obtained in Tests 66 and 72-74 with recoveries of 68-85%.

increase of lime in the regrind to 500 g/t helped product grades in Tests 72-74.

TABLE NO. 27 :
Preliminary Lead and Zinc Cleaning Tests

A. Conditions: LEAD CIRCUIT

Test No.	Purpose	Reagent Additions, g/t						
		Primary Grind	Semi-bulk Ro	Semi-bulk Ro Scav	H.I. Cond	Pb Rougher	Pb 1st Cl + Cl Scav	Pb 2nd to 4th Cl
64	Initial Pb cleaning test with LSB and MIBC.	Na_2CO_3 =1500 LSB=20 317=50	LSB=30 317=55 MIBC=45	Na_2CO_3 =300 PKD-C=150	LSB=20 317=50 MIBC=20	LSB=5 MIBC=10	LSB=10	LSB=4 PKD-C=60 MIBC=4
65	As for Test 64 with LSB/TH and MIBC.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 MIBC=45	Na_2CO_3 =300 PKD-C=150	LSB/TH=20 317=50 MIBC=20	LSB/TH=5 MIBC=10	LSB/TH=10	LSB/TH=4 PKD-C=60 MIBC=4
66	As for Test 65 with Zn cleaning.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 MIBC=45	Na_2CO_3 =300 PKD-C=150	LSB/TH=20 317=50 MIBC=20	LSB/TH=15 MIBC=10	LSB/TH=10	LSB/TH=11 PKD-C=70 MIBC=6 317=7.5
67	As for Test 66 with C-7/MIBC; no Zn cleaning.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 C-7/MIBC =35	Na_2CO_3 =300 PKD-C=150	LSB/TH=20 317=50 C-7/MIBC =15	LSB/TH=5 C-7/MIBC =7.5	LSB/TH=10	LSB/TH=2 PKD-C=80 C-7/MIBC=2
68	As for Test 67 with Increased PKD-C.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 C-7/MIBC =40	Na_2CO_3 =300 PKD-C=200	LSB/TH=20 317=50 C-7/MIBC =15	LSB/TH=5 C-7/MIBC =7.5	LSB/TH=5	PKD-C=80
69	As for Test 68 with further Increased PKD-C.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 C-7/MIBC =40	Na_2CO_3 =300 PKD-C=300	LSB/TH=20 317=50 C-7/MIBC = 15	LSB/TH=10 C-7/MIBC =5	LSB/TH=5	PKD-C=70
70	As for Test 68 with PZ-3/NaCN and increased regrind Na_2CO_3.	Na_2CO_3 =1500 LSB/TH=20 317=50	LSB/TH=30 317=55 C-7/MIBC =40	Na_2CO_3 =200 PKD-C=200	LSB/TH=20 317=50 C-7/MIBC = 20	LSB/TH=10 317=4	LSB/TH=5 PZ-3=20 317=4 Na_2CO_3 =100	PZ-3=60 Na_2CO_3=300
71*	Semi-bulk/Pb circuits as for Test 8. Zn circuit as for Test 70.	LSB/TH=24 317-60	LSB/TH=10 317=35 MIBC=40	Na_2CO_3 =1200 PKD-C=200 LSB/TH=20	LSB/TH=20 317=50 MIBC=20	LSB/TH=10 317=10 MIBC=10	PKD-C=30 317=12.5 MIBC=2.5	PKD-C=70 LSB/TH=10 317=25 MIBC=5

* 20 minute primary grind.

Discussion - Continued

A. Conditions: Continued

Test No.	Purpose	Reagent Additions, g/t						
		Primary Grind	Semi-bulk Ro	Semi-bulk Ro Scav	H.I. Cond	Pb Rougher	Pb 1st Cl + Cl Scav	Pb 2nd to 4th Cl
72	As for Test 71 with Na_2CO_3 in grind, with 317M & LSB.	Na_2CO_3 =1500 317M=50 LSB=24	317M=10 LSB=8 MIBC=12.5	Na_2CO_3 =1000 PKD-C=200 LSB=8	317M=10 LSB=8 MIBC=12.5	317M=5 MIBC=5	PKD-C=30 317M=7 LSB=8 MIBC=6.5	PKD-C=35 317M=6 LSB=6
73	As for Test 71 with Na_2CO_3 in grind.	Na_2CO_3 =1500 317=50 LSB/THM =24	317=45 LSB/THM =40 MIBC=26	Na_2CO_3 =1000 PKD-C=200 LSB/THM =20	317=25 LSB/THM =40 MIBC=15	317M=10 LSB/THM =15 MIBC=8	PKD-C=10 LSB/THM =5 MIBC=4	PKD-C=20 LSB/THM =6 MIBC=4
74	As for Test 72, reduce collector & shorten grind (15 minutes).	Na_2CO_3 =1500 317M=35 Na_2CO_3 =19	317=40 LSB/THM =12 MIBC=17.5	Na_2CO_3 =1000 PKD-C=150 317M=25	LSB=10 MIBC=10	317M=40 LSB=7.5 MIBC=10	PKD-C=15 317M=15 MIBC=10	PKD-C=15 317M=25 LSB=6 MIBC=10

A. Conditions: ZINC CIRCUIT

Test No.	Reagent Additions, g/t				
	Zn Prefloat	Zn Scalp	Zn Scalp Regrind	Zn 1st Cl	Zn 2nd to 3rd Cls
64	-	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	-	-	-
65	-	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	-	-	-
66	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=10 M2030=12.5 DF250=5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	$Ca(OH)_2$ = 250 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=50 M2030=5 DF250=10	$Ca(OH)_2$=350 DF250=7.5
67	-	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	-	-	-
68	-	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	-	-	-
69	-	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	-	-	-

A. Conditions: ZINC CIRCUIT

Test No.	Reagent Additions, g/t				
	Zn Prefloat	Zn Scalp	Zn Scalp Regrind	Zn 1st Cl	Zn 2nd to 3rd Cls
70	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=15 M2030=20 DF250=7.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	$Ca(OH)_2$ = 250 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=50 DF250=10	$Ca(OH)_2$=375 350=7.5 DF250=10
71	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 20	$Ca(OH)_2$ = 250 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=50 DF250=10	$Ca(OH)_2$=375 350=7.5 DF250=5
72*	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 M2030 = 30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=250	$Ca(OH)_2$=500 350=7.5
73*	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 M2030 = 30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=250	$Ca(OH)_2$=500 DF250=7.5
74*	$Ca(OH)_2$=300 $CuSO_4$ = 500 350=10 M2030=20 DF250=12.5	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 25 M2030 = 20	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030=5	$Ca(OH)_2$=250 350=5 DF250=10	$Ca(OH)_2$=500 350=7.5 DF250=7.5

*regrind 30 minutes; (20 minutes in Test 71), with higher lime in the regrind (500 vs 250 g/t).

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
64	Pb 3rd Cleaner Conc	5.25	54.60	2.99	74.5	1.4
	Pb 1st Cleaner Conc	9.48	33.15	5.91	81.6	4.9
	Pb Ro + Scav Concs	16.72	19.50	8.20	84.7	12.1
	Pb Scavenger Tail	17.07	0.94	13.70	4.2	20.6
	Semi-bulk Rougher Conc	33.79	10.12	10.98	88.9	32.7
	Zn Scalp	28.05	0.98	26.40	7.1	65.3
	Zn Tailing	38.16	0.40	0.57	4.0	1.9
	Head (Calc)	100.00	3.85	11.33	100.0	100.0
65	Pb 3rd Cleaner Conc	5.34	53.70	2.72	74.1	1.3
	Pb 1st Cleaner Conc	8.60	36.56	4.84	81.3	3.7
	Pb Ro + Scav Concs	16.26	20.22	7.75	85.0	11.1
	Pb Scavenger Tail	20.67	0.87	15.70	4.7	28.6
	Semi-bulk Rougher Conc	36.93	9.39	12.20	89.7	39.7
	Zn Scalp	23.87	1.00	27.70	6.2	58.2
	Zn Tailing	39.20	0.41	0.62	4.2	2.1
	Head (Calc)	100.00	3.87	11.36	100.0	100.0

B. Results: Continued

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
66	Pb 4th Cleaner Conc	2.15	62.10	2.63	35.6	0.5
	Pb 1st Cl + Cl Scav Concs	8.10	32.85	5.58	71.0	4.0
	Pb Ro + Scav Concs	15.60	20.37	8.41	84.8	11.7
	Zn 3rd Cleaner Conc	14.41	0.35	58.80	1.3	75.5
	Zn 1st Cleaner Conc	18.63	0.67	49.36	3.3	82.0
	Zn 1st Cleaner Tail	11.00	1.32	3.13	3.9	3.1
	Zn Prefloat Tail	13.62	1.01	0.77	3.7	0.9
	Zn Scalp Tailing	41.15	0.39	0.62	4.3	2.3
	Head (Calc)	100.00	3.75	11.21	100.0	100.0
67	Pb 4th Cleaner Conc	5.22	56.50	2.48	76.5	1.1
	Pb 1st Cl + Cl Scav Concs	10.58	30.29	5.76	83.1	5.4
	Pb Rougher Conc	14.90	21.94	7.63	84.8	10.0
	Pb Rougher Tail	18.38	0.91	14.30	4.3	23.2
	Semi-bulk Rougher Conc	33.28	10.32	11.31	89.1	33.3
	Zn Scalp	24.75	0.91	29.10	5.8	63.6
	Zn Tailing	41.98	0.46	0.84	5.0	3.1
	Head (Calc)	100.00	3.85	11.32	100.0	100.0
68	Pb 4th Cleaner Conc	5.37	53.10	2.48	72.8	1.2
	Pb 1st Cleaner Conc	11.14	29.03	5.98	82.5	6.1
	Pb Rougher Conc	18.16	18.47	8.38	85.6	13.9
	Pb Rougher Tail	25.63	0.88	14.30	5.8	33.5
	Semi-bulk Rougher Conc	43.80	8.18	11.85	91.4	47.4
	Zn Scalp	18.68	1.02	29.10	4.9	49.7
	Zn Tailing	37.53	0.39	0.84	3.7	2.9
	Head (Calc)	100.00	3.92	10.94	100.0	100.0
69	Pb 4th Cleaner Conc	5.78	50.90	2.63	77.9	1.4
	Pb 1st Cleaner Conc	10.73	29.50	5.64	83.8	5.5
	Pb Rougher Conc	16.96	19.27	8.20	86.7	12.6
	Pb Rougher Tail	25.21	0.87	15.60	5.8	35.6
	Semi-bulk Rougher Conc	42.18	8.27	12.62	92.5	48.1
	Zn Scalp	19.44	0.83	28.40	4.3	49.9
	Zn Tailing	38.39	0.32	0.56	3.3	1.9
	Head (Calc)	100.00	3.77	11.06	100.0	100.0
70	Pb 4th Cleaner Conc	5.40	53.50	2.37	75.1	1.1
	Pb 1st Cl + Cl Scav Concs	12.77	25.46	6.19	84.6	7.0
	Pb Rougher Conc	16.52	19.96	7.88	85.8	11.5
	Zn 3rd Cleaner Conc	17.74	0.56	52.60	2.6	82.2
	Zn 1st Cleaner Conc	20.58	0.74	46.18	4.0	83.7
	Zn Scalp Tailing	40.75	0.43	0.77	4.6	2.8
	Zn Prefloat Tailing	13.84	0.94	0.78	3.4	1.0
	Head (Calc)	100.00	3.84	11.4	100.0	100.0
71	Pb 4th Cleaner Conc	3.85	66.70	2.70	66.1	0.9
	Pb 1st Cleaner Conc	5.84	54.80	3.42	68.6	1.4
	Pb Rougher Conc	9.36	29.82	6.29	71.9	5.0
	Zn 3rd Cleaner Conc	21.00	1.54	49.60	8.3	88.4
	Zn 1st Cleaner Conc	24.00	1.71	44.03	10.6	89.7
	Zn Scalp Tailing	46.55	0.65	0.62	7.8	2.5
	Zn Prefloat Tailing	8.80	2.11	1.13	4.8	0.8
	Head (Calc)	100.00	3.88	11.80	100.0	100.0

B. Results: Continued

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
72	Pb 4th Cleaner Conc	4.85	55.10	3.15	69.3	1.3
	Pb 1st Cleaner Conc	8.94	34.83	4.99	80.7	3.9
	Pb Rougher Conc	14.89	21.93	7.76	84.7	10.1
	Zn 3rd Cleaner Conc	15.48	0.49	55.5	2.0	75.0
	Zn 1st Cleaner Conc	21.64	0.74	42.34	4.2	80.0
	Zn Scalp Tail	32.73	0.23	0.25	2.0	0.7
	Zn Prefloat Tailing	16.75	1.24	0.75	5.4	1.1
	Head (Calc)	100.00	3.85	11.46	100.0	100.0
73	Pb 4th Cleaner Conc	3.44	66.2	2.00	59.9	0.6
	Pb 1st Cleaner Conc	6.96	42.12	4.34	77.1	2.6
	Pb Rougher Conc	10.21	29.86	6.14	80.2	5.4
	Zn 3rd Cleaner Conc	14.40	0.63	55.3	2.4	68.3
	Zn 1st Cleaner Conc	20.72	0.87	41.88	4.8	74.5
	Zn Scalp Tail	34.24	0.32	0.33	2.9	1.0
	Zn Prefloat Tailing	7.72	1.84	0.58	3.7	0.4
	Head (Calc)	100.00	3.80	11.66	100.0	100.0
74	Pb 4th Cleaner Conc	5.97	49.40	4.39	76.0	2.3
	Pb 1st Cleaner Conc	10.31	30.33	7.05	80.6	6.5
	Pb Rougher Conc	14.28	22.53	8.51	82.9	10.9
	Zn 3rd Cleaner Conc	17.06	0.75	55.2	3.3	84.5
	Zn 1st Cleaner Conc	35.92	0.94	26.93	8.7	86.8
	Zn Scalp Tail	36.93	0.33	0.45	3.1	1.5
	Zn Prefloat Tailing	12.87	1.56	0.72	5.2	0.8
	Head (Calc)	100.00	3.88	11.15	100.0	100.0

7.8. Effect of High Intensity Conditioning

The effect of Pb high intensity conditioning time was investigated in Tests 75-77. Collectors used in these tests were 317 and LSB/TH, with C-7/MIBC frother and 1500 g/t Na_2CO_3 in the grind (a second regrind, after the Pb 1st cleaner, was used in these tests).

Test conditions and results are summarized in Table No. 28 and Figure No. 27.

Discussion - Continued

TABLE NO. 28 :
Effect of Pb High Intensity Conditioning

A. Conditions: LEAD CIRCUIT

Test No.	H.I. Cond Time min.	Reagent Additions, g/t							
		Primary Grind	Semi-bulk Ro	Semi-bulk Conc Regr	H.I. Cond	Pb Rougher	Pb 1st Cl	1st Cl Regrind	2nd to 4th Cl
75	0	Na_2CO_3 =1500 317=50 LSB/TH =20	317=55 LSB/TH=30 C-7/MIBC =40	Na_2CO_3 =300 PKD-C=300 (40 min)	-	317=45 LSB/TH=25 C-7/MIBC =17.5	PKD-C=1 317=15 LSB/TH =10	PKD-C=100 Na_2CO_3 =100 (10 min)	PKD-C=5 317=25 LSB/TH =6 C-7/MIBC =10
76	20	Na_2CO_3 =1500 317=50 LSB/TH =20	317=55 LSB/TH=30 C-7/MIBC =42.5	Na_2CO_3 =300 PKD-C=300 (40 min)	317=25 LSB/TH =25 C-7/MIBC =10 (10 min)	317=5 LSB/TH=5 C-7/MIBC =7.5	PKD-C=1 317=15 LSB/TH =10	PKD-C=100 Na_2CO_3 =100 (10 min)	PKD-C=1
77	30	Na_2CO_3 =1500 317=50 LSB/TH =20	317=55 LSB/TH=30 C-7/MIBC =42.5	Na_2CO_3 =300 PKD-C=300 (40 min)	317=50 LSB/TH =25 C-7/MIBC =10 (20 min)	317=5 LSB/TH=5 C-7/MIBC =7.5	PKD-C=1	PKD-C=100 Na_2CO_3 =100 (10 min)	PKD-C=1 317=5 LSB/TH =5

A. Conditions: ZINC CIRCUIT

Test No.	Reagent Additions, g/t				
	Zn Scalp	Scalp Regrind	Zn Prefloat Rougher	Zn 1st Cleaner*	Zn 2nd to 3rd Cls
75	$Ca(OH)_2$=600 $CuSO_4$ = 100 350=70 M2030=30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$=250	$Ca(OH)_2$=500 350=7.5
76	$Ca(OH)_2$=600 $CuSO_4$ = 100 350=70 M2030=30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$=250	$Ca(OH)_2$=500 350=7.5
77	$Ca(OH)_2$=600 $CuSO_4$ = 100 350=70 M2030=30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350=10 M2030=20 DF250=10	$Ca(OH)_2$=250	$Ca(OH)_2$=500 350=7.5 DF250=2.5

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
75	Pb Cleaner Concentrate	6.28	45.7	6.08	75.9	3.5
	Pb Rougher Concentrate	19.10	17.0	13.2	85.8	22.8
	Zn Scalp Concentrate	25.78	1.01	24.6	6.9	57.7
	Zn Scalp Tailing	36.36	0.32	0.42	3.1	1.4
	Head (Calc)	100.00	3.78	11.00	100.0	100.0
76	Pb Cleaner Concentrate	3.19	61.8	2.09	55.0	0.6
	Pb Rougher Concentrate	12.33	23.8	6.30	81.9	6.8
	Zn Concentrate	12.15	0.34	63.4	1.2	67.7
	Zn 1st Cleaner Conc	17.92	0.75	52.9	3.7	83.4
	Zn 1st Cleaner Tail	16.99	1.20	4.32	5.7	6.5
	Zn Prefloat Tailing	15.61	1.02	1.08	4.4	1.5
	Zn Scalp Tailing	37.16	0.41	0.56	4.3	1.8
	Head (Calc)	100.00	3.58	11.4	100.0	100.0
77	Pb Cleaner Concentrate	3.92	64.3	1.64	68.7	0.6
	Pb Rougher Concentrate	17.31	18.0	8.84	84.8	13.5
	Zn Concentrate	9.76	0.42	57.7	1.1	49.9
	Zn 1st Cleaner Conc	14.69	0.71	44.2	2.8	57.5
	Zn 1st Cleaner Tail	14.69	1.13	19.8	4.5	25.7
	Zn Prefloat Tailing	13.98	0.95	0.94	3.6	1.2
	Zn Scalp Tailing	39.33	0.39	0.60	4.2	2.1
	Head (Calc)	100.00	3.67	11.30	100.0	100.0

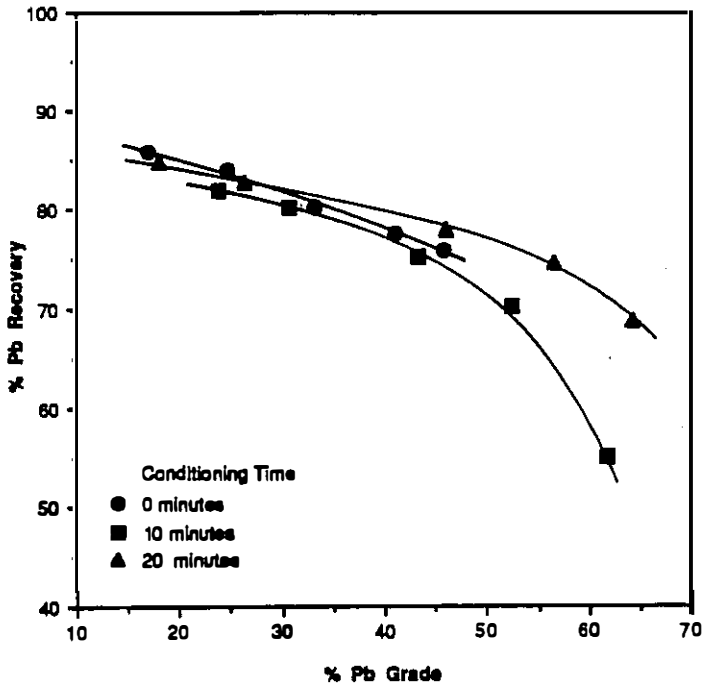


FIGURE NO. 27 : Effect of high intensity conditioning

Concentrate grade was significantly increased with high intensity conditioning, and recovery was increased with an increase in conditioning time from ten to twenty minutes.

Discussion - Continued

7.9. Effect of Secondary Collector on Pb Cleaning

Additional tests were conducted to further optimize flotation with various secondary collectors. Tests 71, 76 and 78 were conducted with LSB/THM, LSB/TH, and 830/TH respectively. (Test 71 conditions were considerably different than those of Tests 76 and 78, but it is included here for comparison). Test conditions and results are summarized in Table No .29 and Figure No. 28.

TABLE NO. 29 :
Effect of Secondary Collector on Pb Cleaning

A. Conditions: LEAD CIRCUIT

Test No.	Secondary Collector	REAGENT ADDITIONS, g/t									
		Primary Grind	Semi-bulk Ro	Semi-bulk Conc Regr	H.I. Cond	Pb Ro	Pb Ro Conc Regr	H.I. Cond	Pb 1st Cl	1st Cl Regrind	2nd to 4th Cl
76	LSB/TH	Na_2CO_3=1500 317=50 LSB/TH=20	317=55 LSB/TH=30 C7/MIBC=4.25	Na_2CO_3=300 PKD-C=300 (40 min)	317=25 LSB/TH=25 C7/MIBC=10 (10 min)	317=5 LSB/TH=5 C7/MIBC=7.5	-	-	PKD-C=15 317=15 LSB/TH=10	PKD-C=100 Na_2CO_3=100 (10 min)	PKD=15 -
71	LSB/THM	317=60 LSB/THM=24	317=35 LSB/TH=10 MIBC=40	Na_2CO_3=1200 PKD-C=200 LSB/THM=20 (50 min)	317=50 LSB/THM=20 MIBC=20 (20 min)	317=10 LSB/THM=10 MIBC=10	-	-	PKD-C=30 317=12.5 MIBC=2.5	-	PKD-C=70 317=25 LSB/THM=5
78	830/TH	Na_2CO_3=1500 317=50 830/TH=20	317=55 830/TH=30 C7/MIBC=42.5	Na_2CO_3=300 PKD-C=300 (40 min)	317=50 830/TH=25 C7/MIBC=10 (10 min)	317=5 830/TH=5 C7/MIBC=5	-	-	830/TH=25 PKD-C=15	PKD-C=100 Na_2CO_3=100 (10 min)	PKD-C=10 317=5 830/TH=20

A. Conditions: ZINC CIRCUIT

Test No.	REAGENT ADDITIONS, g/t					
	Zn Scalp	Scalp Regrind	Zn Pre-float Rougher	H.I. Cond*	Zn 1st Cleaner*	Zn 2nd to 3rd Cl
76	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 M2030 = 30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350 = 10 M2030 = 20 DF250 = 10	-	$Ca(OH)_2$ = 250	$Ca(OH)_2$ = 500 350 = 7.5
71	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 M2030 = 25	$Ca(OH)_2$ = 250 $CuSO_4$ = 100 M2030 = 5 (20 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350 = 10 M2030 = 20 DF250 = 10	-	$Ca(OH)_2$ = 50 DF250=10	$Ca(OH)_2$ = 375 350 = 7.5 DF250 = 10
78	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 M2030 = 30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 M2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350 = 10 M2030 = 20 DF250 = 12.5	-	$Ca(OH)_2$ = 250	$Ca(OH)_2$ = 500 350 = 7.5 DF250 = 10

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
76	Pb Cleaner Conc	3.19	61.8	2.09	55.0	0.6
	Pb Rougher Conc	12.33	23.8	6.30	81.9	6.8
	Zn Concentrate	12.15	0.34	63.4	1.2	67.7
	Zn 1st Cleaner Conc	17.92	0.75	52.9	3.7	83.4
	Zn 1st Cleaner Tail	16.99	1.20	4.32	5.7	6.5
	Zn Pre-float Ro Tail	15.61	1.02	1.08	4.4	1.5
	Zn Scalp Tail	37.16	0.41	0.56	4.3	1.8
	Head (Calc)	100.00	3.58	11.4	100.0	100.0
71	Pb Cleaner Conc	3.85	66.7	2.7	66.1	0.9
	Pb Rougher Conc	9.36	29.8	6.29	71.9	5.0
	Zn Concentrate	21.00	1.54	49.6	8.3	88.4
	Zn 1st Cleaner Conc	24.00	1.71	44.0	10.6	89.7
	Zn 1st Cleaner Tail	11.29	1.71	2.09	5.0	2.0
	Zn Pre-float Ro Tail	8.80	2.11	1.13	4.8	0.8
	Zn Scalp Tail	46.55	0.65	0.62	7.8	2.5
	Head (Calc)	100.00	3.88	11.8	100.0	100.0
78	Pb Cleaner Conc	3.48	65.2	1.62	62.3	0.5
	Pb Rougher Conc	15.10	21.0	7.19	87.3	9.7
	Zn Concentrate	11.58	0.33	61.1	1.0	63.1
	Zn 1st Cleaner Conc	14.71	0.52	53.6	2.3	70.4
	Zn 1st Cleaner Tail	13.40	1.11	13.4	4.1	16.0
	Zn Pre-float Ro Tail	13.79	0.45	0.99	1.7	1.2
	Zn Scalp Tail	43.01	0.39	0.70	4.6	2.7
	Head (Calc)	100.00	3.64	11.2	100.0	100.0

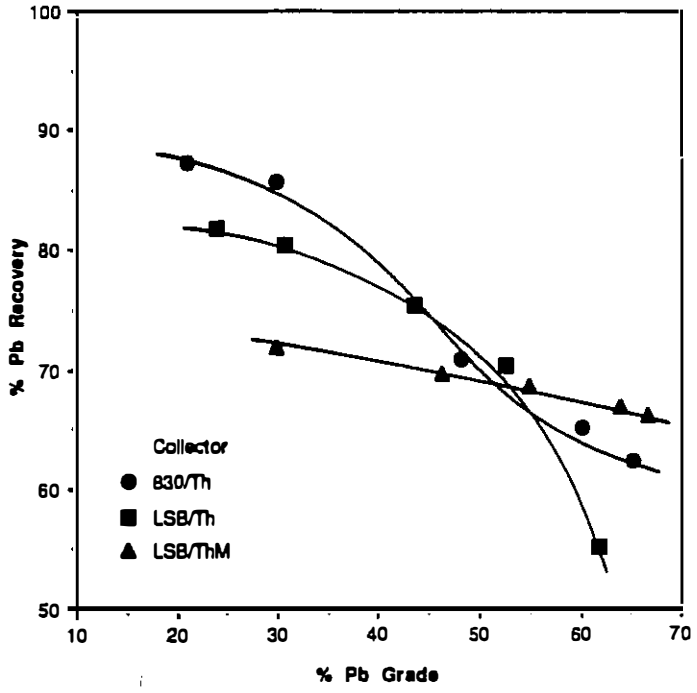


FIGURE NO. 28 : Effect of secondary collector type on lead cleaner flotation

All three collectors provided Pb grades of over 60%. The LSB/TH reagent resulted in Pb losses in the later cleaners.

Subsequent tests were conducted with the 830/TH as this collector seemed to provide the most stable froth.

7.10. Effect of Two Stage Regrinding

Regrinding of the Pb rougher or 1st cleaner concentrate was investigated. Conditions and results of Tests 68, 76 and 80 are are summarized in Table No. 30 and Figure No. 29.

TABLE NO. 30 :
Effect of Two-Stage Regrinding

A. Conditions: LEAD CIRCUIT

Test No.	Regrinding	REAGENT ADDITIONS, g/t									
		Primary Grind	Semi-bulk Ro	Semi-bulk Conc Regr	H.I. Cond	Pb Ro	Pb Ro Conc Regr	H.I. Cond	Pb 1st Cl	1st Cl Regrind	2nd to 4th Cl
76	Semi-bulk regrind 40 min Pb 1st Cl Conc regrind 10 min	Na_2CO_3= 1500 317=50 LSB/TH=20	317=55 LSB/TH=30 C7/MIBC= 4.25	Na_2CO_3=300 PKD-C=300 (40 min)	317= 25 LSB/TH=25 C7/MIBC= 10 (10 min)	317= 5 LSB/TH=5 C7/MIBC= 7.5	-	-	PKD-C=15 317=15 LSB/TH=1(	PKD-C=100 Na_2CO_3= 100 (10 min)	PKD-C=15 -
68	Semi-bulk regrind 46 min.	Na_2CO_3= 1500 317=50 LSB/TH=20	317=35 LSB/TH=30 C-7/MIBC =40	Na_2CO_3= 300 PKD-C=200 (40min)	317=50 LSB/TH =20 C-7/MIBC =15 (10 min)	LSB/TH=5 C-7/MIBC =7.5	-	-	LSB/TH =5	-	PKD-C=80
80	Semi-bulk regrind 30 min Pb Ro Conc regrind 20 min.	Na_2CO_3= 1500 317=50 830/TH=20	317=55 830/TH=30 C-7/MIBC =42.5	Na_2CO_3= 300 PKD-C=300 (30 min)	317=50 830/THM =25 C-7/MIBC =10 (10 min)	317=10 830/THM =10	Na_2CO_3 =100 PKD-C=100 (20 min)	317=10 830/TH=20 (10 min)	830/TH=5 C-7/MIBC =5	-	PKD-C=25

ZINC CIRCUIT:

Test No.	Reagent Additions, g/t					
	Zn Scalp	Scalp Regrind	Zn Pre-float Rougher	H.I. Cond	Zn 1st Cleaner	Zn 2nd to 3rd Cl
76	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 2030 = 30	$Ca(OH)_2$ = 500 $CuSO_4$ = 100 2030 = 5 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350 = 10 2030 = 20 250 = 10	-	$Ca(OH)_2$ = 250	$Ca(OH)_2$ = 500 350 = 7.5
68	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 50 2030 = 20	-	-	-	-	-
80	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 2030 = 30	$Ca(OH)_2$ = 600 $CuSO_4$ = 1000 350 = 70 2030 = 30 (30 min)	$Ca(OH)_2$ = 300 $CuSO_4$ = 500 350 = 25 2030 = 20 250 = 15	$Ca(OH)_2$ = 250 350 = 5 2030 = 10 250 = 5 (15 min)	$Ca(OH)_2$ = 250 350 = 5 2030 = 2.5	$Ca(OH)_2$ = 500 350 = 5

Discussion - Continued

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Pb	Zn	Pb	Zn
76	Pb Cleaner Conc	3.19	61.8	2.09	55.0	0.6
	Pb Rougher Conc	12.33	23.8	6.30	81.9	6.8
	Zn Concentrate	12.15	0.34	63.4	1.2	67.7
	Zn 1st Cleaner Conc	17.92	0.75	52.9	3.7	83.4
	Zn 1st Cleaner Tail	16.99	1.20	4.32	5.7	6.5
	Zn Pre-float Ro Tail	15.61	1.02	1.08	4.4	1.5
	Zn Scalp Tail	37.16	0.41	0.56	4.3	1.8
	Head (Calc)	100.00	3.58	11.4	100.0	100.0
68	Pb Cleaner Conc	5.37	53.1	2.48	72.8	1.2
	Pb Rougher Conc	18.16	18.5	8.38	85.6	13.9
	Pb Rougher Tail	25.63	0.88	14.3	5.8	33.5
	Zn Scalp Conc	18.68	1.02	29.1	4.9	49.7
	Zn Scalp Tail	37.53	0.39	0.84	3.7	2.9
	Head (Calc)	100.00	3.92	10.9	100.0	100.0
80	Pb Cleaner Conc	3.47	70.3	1.35	67.6	0.4
	Pb Rougher Conc	15.35	19.6	8.85	83.5	12.0
	Zn Concentrate	14.91	0.82	58.8	3.4	77.7
	Zn 1st Cleaner Conc	18.59	1.00	49.6	5.1	81.7
	Zn 1st Cleaner Tail	15.04	0.97	2.39	4.0	3.2
	Zn Pre-float Ro Tail	9.54	1.13	1.26	3.0	1.1
	Zn Scalp Tail	41.47	0.38	0.53	4.4	1.9
	Head (Calc)	100.00	3.61	11.28	100.0	100.0

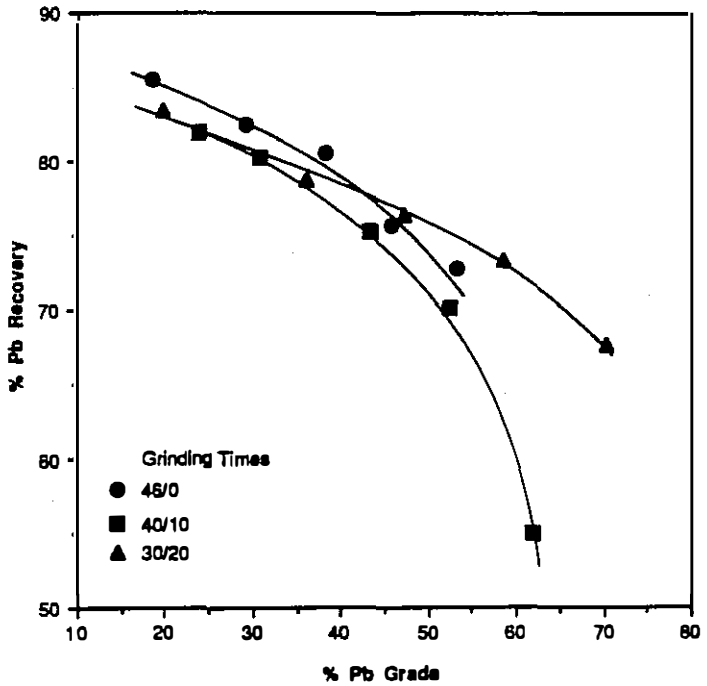


FIGURE NO. 29 : Effect of single and two-stage grinding on lead flotation

Discussion - Continued

The resuits indicated the following:

- A two-stage regrind provided a Pb product grade of over 60% Pb with recoveries of 55-68%. The single regrind of the semi-bulk concentrate in Test 68 provided a low grade. Fine grinding likely improved product grade by providing better liberation of galena from pyrite.
- High intensity conditioning of the Zn 1st cleaner feed was included in the flowsheet in Test 80. The resultant product grade was 59% Zn, as opposed to 53% Zn in Test 76. High intensity conditioning of the reground zinc concentrate therefore improved selectivity against pyrite, and was used in subsequent tests.

7.11. Locked Cycle Testwork

Three locked cycle tests were conducted on the ore in Tests 81, 82 and 84. The purpose of the testwork was twofold: to generate water samples for environmental testwork, and to evaluate the effect of recycling on metallurgical performance.

The flowsheet used in Tests 81 and 84 is shown in Figure No. 6. The flowsheet used for Test 82 was similar, but with the following changes:

- the 2nd Pb regrind was performed on the 1st cleaner concentrate.
- no high intensity conditioning of the 2nd regrind product was performed.

Test conditions and resuits are summarized in Table No. 31.

TABLE NO. 31 :
Locked Cycle Testwork

A. Conditions: LEAD CIRCUIT

Test No.	Purpose	Reagent Additions, g/t								
		Primary Grind	Semi-bulk Ro	Semi-bulk Conc Regr	H.I. Cond	Pb Ro	2nd Regrind	H.I. Cond	Pb 1st Cl	Pb 2nd to 4th Cls
81	Test 80 conditions but with longer semi bulk regrind, shorter Pb regrind.	Na_2CO_3= 1500 317=50 830/TH=20 (15 min)	317=35 830/TH=10 C-7/MIBC= 30	Na_2CO_3=300 PKD-C=300 (40 min)	317= 50 830/TH=25 C-7/MIBC= 10 (10 min)	317= 10 830/TH=10	Na_2CO_3 =100 PKD-C=100 (10 min) (Ro conc reground)	317=10 830/TH=20 (10 min)	-	PKD-C=150
82	As for Test 78 with out H.I. Cond of Pb regrind product.	Na_2CO_3= 1500 317=50 830/TH=20 (15 min)	317=55 830/TH=30 C-7/MIBC =42.5	Na_2CO_3= 300 PKD-C=300 (40 min)	317=50 830/TH =25 C-7/MIBC =10 (10 min)	317=5 830/TH=5 C-7/MIBC =5	Na_2CO_3 =100 PKD-C=100 (10 min) (1st Cl Conc reground)	-	PKD-C=15 C-7/MIBC =2.5	PKD-C/MIBC =10 317=5 830/TH=20
83	As for Test 81 but with a shorter semi-bulk regrind; longer Pb Ro regrind	Na_2CO_3= 1500 317=50 830/TH=20 (15 min)	317=35 830/TH=10 C-7/MIBC =30	Na_2CO_3= 300 PKD-C=300 (30 min)	317=50 830/TH =25 C-7/MIBC =10 (10 min)	317=10 830/TH =10	Na_2CO_3 =100 PKD-C=100 (15 min) (Ro conc reground)	317=10 830/TH=20 (10 min)	-	PKD-C=150

Discussion - Continued

ZINC CIRCUIT:

Test No.	Reagent Additions, g/t						
	Zn Scalp	Scalp Regrind	Zn Pre-float Rougher	H.I. Cond	Zn 1st Cleaner	Zn 2nd to 3rd Cl	Zn 1st Cl Scav
81	$Ca(OH)_2$=600 $CuSO_4$=1000 350=90 M2030=30	$Ca(OH)_2$=500 $CuSO_4$=100 M2030=5 (30 min)	$Ca(OH)_2$=300 $CuSO_4$=500 350=25 M2030=20 DF250=17.5	-	350=5 DF250=2.5	$Ca(OH)_2$=500 350=5	350=10 M2030=5
82	$Ca(OH)_2$=600 $CuSO_4$=1000 350=70 M2030=30	$Ca(OH)_2$=500 $CuSO_4$=100 M2030=5 (30 min)	$Ca(OH)_2$=300 $CuSO_4$=500 350=10 M2030=20 DF250=12.5	-	$Ca(OH)_2$=250	$Ca(OH)_2$=500 350=7.5 DF250=10	350=10 M2030=5
84	$Ca(OH)_2$=600 $CuSO_4$=1000 350=70 M2030=30	$Ca(OH)_2$=500 $CuSO_4$=100 M2030=5 (30 min)	$Ca(OH)_2$=300 $CuSO_4$=500 350=25 M2030=20 DF250=15	$Ca(OH)_2$=250 350=5 M2030=10 DF250=15	350=5 M2030=2.5	$Ca(OH)_2$=500 350=5	350=5 DF250=2.5

B. Results:

Test No.	Product	Weight %	Assays %			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
81	Pb Cleaner Conc	5.5	57.8	2.55	152	79.5	1.3	14.6
	Zn Cleaner Conc	17.5	0.74	57.4	139	3.2	92.4	41.9
	Zn Combined Tail	76.9	0.91	0.89	32.7	17.3	6.3	43.5
	Head (Calc)	100.00	4.03	10.9	57.9	100.0	100.0	100.0
82	Pb Cleaner Conc	5.3	53.4	5.28	174	78.8	2.5	15.8
	Zn Cleaner Conc	18.1	1.21	56.2	129	6.1	90.7	39.7
	Zn Combined Tail	76.6	0.71	0.99	34.2	15.1	6.8	44.5
	Head (Calc)	100.00	3.62	11.2	58.8	100.0	100.0	100.0
84	Pb Cleaner Conc	3.9	67.1	2.04	-	70.7	0.7	-
	Zn Cleaner Conc	18.2	1.55	54.9	-	7.6	90.6	-
	Zn Combined Tail	77.8	1.04	1.23	-	21.7	8.7	-
	Head (Calc)	100.00	3.73	11.1	-	100.0	100.0	-

The results showed the following:

- Pb recoveries of 70-80% were achieved with this flowsheet. Overall recovery in Test 81 approached Pb rougher recovery obtained in Test 80 (i.e. 79.5 % overall recovery in Test 81, 83.5 % rougher recovery in Test 80).

Discussion - Continued

Recovery was considerably lower in Test 84, but with a high grade product. There was clearly a strong relationship between lead recovery and concentrate grade.

- Excellent zinc product grades were obtained.
- The regrinding arrangement (i.e. 1st cleaner concentrate reground) and omission of high intensity conditioning in Test 82 yielded a relatively low grade Pb product.
- Increased regrinding of the Pb rougher concentrate in Test 84 contributed to the higher product grade.
- High zinc product grades (>55 % Zn) and Zn recoveries of over 90 % were achieved in each of the tests.
- Sliver recoveries were 54-55%.

The locked cycle testwork therefore confirmed that the flowsheet and reagent scheme could produce high grade concentrates with acceptably high metal recoveries. However, further development testwork is required to optimize several parameters in order to consistently achieve desired product grades.

7.12. Concentrate Assays

The concentrates from the final cycle of Test 81 were submitted for a 24 element smelter analysis. The results are presented in Table No. 32. The assays indicated that there should be no problem in marketing the lead and zinc concentrates.

TABLE NO. 32 :
Concentrate Assays

Element	Assays %, g/t	
	Pb Conc	Zn Conc
Pb	55.0	0.66
Zn	2.78	56.9
Cu	0.005	0.092
Fe	15.6	5.11
Ni	<0.002	<0.002
Bi	<0.002	<0.002
Cd	0.020	0.35
Co	<0.002	<0.002
Cr	<0.002	<0.002
As	<0.001	<0.001
Sb	0.008	<0.002
Sn	<0.001	<0.001
Au g/t	0.05	<0.02
Ag g/t	151	137
F	0.02	<0.01
Cl	0.0062	0.011
S	25.8	33.7
$C_{(T)}$	0.32	0.34
SiO_2	0.23	0.69
MgO	<0.002	0.010
CaO	0.05	0.20
Na_2O	0.002	0.004
K_2O	0.005	0.14
Hg	0.00091	0.0119
Insol	0.33	1.20

Discussion - Continued

7.13. Environmental Testwork

The combined tailings of locked cycle Tests 81/82 and 84 were collected for environmental testwork. The procedures were as follows:

Tests 81 & 82:

Each of the scalp tails, prefloat tails, and cleaner scavenger tails for each of the six cycles were collected and filtered using a clean buchner funnel and flask (cleaned with nitric and then hydrochloric acid, and thoroughly washed with distilled water). A representative portion of each cake was removed for a mass balance determination; and the remaining solids and water were added to clean plastic-lined 20L plastic pails. All of the tails were combined in this manner and excess water was decanted off to produce a 25-30% solids tailing.

This tailing was shipped to Rescan Environmental Services Ltd. in Vancouver for environmental testwork.

Test 84:

The method used in Test 81 was followed, but no solids were included in the environmental sample. Aii of the liquid was sent to Beak Consultants Ltd. in Brampton for environmental testwork.

All environmental metal assays were performed by other labs. However, cyanide complex assays for Test 84 effluent were completed by Lakefield Research. The results are shown in Table No. 33.

TABLE NO. 33 :
Cyanide Complex Assays on Locked Cycle Tailing Water Samples

Sample	Assays, ppm			
	CN_T	CN_{WAD}	CNS	CNO
Overall Tail Water	0.33	0.25	14.3	<0.3
Pb 1st Cl Tall Water	5.99	5.49	34.3	<0.3

7.14. Backfill Testwork

Some testing was conducted in order to perform a preliminary evaluation of backfill requirements. The scalp and prefloat tails of Test 83 were combined, the pyrite floated, and the percolation rate of the classified pyrite tall was determined.

The flotation conditions used in Test 83 were similar to those used in Test 80. The scalp and prefloat tails were conditioned with H_2SO_4 to reduce the pH to 6.5, and floated with A350 and DF250. Samples of the pyrite concentrate and tails were both submitted for cyciosizer analysis, and the pyrite tails were cycioned to remove slimes. The percolation rate of the backfill sands was then determined.

The data are summarized as follows:

- the percolation rate was 11.9 cm/h with a void ratio of 0.80.
- the backfill sands size analysis is shown in Table No. 34.

TABLE NO. 34 :
Backfill Size Analysis

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Passing
589	28	1.5	0.7	0.7	99.3
417	35	1.7	0.8	1.6	98.4
295	48	1.6	0.8	2.3	97.7
208	65	5.6	2.7	5.1	94.9
147	100	13.3	6.5	11.5	88.5
104	150	26.1	12.7	24.2	75.8
74	200	40.4	19.7	43.9	56.1
53	270	51.0	24.8	68.7	31.3
38	400	32.4	15.8	84.5	15.5
-38	-400	31.9	15.5	100.0	-
	Total	205.5	100.0	-	-

- iron recovery from the pyrite circuit feed was 76%, as shown in Table No. 35.

TABLE NO. 35 :
Pyrite Flotation Results

Test No.	Product	Weight %	Assays %		% Distribution	
			Fe	S	Fe	S
83	Pyrite Concentrate	29.9	37.3	43.8	76.3	58.6
	Pyrite Tailing	70.1	4.95	13.2	23.7	41.4
	Head (Calc)	100.0	14.6	22.3	100.0	100.0

The testwork demonstrated that a backfill product with a reasonably good percolation rate could be produced from the Cirque tailings.

8. Flotation of Other Ore Samples

8.1. Flotation of Rock Type 5 Ore

Twelve flotation tests were conducted with the semi-bulk flowsheet using Rock Type 5 ore. The purpose of the testwork was as follows:

- To confirm that the flowsheet and reagent scheme developed for Composite 1 ore would be appropriate for treatment of the higher sulphide ore in preparation for testing in the pilot plant.
- To evaluate the effect of dilution of the ore with Hanging Wall material; specifically, to determine whether the increased amount of carbonaceous material would resuit in dilution of the Pb concentrate.

Discussion - Continued

- To perform locked cycle testwork in preparation for pilot plant operation.
- To evaluate various process parameters in preparation for pilot plant operation.

Metallurgical results for Composite 1 and Rock Type 5 using the semi-bulk flowsheet are compared in Table No. 35.

TABLE NO. 35 :
Comparison of Composite 1 and Ore Type 5 Flotation - Semi-Bulk Flowsheet

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
80	Composite No. 1	Pb Cleaner Conc	3.47	70.3	1.35	67.6	0.4
		Pb Rougher Conc	15.35	19.6	8.85	83.5	12.0
		Zn Cleaner Conc	14.91	0.82	58.8	3.4	77.7
		Zn 1st Cl Conc	18.59	1.00	49.6	5.1	81.7
		Zn Combined Tail	51.01	0.52	0.67	7.4	3.0
		Head (Calc)	100.00	3.61	11.3	100.0	100.0
85	Rock Type 5	Pb Cleaner Conc	3.80	62.2	1.82	63.9	0.5
		Pb Rougher Conc	20.72	14.2	9.29	79.6	14.2
		Zn Cleaner Conc	18.40	0.95	51.7	4.7	70.3
		Zn 1st Cl Conc	24.67	1.08	41.8	7.2	76.3
		Zn Combined Tail	47.78	0.89	2.37	11.5	8.4
		Head (Calc)	100.00	3.70	13.5	100.0	100.0

Product grades and recoveries were somewhat lower for the higher sulphide Rock Type 5 ore. However, the metallurgical results in Test 85 were reasonably good, and confirmed that the semi-bulk flowsheet and the reagent scheme were suitable for treatment of the high sulphide ore.

The following parameters were investigated:

- pH modifier type and level
- frother type
- regrinding times
- carbon preflotation.

In addition, one test was completed using the conventional flowsheet and reagents. The test results for Tests 40 (Composite 1 - lead circuit), and 86 (Rock Type 5) are compared in Table 37.

Discussion - Continued

TABLE NO. 37 :
Comparison of Composite 1 and Rock Type 5 Flotation - Conventional Flowsheet

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
40	Composite No. 1	Pb Cleaner Conc	6.24	51.6	5.16	78.3	2.7
		Pb Rougher Conc	43.27	8.96	17.1	94.2	62.9
		Pb Scav Tail	56.73	0.42	7.70	5.8	37.1
		Head (Calc)	100.00	4.12	11.8	100.0	100.0
86	Rock Type 5	Pb Cleaner Conc	2.75	44.7	3.53	33.9	0.7
		Pb Rougher Conc	62.87	5.49	13.6	95.0	62.5
		Pb Scav Tail	37.13	0.49	13.8	5.0	37.5
		Head (Calc)	100.00	3.63	13.6	100.0	100.0

A very low Pb recovery was obtained in Test 86. The test confirmed that the conventional flowsheet yields a low grade lead product from this ore.

8.1.1. Effect of Dilution with Hanging Wall Shale

The effect of dilution of the ore with Hanging Wall material was investigated in Tests 85, 88 and 93. Test results are summarized in Table No. 38.

TABLE NO. 38 :
Effect of Hanging Wall Dilution on Rock Type 5 Flotation

Test No.	Ore Type	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
85	Rock Type 5 100%	Pb Cleaner Conc	3.80	62.2	1.82	63.9	0.5
		Pb Rougher Conc	20.72	14.2	9.29	79.6	14.2
		Zn Cleaner Conc	18.40	0.95	51.7	4.7	70.3
		Zn 1st Cl Conc	24.67	1.08	41.8	7.2	76.3
		Zn Combined Tail	47.78	0.89	2.37	11.5	8.4
		Head (Calc)	100.00	3.70	13.5	100.0	100.0
88	Rock Type 5 90%	Pb Cleaner Conc	3.48	59.5	1.93	63.1	0.5
		Pb Rougher Conc	18.53	13.6	8.48	77.0	12.9
		Zn Cleaner Conc	17.30	0.87	53.5	4.6	75.8
		Zn 1st Cl Conc	22.52	1.03	42.5	7.1	78.3
		Zn Combined Tail	45.52	0.81	1.82	11.3	6.8
		Head (Calc)	100.00	3.28	12.2	100.0	100.0
93	Rock Type 5 80%	Pb Cleaner Conc	2.19	72.7	1.04	55.9	0.2
		Pb Rougher Conc	10.61	19.4	6.72	72.4	6.5
		Zn Cleaner Conc	17.26	1.08	53.0	6.5	83.7
		Zn 1st Cl Conc	20.94	1.24	44.8	9.1	85.9
		Zn Combined Tail	53.36	0.64	1.05	12.1	5.1
		Head (Calc)	100.00	2.85	10.9	100.0	100.0

Discussion - Continued

The data showed the following:

- Pb concentrate grade was not reduced by the additional carbonaceous material. In fact, a very high grade product was produced in Test 93 (20% of feed hanging wall material). Most of the excess carbonaceous material was rejected in the semi-bulk and scalp tails.
- Zinc circuit metallurgy was not adversely affected; in fact, zinc recovery increased with increased Hanging Wall content in the feed.

8.1.2. Effect of Carbon Preflotation

One test was conducted to examine the effect of carbon preflotation. The ore (90% Type 5, 10% Hanging Wall) was ground in water and Dowfroth 250 was added to float graphite. Semi-bulk-Pb and Zn flotation, roughly similar to that in Test 88, was completed, but with carbonate and collectors added to semi-bulk flotation conditioning (MIBC frother was used in lead flotation instead of C-7/MIBC). Test results are summarized in Table No. 39.

TABLE NO. 39:
Effect of Carbon Preflotation on Pb and Zn Metallurgy

Test No.	Conditions	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
89	Without C pre-float, reagents added to grind.	Pb Cleaner Conc	3.48	59.5	1.93	63.1	0.5
		Pb Rougher Conc	18.53	13.6	8.48	77.0	12.9
		Zn Cleaner Conc	17.30	0.87	53.5	4.6	75.8
		Zn 1st Cl Conc	22.52	1.03	42.5	7.1	78.3
		Zn Combined Tail	45.52	0.81	1.82	11.3	6.8
		Head (Calc)	100.00	3.28	12.2	100.0	100.0
87	With C pre-float, reagents added to semi-bulk feed.	Pb Cleaner Conc	2.53	73.0	1.33	56.6	0.3
		Pb Rougher Conc	9.11	24.1	9.87	67.5	7.3
		Zn Cleaner Conc	8.86	0.67	55.4	1.8	39.9
		Zn 1st Cl Conc	11.76	0.83	45.6	3.0	43.6
		Zn Combined Tail	67.48	1.03	7.56	21.4	41.5
		Carbon Conc	6.20	3.43	10.1	6.5	5.1
		Head (Calc)	100.00	3.26	12.3	100.0	100.0

The results showed the following:

- Lead recovery was reduced, in part due to a loss of 6.5% of the Pb in the carbon concentrate. Pb concentrate grade was over 73%.
- Zinc recovery was greatly reduced as a recovery of 40% was obtained.

The advantages of including a C prefloat were not clearly defined in this test, and further testwork was not pursued.

Discussion - Continued

8.1.3. Effect of Frother Type

Three semi-bulk/lead circuit frothers were examined in this testwork: C-7/MIBC, MIBC, and AF65. The results of Tests 85 and 94 are compared in Table No. 40.

TABLE NO. 40 :
Comparison of Frothers AF65 and C-7/MIBC

Test No.	Frother	Product	Weight %	Assays %		% Distribution	
				Pb	Zn	Pb	Zn
85	C-7/MIBC	Pb Cleaner Conc	3.80	62.2	1.82	63.9	0.5
		Pb Rougher Conc	20.72	14.2	9.29	79.6	14.2
		Zn Cleaner Conc	18.40	0.95	51.7	4.7	70.3
		Zn 1st Cl Conc	24.67	1.08	41.8	7.2	76.3
		Zn Combined Tail	47.78	0.89	2.37	11.5	8.4
		Head (Calc)	100.00	3.70	13.5	100.0	100.0
94	AF65	Pb Cleaner Conc	5.52	47.9	2.48	69.7	1.0
		Pb Rougher Conc	20.01	14.6	7.37	76.8	10.7
		Zn Cleaner Conc	19.19	0.85	56.3	4.3	78.3
		Zn 1st Cl Conc	23.96	1.26	47.2	8.0	82.0
		Zn Combined Tail	36.91	0.71	1.24	6.9	3.3
		Head (Calc)	100.00	3.79	13.8	100.0	100.0

The AF65 produced much heavier froths than did the C-7/MIBC, and resulted in a very low Pb product grade.

AF65 was used in Tests 95 and 97-99. Lead product grades were generally poor (i.e. <56% Pb) or at higher grades, Pb recovery was quite low. AF65 was used in the first cycle of locked cycle Test 96, but high weight recoveries lead to switching to MIBC after the first cycle.

Therefore, the use of AF65 was not considered to be appropriate.

MIBC was used in Test 99 (diluted ore). The best comparison would be with Test 95 (undiluted ore). The MIBC yielded a higher grade but at lower recovery. MIBC was therefore used in locked cycle test 100, and in the pilot plant (this was partly due to an effort to limit the number of pilot plant reagents).

Discussion - Continued

8.1.4. Effect of pH Modifier

Lime was used as the pH modifier in Test 90. Metallurgical results were extremely poor, with low Pb and Zn recoveries and grades. Further tests with lime were not conducted.

The primary grinding carbonate level was increased from 1500 g/t to 2500 g/t after Test 94. The closest comparison that can be made is between Test 94 (with C-7/MIBC frother) and Test 95 (same frother but also with increased PKD-C in the Pb rougher regrind). Pb product grade was higher in Test 95 (56.5 % Pb as opposed to 47.9 %), but the higher grade may be attributed to either factor.

Locked cycle Tests 96 and 100 were conducted with 2500 g/t Na_2CO_3 in the primary grind, and the higher level of PKD-C (i.e. 300 g/t) in the Pb rougher regrind.

8.1.5. Locked Cycle Flotation

Locked cycle flotation was performed in Tests 96 and 100, according to the flowsheet used for Tests 81, 82 and 84 for Composite 1. Test conditions and results are presented in Table No. 41. The differences in the conditions for the two tests are contrasted as follows:

Test 96 - Semi-bulk Lead Circuit:

- Less semi-bulk collector 317 was used
- Less Pb rougher H.I. conditioning collectors were used.
- More MIBC used in the Pb rougher and 1st cleaner.
- Shorter regrinding times were used. Semi-bulk and Pb regrind times were 30 and 20 minutes respectively, as compared with 40 and 30 minutes respectively in Test 100.

Test 96 - Zn Circuit:

- Less lime was used in the Zn scalp.
- Lime was added to the zinc prefloat.
- Lime was added to the Zn 1st cleaner.

TABLE NO. 41 :
Locked Cycle Flotation

A. Conditions : LEAD CIRCUIT:

Test No.	Reagent Additions, g/t								
	Primary Grind	Semi-bulk Ro	Semi-bulk Conc Regr	H.I. Cond	Pb Ro	Pb Ro Conc Regr	H.I. Cond	Pb 1st Cl	Pb 2nd to 4th Cls
96	Na_2CO_3=2500 317=50 830/TH=20	317=25 MIBC=20	Na_2CO_3=300 PKD-C=300 (30 min)	317=20 830/TH=10 MIBC=5 (15 min)	317=10 830/TH=5	Na_2CO_3=100 PKD-C=300 (20 min)	317=10 M2030=20 (10 min)	317=5	PKD-C=225 (75g/t per stage)
100	Na_2CO_3=2500 317=50 830/TH=20	317=35 M2030=25	Na_2CO_3=300 PKD-C=300 (40 min)	317=50 830/TH=25 (15 min)	317=10 830/TH=5 MIBC=5	Na_2CO_3=100 PKD-C=300 (30min)	317=10 M2030=20 MIBC=10 (10 min)	317=10 MIBC=10	PKD-C=225 (75g/t per stage)

ZINC CIRCUIT:

Test No.	Reagent Additions, g/t						
	Zn Scalp	Zn Scalp Regrind	Zn Prefloat	H.I. Cond	Zn 1st Cleaner	Zn 1st Cl Scav	Zn 2nd -3rd Cls
96	$Ca(OH)_2$=1200 $CuSO_4$=1000 317=45 M2030=15 DF250=12.5	$Ca(OH)_2$=500 $CuSO_4$=200 (30 min)	$Ca(OH)_2$=750 $CuSO_4$=500 317=30 M2030=15 DF250=15	$Ca(OH)_2$=250 317=15 M2030=10 DF250=5 (15 min)	$Ca(OH)_2$=250 317=5 M2030=5 DF250=12.5	317=5 M2030=5 DF250=5	$Ca(OH)_2$ =1000 317=2.5 M2030 =2.5 DF250=5
100	$Ca(OH)_2$=800 $CuSO_4$=1000 317=45 M2030=15 DF250=20	$Ca(OH)_2$=500 $CuSO_4$=200 (30 min)	$Ca(OH)_2$=1050 $CuSO_4$=500 317=30 M2030=15 DF250=15	$Ca(OH)_2$=250 317=15 M2030=10 DF250=5 (15 min)	317=5 M2030=5 DF250=12.5	317=5 M2030=5 DF250=5	317=1000 M2030=5 DF250=5

B. Results:

Test No.	Product	Weight %	Assays %		% Distribution	
			Fe	S	Fe	S
96	Pb Cleaner Conc	4.8	55.3	2.28	72.4	0.8
	Zn Cleaner Conc	22.7	1.38	54.1	8.5	90.3
	Zn Combined Tail	72.5	0.97	1.68	19.1	8.9
	Head (Calc)	100.0	3.68	13.6	100.0	100.0
100	Pb Cleaner Conc	4.0	68.3	1.37	74.2	0.4
	Zn Cleaner Conc	28.8	1.29	45.2	10.0	95.5
	Zn Combined Tail	67.2	0.86	0.83	15.7	4.1
	Head (Calc)	100.0	3.69	13.6	100.0	100.0

Discussion

The test results showed the following:

- An excellent lead grade was achieved in Test 100. The high grade may have been due to the finer regrinding.
- Zn grade was 54% in Test 96, but was poor in Test 100.

The testwork confirmed that good metallurgical results could be achieved with the high sulphide ore. As was concluded for the flotation of Composite 1 ore, further testwork would have been desirable to optimize results to consistently achieve the higher grade products.

8.1.6. Mineralogy of Zn Prefloat Tails

A sample of locked cycle Test 96 prefloat tail (Cycle F) was submitted for mineralogical examination. Two polished sections were prepared and a grain count estimate made using a high power objective on the ore microscope in order to determine the proportion of liberated and locked sphalerite and galena grains. Results of the grain count are as follows:

		Est % by volume
Sphalerite	liberated grains	19.1
	associated with pyrite	76.4
	associated with gangue	4.5
Galena	liberated grains	0
	associated with pyrite	100

The grain size of sphalerite in the various associations is as follows:

liberated sphalerite 2.5 μm average, 12.0 μm maximum

associated with pyrite 2.2 μm average, 20.0 μm maximum

associated with gangue 1.7 μm average, 9.0 μm maximum.

Galena associated with pyrite 1.6 μm average 9.0 μm maximum.

8.2. Flotation of Rock Type 4 Ore

Three tests were conducted on Rock Type 4 ore. The tests were conducted in a manner similar to that in Test 85 with very minor modifications in collector levels. The purpose of the testwork was to confirm the flowsheet and reagent scheme for this ore type and to investigate the effect of dilution of the ore with Hanging Wall material.

Test conditions and results are summarized in Table No. 42.

Discussion - Continued

TABLE NO. 42 :
Rock Type 4 Flotation Results

Test No.	Feed		Product	Weight %	Assays %		% Distribution	
	% Rock Type 4	% Hanging Wall Shale			Pb	Zn	Pb	Zn
91	100	0	Pb Cleaner Conc	2.68	77.6	1.00	80.2	0.3
			Pb Rougher Conc	8.68	26.4	7.40	88.3	7.6
			Zn Cleaner Conc	12.20	0.58	58.1	2.7	83.5
			Zn 1st Cleaner Conc	14.11	0.66	51.3	3.6	85.1
			Zn Combined Tail	70.46	0.24	0.74	6.6	6.1
			Head (Calc)	100.00	2.59	8.50	100.0	100.0
89	90	10	Pb Cleaner Conc	2.53	71.0	1.61	80.1	0.5
			Pb Rougher Conc	10.82	18.4	7.89	88.6	11.1
			Zn Cleaner Conc	11.41	0.61	55.8	3.1	82.9
			Zn 1st Cleaner Conc	14.39	0.65	45.1	4.2	84.5
			Zn Combined Tail	63.90	0.18	0.38	5.0	3.1
			Head (Calc)	100.00	2.24	7.68	100.0	100.0
92	80	20	Pb Cleaner Conc	1.97	75.9	0.95	74.5	0.3
			Pb Rougher Conc	8.74	19.6	6.95	85.3	8.9
			Zn Cleaner Conc	9.67	0.48	57.0	2.3	81.2
			Zn 1st Cleaner Conc	11.68	0.63	48.6	3.7	83.5
			Zn Combined Tail	72.01	0.24	0.59	8.5	6.2
			Head (Calc)	100.00	2.01	6.79	100.0	100.0

The results of the testwork indicated the following:

- Excellent metallurgical results were obtained with high Pb and Zn grades and recoveries. This confirmed the observation made in previous testwork that the lower sulphide ore is not as difficult to float.
- Dilution of the ore with the Hanging Wall carbonaceous material did not adversely affect metallurgical performance. Specifically, the lead concentrate was not severely diluted by the additional carbonaceous material introduced into the feed sample.

No further tests were conducted with this ore sample, and no locked cycle flotation was completed.

9. Reagents

A list of reagents used in the testwork is shown in Table No. 43.

TABLE NO. 43 :
List of Reagents

Name	Description	Use	Supplier
Modifiers & Depressants:			
Calcium Hydroxide	$Ca(OH)_2$	Modifier / Depressant	Nymoc
Cupric Sulphate	$CuSO_4 . 5H_2O$	Activator	Nymoc
Sodium Carbonate	Na_2CO_3	Modifier / Depressant	Nymoc
Sodium Silicate	Na_2SiO_3	Dispersant	National Silicates
Sodium Cyanide	NaCN	Depressant	Nymoc
Sulphur Dioxide	SO_2	Depressant	Nymoc
PKD	Hart Chemicals SD100	Depressant	Hart Chemical
PKD-C**	PKD/NaCN (1:1)	Depressant	Lakefield Research
PQ4	Caustic Starch*	Depressant	Lakefield Research
PZ-3	Caustic Starch*	Depressant	Lakefield Research
PZ-3-C	Caustic Starch/NaCN*	Depressant	Lakefield Research
Collectors:			
317	Na Isobutyl Xanthate	Collector	Cyanamid
343	Na Isopropyl Xanthate	Collector	Cyanamid
350	K Amyl Xanthate	Collector	Cyanamid
317 modified	Na Isobutyl Xanthate/ Propylene-diamine (4:1)	Collector	Lakefield Research
830/TH	Mercaptobenzyl thiazole: dithlophosphate/thiourea (4:1)	Collector	CA830-Allied Colloids
M2030	Isopropyl Ethyl Thiono-carbamate	Collector	Cyanamid
3418A	Phosphine	Collector	Cyanamid
317/3418A	Xanthate/Phosphine (1:1)	Collector	Cyanamid
242	Aryl Dithiophosphate	Secondary Collector	Cyanamid
242/TH	Aryl Dithlophosphate/ Thiourea (1:1)	Secondary Collector	Lakefield Research
3418A/TH	Phosphine/Thiourea (1:1)	Secondary Collector	Lakefield Research
SP117	Na mercaptobenzothiazole	Secondary Collector	Hart Chemical
SP117 THM	Na mercaptobenzothiazole /thiourea/propylene diamine (4:1:1)	Secondary Collector	Lakefield Research
SP117 GR	*	Secondary Collector	Lakefield Research
Hostaflot LSB	Na di-sec butyl dithiophosphate	Secondary Collector	Hoechst
LSB/TH	LSB/Thiourea (4:1)	Secondary Collector	Lakefield Research
LSB/THM	LSB/Thiourea/propylene diamine (4:1:1)	Secondary Collector	Lakefield Research
LSBCU	*	Secondary Collector	Lakefield Research
LSB/GR	*	Secondary Collector	Lakefield Research
Frothers:			
MIBC	Methyl Isobutyl benzyl carbinol	Frother	Bate Chemical
AF65	Polypropylene glycol	Frother	Cyanamid
DF1012	Polyglycol	Frother	Dow Chemical
Flotanol C-7/MIBC	Polyalkalene glycol/carbinol	Frother	Hoechst/Bate Chem
MIBC/AF65	Carbinol/Polyglycol	Frother	Bate Chem/Cyanamid
DF250	Polyglycol	Frother	Dow Corning

* modified collectors or starches
**PKD-C and SD200/cyanide are equivalent reagents; SD200 is Hart Chemical's trade name.

SEMI-BULK FLOTATION FLOWSHEET TEST DETAILS

Test No. 2

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc.1	179.7	9.06	14.1	8.65	124.80	30.5	6.7	15.7
2. Pb,Zn Ro. Conc. 2	289.3	14.59	14.80	11.80	105.90	51.5	14.6	21.4
3.Pb,Zn Ro. Conc. 3	420.0	21.17	2.28	13.50	85.90	11.5	24.3	25.2
4. Ro. Tail	1094.5	55.18	0.49	11.60	49.40	6.5	54.4	37.8
Head Calc.	1983.5	100.00	4.19	11.76	72.20	100.0	100.0	100.0

Comb. Prod.

Products 1+2	23.65	14.53	10.59	113.14	82.0	21.3	37.1
Products 1-3	44.82	8.74	11.97	100.27	93.5	45.6	62.2

Test No. 3

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	231.9	11.7 1	18.50	9.10	122.70	52.5	9.8	20.9
2.Pb,Zn Ro. Conc.2	283.3	14.31	9.46	14.00	102.30	32.8	18.5	21.3
3. Pb,Zn Ro. Conc. 3	327.2	16.53	2.05	16.10	90.30	8.2	24.5	21.7
4. Zn Scalp	123.0	6.21	0.67	42.20	105.70	1.0	24.2	9.6
5. Zn Tail	1014.6	51.24	0.44	4.88	35.60	5.5	23.0	26.5
Head Calc.	1980.0	100.00	4.13	10.85	68.74	100.0	100.0	100.0

Comb. Prod.

Products 1+2		26.02	13.53	11.79	111.48	85.3	28.3	42.2
Products 1to3		42.55	9.07	13.47	103.25	93.5	52.8	63.9
Products 1to3		48.76	8.00	17.13	103.57	94.5	77.0	73.5

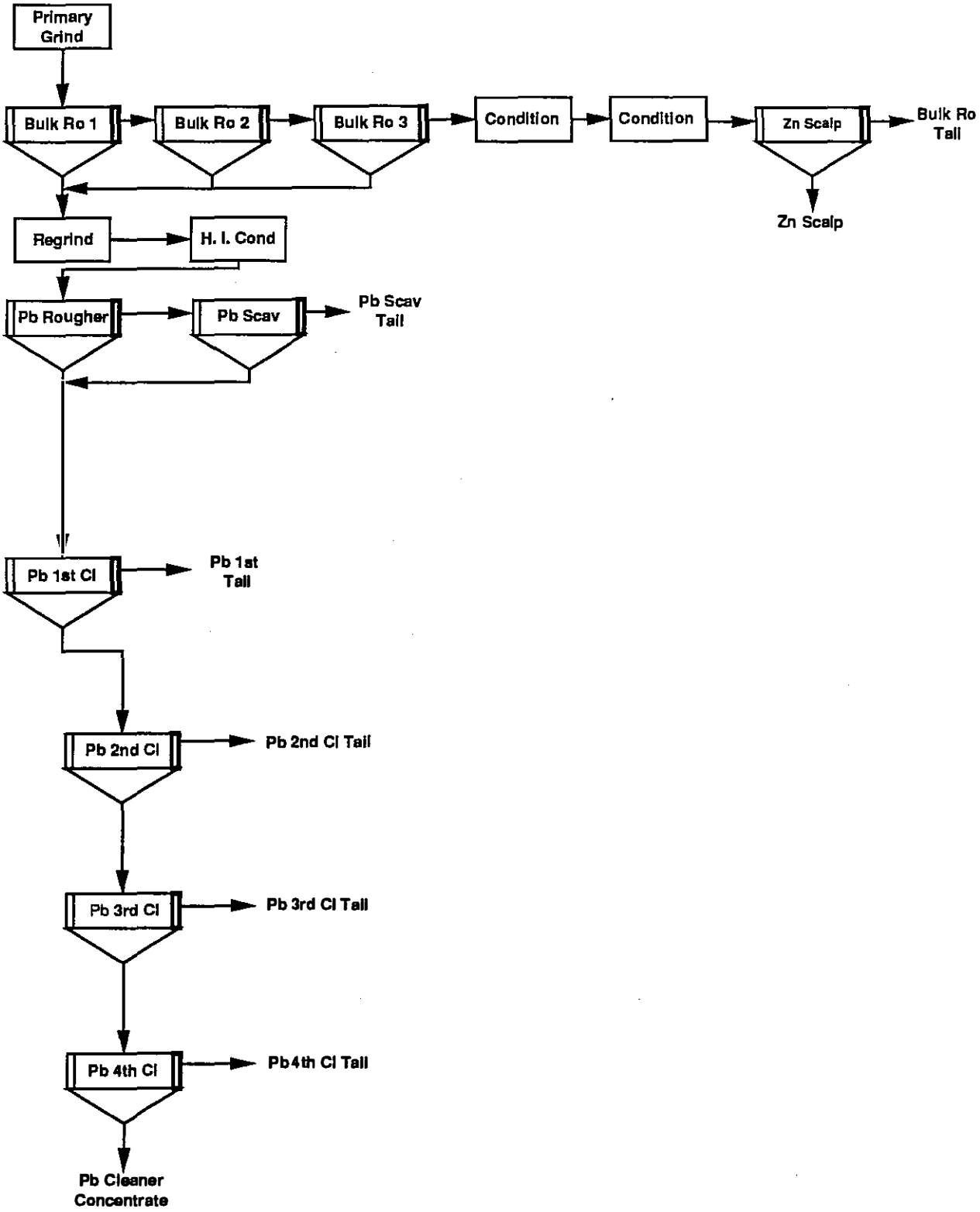
Test No. 4

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	387.4	19.61	15.20	10.10	119.20	72.3	17.2	33.3
2.Pb,Zn Ro. Conc.2	153.1	7.75	7.38	14.60	95.30	13.9	9.8	10.5
3. Pb,Zn Ro. Conc. 3	226.4	11.46	1.91	15.70	85.60	5.3	15.6	14.0
4. Zn Scalp	84.9	4.30	0.81	27.90	77.90	0.8	10.4	4.8
5. Zn Tail	1124.2	56.89	0.56	9.48	46.00	7.7	46.9	37.3
Head Calc.	1976.0	100.00	4.12	11.50	70.08	100.0	100.0	100.0

Comb. Prod.

Products 1+2	27.35	12.98	11.37	112.43	86.1	27.0	43.9
Products 1-3	38.81	9.72	12.65	104.51	91.4	42.7	57.9
Products 1-4	43.11	8.83	14.17	101.86	92.3	53.1	62.7

Test No. 5 Flowsheet



TEST NO. 6

Purpose: To repeat conditions of Test 3, but replace 242/TH mixture with 3418A/TH mixture.

Procedure: As for Test 3.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	317	3418A / TH	MIBC	$CuSO_4$	Grind	Cond.	Froth	
Grind	50	20	-	-	20	-	-	-
Bulk Rougher 1	25	-	25	-	-	1	3	7.8
2	10	10	15	-	-	1	4	-
3	15	15	12.5	-	-	1	3	-
Zn Scalp	15	-	12.5	500	-	1	3.5	-

TEST NO. 7

Purpose: To repeat roughing conditions of Test 4, but improve recovery by increased Pb rougher stage collector addition and using the modified LSB/TH collector, LSB/THM.

Procedure: Grind, then float a bulk rougher concentrate. Regrind the concentrate in the lab rod mill, and high intensity condition. Float a Pb rougher and scavenger, clean 4 times to produce a Pb concentrate. Condition the bulk rougher tail with lime and increased $CuSO_4$ to improve Zn recovery in Zn scalp.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB TH-M	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	60	24	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	-	2.5	7.7
2	10	10	15	-	-	-	-	4.0	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	40	20	20	-	-	-	20	-	-
Pb Rougher	-	-	-	-	-	-	-	3.7	9.9
Pb Scavenger	10	-	-	-	-	-	1	1.0	-
Pb 1st Cleaner	5	-	-	-	20	-	-	7.3	-
Pb 2nd Cleaner	5	2.5	5.0	-	30	-	1	5.0	9.5
Pb 3rd Cleaner	5	2.5	-	-	30	-	1	5.0	-
Pb 4th Cleaner	5	5	-	-	20	-	1	4.0	-

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	LSB/THM	Grind	Cond.	Froth	
Condition	670	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	10.5
Zn Scalp	-	-	50	20	-	-	1	3	-

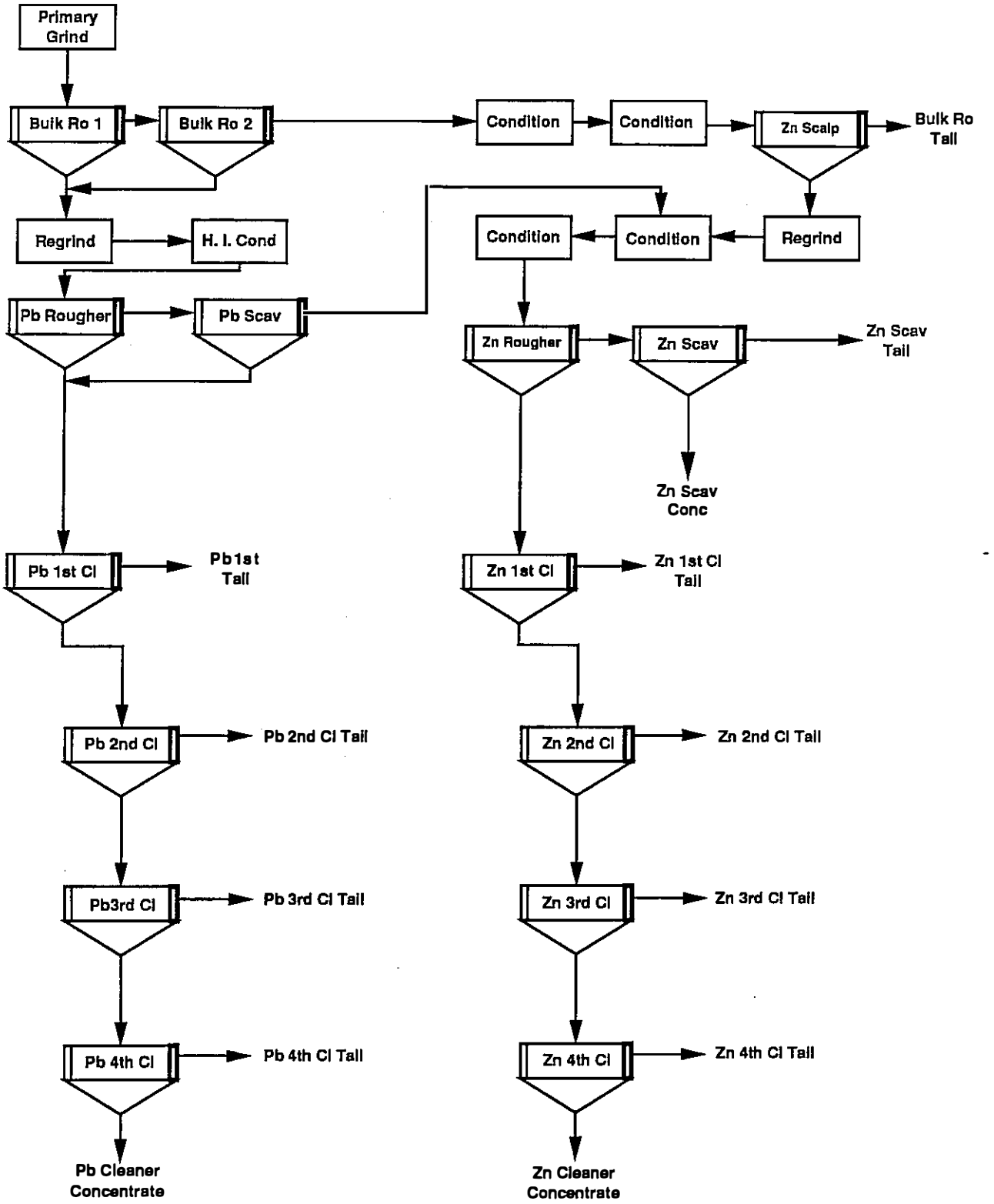
Test No. 7

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	74.3	3.73	68.6	1.77	179.3	66.8	0.5	11.0
2. Pb 4th Cl. Tail	8.2	0.41	25.4	4.56	114.0	2.7	0.2	0.8
3. Pb 3rd Cl. Tail	12.9	0.65	17.2	6.35	117.6	2.9	0.3	1.3
4. Pb 2nd Cl. Tail	22.5	1.13	7.98	8.11	119.8	2.4	0.8	2.2
5. Pb1st Cl. Tail	27.1	1.36	4.00	9.45	99.5	1.4	1.1	2.2
6. Pb Scav Conc.	13.3	0.67	4.93	8.75	101.3	0.9	0.5	1.1
7. Pb Ro. Tail	422.0	21.16	1.65	13.6	73.3	9.1	23.8	25.5
8. Zn Scalp	424.3	21.27	1.32	38.4	109.8	7.3	67.5	38.4
9. Ro. Tail	989.9	49.63	0.50	1.30	21.4	6.5	5.3	17.5
Head Calc.	1994.5	100.00	3.83	12.10	60.78	100.0	100.0	100.0

Combined Products

Products 1+2	4.14	64.31	2.05	172.81	69.5	0.7	11.8
Products 1-3	4.78	57.94	2.63	165.34	72.4	1.0	13.0
Products 1-4	5.91	48.40	3.68	156.65	74.8	1.8	15.2
Products 1-5	7.27	40.10	4.75	145.97	76.2	2.9	17.5
Products 1-6	7.94	37.15	5.09	142.22	77.1	3.3	18.6
Products 1-7	29.10	11.33	11.28	92.10	86.2	27.1	44.1
Products 1-8	50.37	7.10	22.73	99.58	93.5	94.7	82.5

Test No. 8 Flowsheet



TEST NO. 9

Purpose: To conduct a test using optimum conditions thus far.

Procedure: As for Test 8, but using secondary collector 3418A/TH, and with zinc cleaning.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	3418A TH	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	50	20	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	-	4	-
3	15	15	12.5	-	-	-	-	3	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	50	20	20	-	-	-	20	-	-
Pb Rougher	-	-	-	-	-	-	-	4.5	-
Pb Scavenger	10	10	-	-	-	-	-	2	-
Pb 1st Cleaner	10	-	-	-	30	-	1	3.5	-
Pb 2nd Cleaner	10	5	2.5	-	20	-	1	3	-
Pb 3rd Cleaner	10	5	2.5	-	20	-	1	3	-
Pb 4th Cleaner	5	-	-	-	30	-	1	3	-

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	LSB/TH-M	Grind	Cond.	Froth	
Condition	800	-	-	-	-	-	5	-	10.7
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	1	3	-

TEST NO. 10

Purpose: To repeat the conditions of Test 6 but replace secondary collector 3418A/TH with modified SP117 (SP117M).

Procedure: Bulk flotation similar to Test 6. Zinc scalp similar to Test 7.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne							Time, minutes			pH
		317	SP117M	MIBC	$CuSO_4$	M2030	$Ca(OH)_2$	350	Grind	Cond.	Froth	
Grind		58	20	-	-	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	25	-	-	-	-	-	1	3	7.5
	2	10	10	12.5	-	-	-	-	-	1	3	-
	3	10	15	12.5	-	-	-	-	-	1	3	-
Conditioning	1	-	-	-	-	-	450	-	-	5	-	-
	2	-	-	-	800	-	-	-	-	5	-	9.5
Zn Scalp		-	-	-	-	20	-	50	-	3	5	-
		-	-	5.0	-	-	-	10	-	1	2	-

TEST NO. 11

Purpose: As for Test 8, but with secondary collector 348A/TH, and with 2nd regrinding stages and high intensity conditioning prior to lead cleaning and zinc cleaning.

Procedure: Similar to Test 8, but with pebble mill regrinding prior to cleaning.

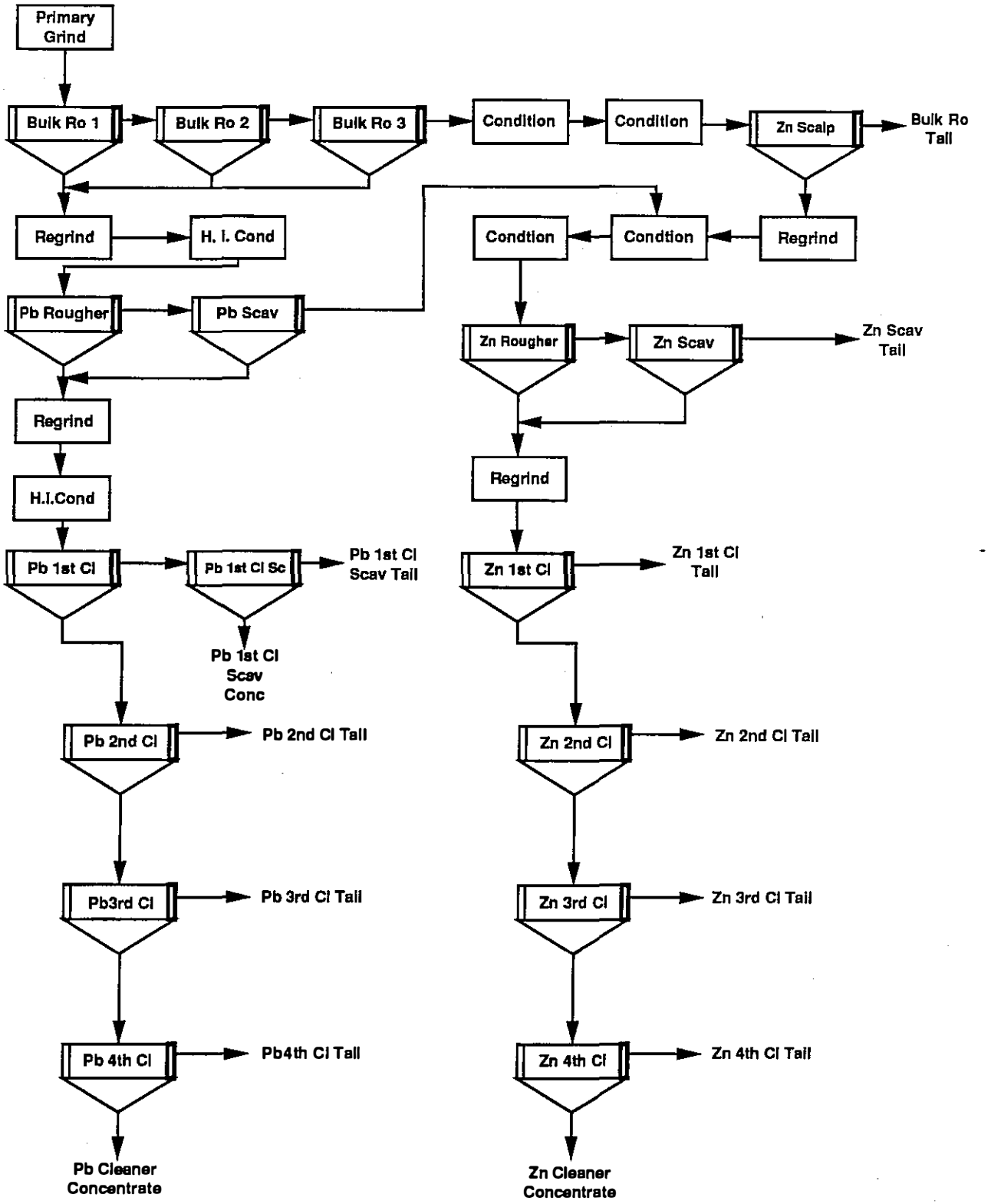
Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	3418A TH	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	50	20	-	-	-	20	-	-	7.5
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	-	3	-
3	15	15	12.5	-	-	-	-	3	-
Ro Conc Regr	-	20	-	1200	200	30	-	-	-
H.I. Condition	50	20	20	-	-	-	10	-	-
Pb Rougher	-	-	-	-	-	-	-	-	-
Pb Scavenger	10	10	-	-	-	-	-	-	-
Pb Ro & Scav Conc Regrind	30	20	-	600	100	20	-	-	-
H.I. Condition	30	10	15	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	1	8	-
Pb 1st Cl Scav	-	10	4	-	-	-	1	4	-
Pb 2nd Cl	-	-	-	-	30	-	3	3	-
	-	10	6	-	-	-	1	3	-
Pb 3rd Cl	-	-	-	-	30	-	3	3	-
	-	5	6	-	-	-	1	3	-
Pb 4th Cl	5	-	-	-	30	-	3	-	-
	5	5	-	-	-	-	1	-	-

Test No. 11 Flowsheet



TEST NO. 12

Purpose: To repeat roughing conditions of Test 6, but use 500 g/t Na_2CO_3 in the primary grind and 300 g/t $Ca(OH)_2$ in the Zn scalp.

Procedure: Grind then float 3 bulk rougher concentrates and a Zn scalp.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	500	20	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	8.4
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Condition		-	-	-	-	-	300	-	5	-	-
Condition		-	-	-	-	1000	-	-	5	-	6.4
		350		M2030							-
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

TEST NO. 13

Purpose: To repeat Test 11, but increase Na_2CO_3 in the primary grind to 1000 g/t and $Ca(OH)_2$ in the Zn scalp to 600 g/t.

Procedure: As for Test 12.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	9.4
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Condition		-	-	-	-	-	600	-	5	-	11.5
Condition		-	-	-	-	1000	-	-	5	-	9.2
		350		M2030							-
Zn Scalp	1	50	-	20	-	-	-	-	2	3	9.5
	2	10	-	5	-	-	-	-	1	2	-

SEMI-BULK FLOTATION FLOWSHEET TEST DETAILS

TEST NO. 2

Purpose: To conduct a bulk sulphide float of Pb and Zn.

Procedure: Grind, then float a Pb, Zn bulk concentrate in the 4 L cell.

Feed: 2000 grams of minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne		Time, minutes			pH
	317	MIBC	Grind	Cond.	Froth	
Grind	50	-	20	-	-	-
Bulk Rougher 1	15	25	-	1	3	7.8
2	25	12.5	-	1	3	-
3	25	10	-	1	4	-
	20	10	-	1	4	-

Test No. 2

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc.1	179.7	9.06	14.1	8.65	124.80	30.5	6.7	15.7
2. Pb,Zn Ro. Conc. 2	289.3	14.59	14.80	11.80	105.90	51.5	14.6	21.4
3.Pb,Zn Ro. Conc. 3	420.0	21.17	2.28	13.50	85.90	11.5	24.3	25.2
4. Ro. Tail	1094.5	55.18	0.49	11.60	49.40	6.5	54.4	37.8
Head Calc.	1983.5	100.00	4.19	11.76	72.20	100.0	100.0	100.0

Comb. Prod.

Products 1+2	23.65	14.53	10.59	113.14	82.0	21.3	37.1
Products 1-3	44.82	8.74	11.97	100.27	93.5	45.6	62.2

TEST NO. 3

Purpose: To repeat the conditions of Test 2, but add 242/TH as a secondary collector..

Procedure: As for Test 2, but with zinc flotation from the bulk rougher tail.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	317	242/TH (1:1)	MIBC	$CuSO_4$	Grind	Cond.	Froth	
Grind	50	20	-	-	20	-	-	7.5
Bulk Rougher 1	25	-	25	-	-	1	3	-
2	15	15	12.5	-	-	1	3	-
3	15	15	12.5	-	-	1	3	-
Zn Scalp	10	-	12.5	200	-	1	3.5	-

Test No. 3

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	231.9	11.71	18.50	9.10	122.70	52.5	9.8	20.9
2.Pb,Zn Ro. Conc.2	283.3	14.31	9.46	14.00	102.30	32.8	18.5	21.3
3. Pb,Zn Ro. Conc. 3	327.2	16.53	2.05	16.10	90.30	8.2	24.5	21.7
4. Zn Scalp	123.0	6.21	0.67	42.20	105.70	1.0	24.2	9.6
5. Zn Tail	1014.6	51.24	0.44	4.88	35.60	5.5	23.0	26.5
Head Calc.	1980.0	100.00	4.13	10.85	68.74	100.0	100.0	100.0

Comb. Prod.

Products 1+2		26.02	13.53	11.79	111.48	85.3	28.3	42.2
Products 1to3		42.55	9.07	13.47	103.25	93.5	52.8	63.9
Products 1to3		48.76	8.00	17.13	103.57	94.5	77.0	73.5

TEST NO. 4

Purpose: To repeat conditions of Test 3, but replace 242/TH mixture with LSB/TH mixture.

Procedure: As for Test 3.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	317	LSB/TH	MIBC	$CuSO_4$	Grind	Cond.	Froth	
Grind	50	20	-	-	20	-	-	-
Bulk Rougher 1	25	-	25	-	-	1	3.5	7.7
2	10	10	12.5	-	-	1	3.0	-
3	15	15	12.5	-	-	1	3.5	-
Zn Scalp	15	-	12.5	500	-	1	3.7	-

Test No. 4

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	387.4	19.61	15.20	10.10	119.20	72.3	17.2	33.3
2.Pb,Zn Ro. Conc.2	153.1	7.75	7.38	14.60	95.30	13.9	9.8	10.5
3. Pb,Zn Ro. Conc. 3	226.4	11.46	1.91	15.70	85.60	5.3	15.6	14.0
4. Zn Scalp	84.9	4.30	0.81	27.90	77.90	0.8	10.4	4.8
5. Zn Tail	1124.2	56.89	0.56	9.48	46.00	7.7	46.9	37.3
Head Calc.	1976.0	100.00	4.12	11.50	70.08	100.0	100.0	100.0

Comb. Prod.

Products 1+2	27.35	12.98	11.37	112.43	86.1	27.0	43.9
Products 1-3	38.81	9.72	12.65	104.51	91.4	42.7	57.9
Products 1-4	43.11	8.83	14.17	101.86	92.3	53.1	62.7

TEST NO. 5

Purpose: To repeat roughing conditions of Test 4 but regrind rougher concentrate, high intensity condition, and perform Pb cleaning.

Procedure: Grind, then float a rougher concentrate and then perform the zinc scalp. Combine the rougher concentrate and regrind it in the lab rod mill, high intensity condition, and clean the concentrate four times.

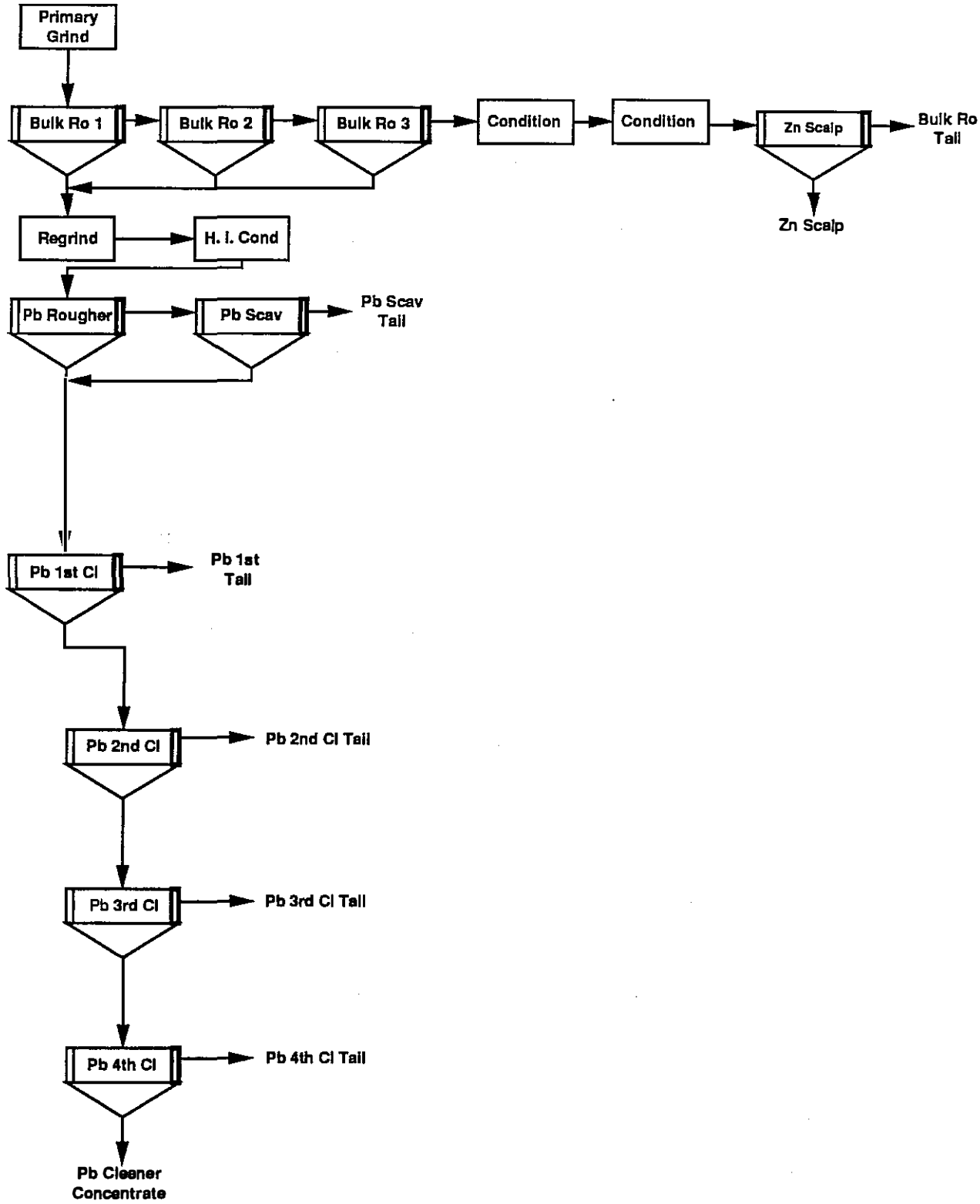
Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions: Regrind with PKD-C and Na_2CO_3.

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	317	LSB/TH	MIBC	$CuSO_4$	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	50	20	-	-	-	-	20	-	-	-
Bulk Rougher 1	25	-	25	-	-	-	-	1	3.5	7.8
2	10	10	12.5	-	-	-	-	1	3.0	-
3	15	15	12.5	-	-	-	-	1	3.5	-
Combine Pb-Zn rougher Conc 1 + 2 + 3 for rod mill regrind.										
Pb-Zn Conc Regr	-	20	-	-	1200	200	40	-	-	-
H.I. Conditioning	40	-	20	-	-	-	-	10	-	-
Pb Rougher	-	-	-	-	-	-	-	-	3	9.9
Pb Scavenger	10	-	-	-	-	-	-	1	1.5	-
Pb 1st Cleaner	-	-	-	-	-	50	-	1	3.5	-
Pb 2nd Cleaner	-	-	5	-	-	50	-	1	3.5	-
Pb 3rd Cleaner	-	-	-	-	-	50	-	1	3.5	-
Pb 4th Cleaner	-	-	7.5	-	-	50	-	1	3.5	9.4
Zn Scalp	15	-	12.5	500	-	-	-	1	3	-

Test No. 5 Flowsheet



Test No. 5

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	74.7	3.79	65.4	1.73	155.8	65.1	0.6	9.0
2. Pb 4th Cl. Tall	14.1	0.71	27.8	4.33	109.6	5.2	0.3	1.2
3. Pb 3rd Cl. Tail	30.5	1.55	15.1	6.41	109.6	6.1	0.9	2.6
4. Pb 2nd Cl. Tail	65.8	3.33	5.29	9.31	104.1	4.6	2.7	5.3
5. Pb1st Cl. Tail	94.7	4.80	2.07	12.8	97.3	2.6	5.4	7.1
6. Pb Ro. Tail	415.9	21.08	1.09	15.1	79.2	6.0	28.2	25.4
7. Zn Scalp	65.9	3.34	0.89	19.8	67.9	0.8	5.9	3.5
8. Ro. Tail	1211.8	61.41	0.59	10.30	49.1	9.5	56.0	45.9
Head Calc.	1973.4	100.00	3.81	11.29	65.62	100.0	100.0	100.0

Combined Products

Products 1+2	4.50	59.43	2.14	148.46	70.3	0.9	10.2
Products 1-3	6.05	48.10	3.23	138.53	76.4	1.7	12.8
Products 1-4	9.38	32.88	5.39	126.29	81.0	4.5	18.1
Products 1-5	14.18	22.45	7.90	116.48	83.7	9.9	25.2
Products 1-6	35.25	9.68	12.20	94.19	89.7	38.1	50.6
Products 1-7	38.59	8.92	12.86	91.92	90.5	44.0	54.1

TEST NO. 6

Purpose: To repeat conditions of Test 3, but replace 242/TH mixture with 3418A/TH mixture.

Procedure: As for Test 3.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	317	3418A / TH	MIBC	$CuSO_4$	Grind	Cond.	Froth	
Grind	50	20	-	-	20	-	-	-
Bulk Rougher 1	25	-	25	-	-	1	3	7.8
2	10	10	15	-	-	1	4	-
3	15	15	12.5	-	-	1	3	-
Zn Scalp	15	-	12.5	500	-	1	3.5	-

Test No. 6

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	285.4	14.39	16.50	9.28	117.50	57.6	11.8	29.6
2.Pb,Zn Ro. Conc.2	332.8	16.77	7.76	14.80	94.50	31.6	21.9	27.8
3. Pb,Zn Ro. Conc. 3	266.2	13.42	1.59	17.70	89.80	5.2	20.9	21.1
4. Zn Scalp	27.5	1.39	1.06	13.00	54.40	0.4	1.6	1.3
5. Zn Tail	1072.1	54.04	0.40	9.20	21.40	5.2	43.8	20.2
Head Calc.	1984.0	100.00	4.12	11.34	57.12	100.0	100.0	100.0

Comb. Prod.

Products 1+2	31.16	11.79	12.25	105.12	89.2	33.7	57.3
Products 1-3	44.58	8.72	13.89	100.51	94.4	54.6	78.4
Products 1-4	45.96	8.49	13.86	99.12	94.8	56.2	79.8

TEST NO. 7

Purpose: To repeat roughing conditions of Test 4, but improve recovery by increased Pb rougher stage collector addition and using the modified LSB/TH collector, LSB/THM.

Procedure: Grind, then float a bulk rougher concentrate. Regrind the concentrate in the lab rod mill, and high intensity condition. Float a Pb rougher and scavenger, clean 4 times to produce a Pb concentrate. Condition the bulk rougher tall with lime and increased $CuSO_4$ to improve Zn recovery in Zn scalp.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids In the lab ball mill.

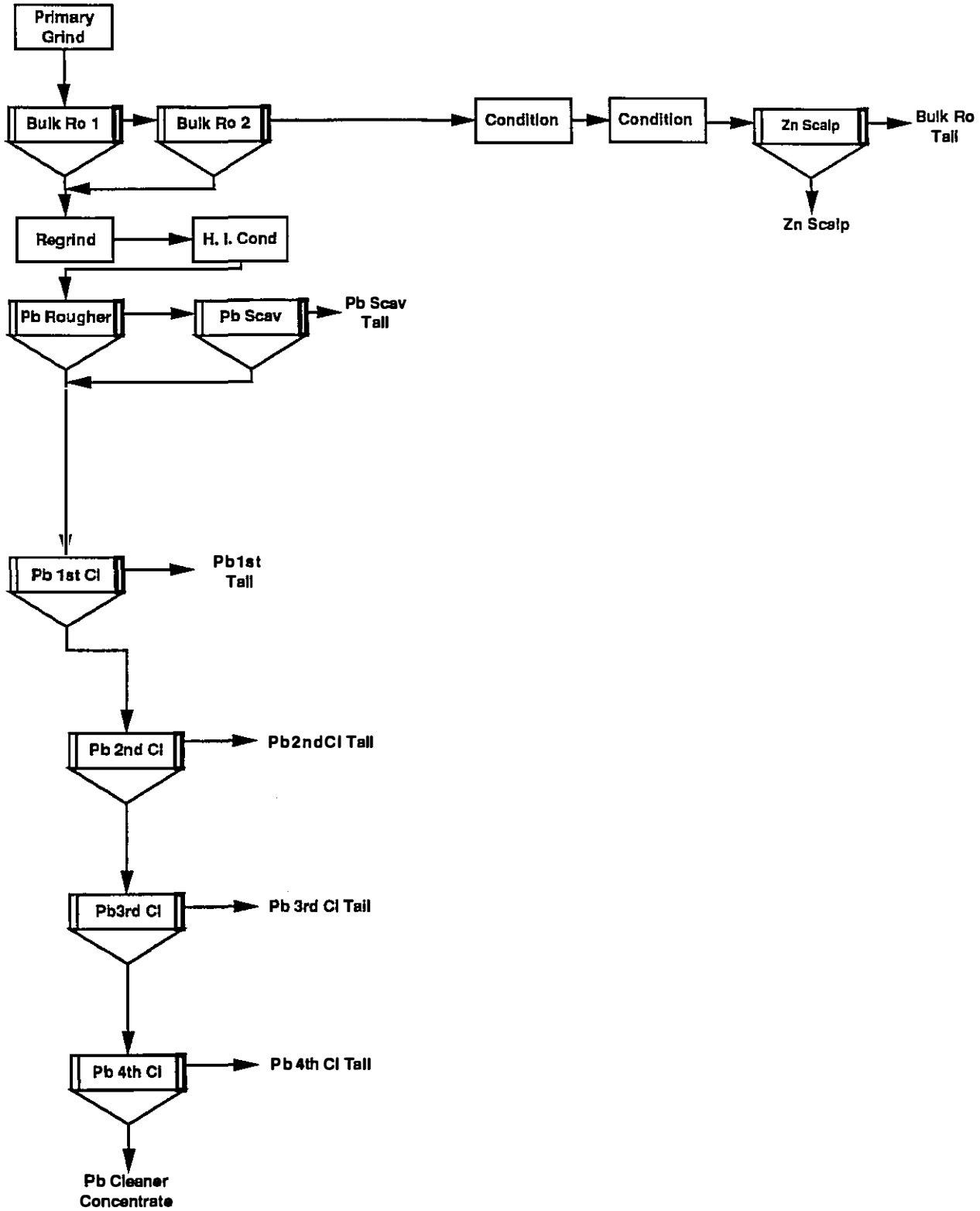
Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB TH-M	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	60	24	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	-	2.5	7.7
2	10	10	15	-	-	-	-	4.0	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	40	20	20	-	-	-	20	-	-
Pb Rougher	-	-	-	-	-	-	-	3.7	9.9
Pb Scavenger	10	-	-	-	-	-	1	1.0	-
Pb 1st Cleaner	5	-	-	-	20	-	-	7.3	-
Pb 2nd Cleaner	5	2.5	5.0	-	30	-	1	5.0	9.5
Pb 3rd Cleaner	5	2.5	-	-	30	-	1	5.0	-
Pb 4th Cleaner	5	5	-	-	20	-	1	4.0	-

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	LSB/THM	Grind	Cond.	Froth	
Condition	670	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	10.5
Zn Scalp	-	-	50	20	-	-	1	3	-

Test No. 7 Flowsheet



Test No. 7

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	74.3	3.73	68.6	1.77	179.3	66.8	0.5	11.0
2. Pb 4th Cl. Tail	8.2	0.41	25.4	4.56	114.0	2.7	0.2	0.8
3. Pb 3rd Cl. Tail	12.9	0.65	17.2	6.35	117.6	2.9	0.3	1.3
4. Pb 2nd Cl. Tail	22.5	1.13	7.98	8.11	119.8	2.4	0.8	2.2
5. Pb1st Cl. Tail	27.1	1.36	4.00	9.45	99.5	1.4	1.1	2.2
6. Pb Scav Conc.	13.3	0.67	4.93	8.75	101.3	0.9	0.5	1.1
7. Pb Ro. Tail	422.0	21.16	1.65	13.6	73.3	9.1	23.8	25.5
8. Zn Scalp	424.3	21.27	1.32	38.4	109.8	7.3	67.5	38.4
9. Ro. Tail	989.9	49.63	0.50	1.30	21.4	6.5	5.3	17.5
Head Calc.	1994.5	100.00	3.83	12.10	60.78	100.0	100.0	100.0

Combined Products

Products 1+2	4.14	64.31	2.05	172.81	69.5	0.7	11.8
Products 1-3	4.78	57.94	2.63	165.34	72.4	1.0	13.0
Products 1-4	5.91	48.40	3.68	156.65	74.8	1.8	15.2
Products 1-5	7.27	40.10	4.75	145.97	76.2	2.9	17.5
Products 1-6	7.94	37.15	5.09	142.22	77.1	3.3	18.6
Products 1-7	29.10	11.33	11.28	92.10	86.2	27.1	44.1
Products 1-8	50.37	7.10	22.73	99.58	93.5	94.7	82.5

TEST NO. 8

Purpose: To repeat Test 7 but recycle Pb Scav Tail to the Zn circuit and clean Zn to produce Zn concentrate.

Procedure: As for Test 7, but recycle Pb Scav Tail to the Zn circuit to be combined with the reground Zn scalp conc. The combined products were conditioned in 3 stages in the Wemco High Intensity Conditioner (1) with lime, (2) with $CuSO_4$, (3) with collector, then the rougher and scavenger conc were cleaned 4 times to produce a Zn conc.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

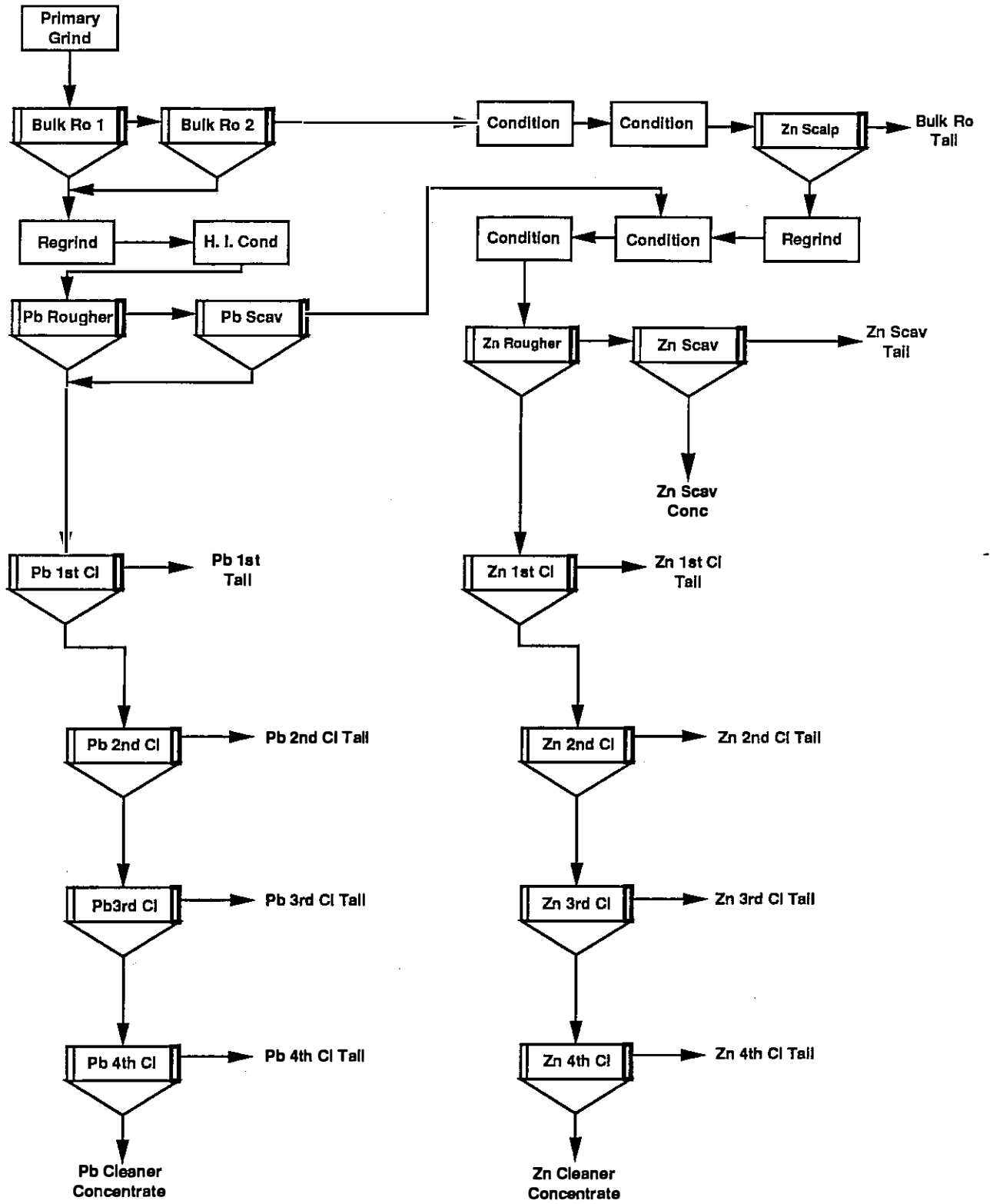
Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB THM	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	60	24	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	1	4	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	50	20	20	-	-	-	20	-	-
Pb Rougher	-	-	5	-	-	-	-	4.3	9.8
Pb Scavenger	10	10	5	-	-	-	-	2	-
Pb 1st Cleaner	10	-	-	-	30	-	1	5	9.7
	2.5	-	2.5	-	-	-	1	2	-
Pb 2nd Cleaner	10	5	2.5	-	20	-	1	4	-
Pb 3rd Cleaner	10	5	2.5	-	20	-	1	3.5	-
Pb 4th Cleaner	5	-	-	-	30	-	1	3	-

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	LSB/TH-M	Grind	Cond.	Froth	
Conditlon	640	-	-	-	-	-	5	-	-
Conditlon	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	1	3	-
Zn Scalp Regr	500	-	-	-	-	50	-	-	-
Combine Zn scalp conc & Pb scav tall for Zn conditlonlng.									
H.I. Cond 1	-	-	-	-	-	-	5	-	11.5
2	-	400	-	-	-	-	5	-	-
3	-	-	30	20	-	-	15	-	-
Zn Rougher	-	-	-	-	-	-	-	-	-
Zn Scavenger	-	-	5	7.5	-	-	-	-	-
Zn 1st Cleaner	150	-	-	5	5	-	5	5	10.5
Zn 2nd Cleaner	150	-	-	5	5	-	4	4.5	11.0
Zn 3rd Cleaner	150	-	-	5	-	-	3	4.5	11.3
Zn 4th Cleaner	100	-	-	5	-	-	1	4	11.5

Test No. 8 Flowsheet



Test No. 8

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	89.3	4.56	66.1	3.62	160.7	72.1	1.3	12.0
2. Pb 4th Cl. Tail	10.9	0.56	11.9	8.98	101.3	1.6	0.4	0.9
3. Pb 3rd Cl. Tail	16.5	0.84	8.57	7.4	111.7	1.7	0.5	1.5
4. Pb 2nd Cl. Tail	20.0	1.02	4.73	7.66	103.6	1.2	0.6	1.7
5. Pb1st Cl. Tail	66.7	3.41	2.70	11	92.4	2.2	2.9	5.1
6. Bulk Ro Tall	938.2	47.90	0.6	0.95	19	6.9	3.5	14.9
7. Zn 4th Cl Conc	316.1	16.14	1.24	57.2	152.1	4.8	71.2	40.1
8. Zn 4th Cl Tail	14.8	0.76	2.19	33.2	103.8	0.4	1.9	1.3
9. Zn 3rd Cl Tail	28.4	1.45	2.06	34.8	95.4	0.7	3.9	2.3
10. Zn 2nd Cl Tail	34.3	1.75	1.91	36	79.2	0.8	4.9	2.3
11. Zn 1st Cl Tail	46.5	2.37	1.68	35.9	58.5	1.0	6.6	2.3
12. Zn Scav Conc	27.2	1.39	1.99	8.64	92.3	0.7	0.9	2.1
13. Zn Scav Tail	349.7	17.85	1.40	1.06	46.1	6.0	1.5	13.5
Head Calc.	1958.6	100.00	4.18	12.96	61.14	100.0	100.0	100.0

Combined Products

Products 1+2	5.12	60.20	4.20	154.24	73.7	1.7	12.9
Products 1-3	5.96	52.90	4.66	148.22	75.5	2.1	14.4
Products 1-4	6.98	45.86	5.09	141.70	76.6	2.7	16.2
Products 1-5	10.38	31.70	7.03	125.53	78.8	5.6	21.3
Products 7-8	16.89	1.28	56.13	149.94	5.2	73.1	41.4
Products 7-9	18.34	1.34	54.44	145.63	5.9	77.0	43.7
Products 7-10	20.10	1.39	52.83	139.84	6.7	81.9	46.0
Products 7-11	22.47	1.42	51.04	131.25	7.7	88.5	48.2
Products 7-12	23.86	1.46	48.58	128.98	8.3	89.4	50.3
Products 7-13	41.71	1.43	28.24	93.50	14.3	90.9	63.8
Products 6+13	65.76	0.82	0.98	26.36	12.9	5.0	28.3

TEST NO. 9

Purpose: To conduct a test using optimum conditions thus far.

Procedure: As for Test 8, but using secondary collector 3418A/TH, and with zinc cleaning.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	3418A TH	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	50	20	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	-	4	-
3	15	15	12.5	-	-	-	-	3	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	50	20	20	-	-	-	20	-	-
Pb Rougher	-	-	-	-	-	-	-	4.5	-
Pb Scavenger	10	10	-	-	-	-	-	2	-
Pb 1st Cleaner	10	-	-	-	30	-	1	3.5	-
Pb 2nd Cleaner	10	5	2.5	-	20	-	1	3	-
Pb 3rd Cleaner	10	5	2.5	-	20	-	1	3	-
Pb 4th Cleaner	5	-	-	-	30	-	1	3	-

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	LSB/TH-M	Grind	Cond.	Froth	
Conditlon	800	-	-	-	-	-	5	-	10.7
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	1	3	-

Test No. 9

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	109.7	5.55	56.8	5.39	161.5	77.1	2.4	14.6
2. Pb 4th Cl. Tail	7.8	0.39	11.2	6.93	107.9	1.1	0.2	0.7
3. Pb 3rd Cl. Tail	26.6	1.35	7.63	6.17	106.6	2.5	0.7	2.3
4. Pb 2nd Cl. Tail	33.4	1.69	3.52	7.06	103.4	1.5	1.0	2.8
5. Pb1st Cl. Tail	172.6	8.73	1.95	12.3	84.5	4.2	8.8	12.0
6. Pb Ro. Tail	519.1	26.26	0.92	17.9	66.3	5.9	38.5	28.4
7. Zn Scalp	386.6	19.55	1.11	28.9	103.4	5.3	46.3	33.0
8. Ro. Tail	721.3	36.48	0.27	0.72	10.3	2.4	2.2	6.1
Head Calc.	1977.1	100.00	4.09	12.22	61.33	100.0	100.0	100.0

Combined Products

Products 1+2	5.94	53.77	5.49	157.94	78.2	2.7	15.3
Products 1-3	7.29	45.26	5.62	148.46	80.7	3.4	17.6
Products 1-4	8.98	37.40	5.89	139.98	82.2	4.3	20.5
Products 1-5	17.71	19.92	9.05	112.63	86.4	13.1	32.5
Products 1-6	43.96	8.57	14.34	84.96	92.3	51.6	60.9
Products 1-7	63.52	6.28	18.82	90.64	97.6	97.8	93.9

TEST NO. 10

Purpose: To repeat the conditions of Test 6 but replace secondary collector 3418A/TH with modified SP117 (SP117M).

Procedure: Bulk flotation similar to Test 6. Zinc scalp similar to Test 7.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne							Time, minutes			pH
		317	SP117M	MIBC	$CuSO_4$	M2030	$Ca(OH)_2$	350	Grind	Cond.	Froth	
Grind		58	20	-	-	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	25	-	-	-	-	-	1	3	7.5
	2	10	10	12.5	-	-	-	-	-	1	3	-
	3	10	15	12.5	-	-	-	-	-	1	3	-
Conditioning	1	-	-	-	-	-	450	-	-	5	-	-
	2	-	-	-	800	-	-	-	-	5	-	9.5
Zn Scalp		-	-	-	-	20	-	50	-	3	5	-
		-	-	5.0	-	-	-	10	-	1	2	-

Test No. 10

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1.Pb,Zn Ro. Conc. 1	240.2	12.12	16.30	9.46	91.80	47.0	9.8	15.7
2.Pb,Zn Ro. Conc.2	161.1	8.13	15.90	11.80	94.40	30.8	8.2	10.8
3. Pb,Zn Ro. Conc. 3	133.4	6.73	5.92	13.60	79.50	9.5	7.8	7.6
4. Zn Scalp	672.5	33.93	1.22	25.10	121.80	9.9	72.9	58.4
5. Zn Tail	775.1	39.10	0.31	0.38	13.60	2.9	1.3	7.5
Head Calc.	1982.3	100.00	4.20	11.68	70.78	100.0	100.0	100.0

Comb. Prod.

Products 1+2	20.24	16.14	10.40	92.84	77.8	18.0	26.6
Products 1-3	26.97	13.59	11.20	89.51	87.3	25.9	34.1
Products 1-4	60.90	6.70	18.94	107.50	97.1	98.7	92.5

TEST NO. 11

Purpose: As for Test 8, but with secondary collector 348A/TH, and with 2nd regrinding stages and high intensity conditioning prior to lead cleaning and zinc cleaning.

Procedure: Similar to Test 8, but with pebble mill regrinding prior to cleaning.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	3418A TH	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	50	20	-	-	-	20	-	-	7.5
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	-	3	-
3	15	15	12.5	-	-	-	-	3	-
Ro ConcRegr	-	20	-	1200	200	30	-	-	-
H.I. Condition	50	20	20	-	-	-	10	-	-
Pb Rougher	-	-	-	-	-	-	-	-	-
Pb Scavenger	10	10	-	-	-	-	-	-	-
Pb Ro & Scav Conc Regrind	30	20	-	600	100	20	-	-	-
H.I. Condition	30	10	15	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	1	8	-
Pb 1st Cl Scav	-	10	4	-	-	-	1	4	-
Pb 2nd Cl	-	-	-	-	30	-	3	3	-
	-	10	6	-	-	-	1	3	-
Pb 3rd Cl	-	-	-	-	30	-	3	3	-
	-	5	6	-	-	-	1	3	-
Pb 4th Cl	5	-	-	-	30	-	3	-	-
	5	5	-	-	-	-	1	-	-

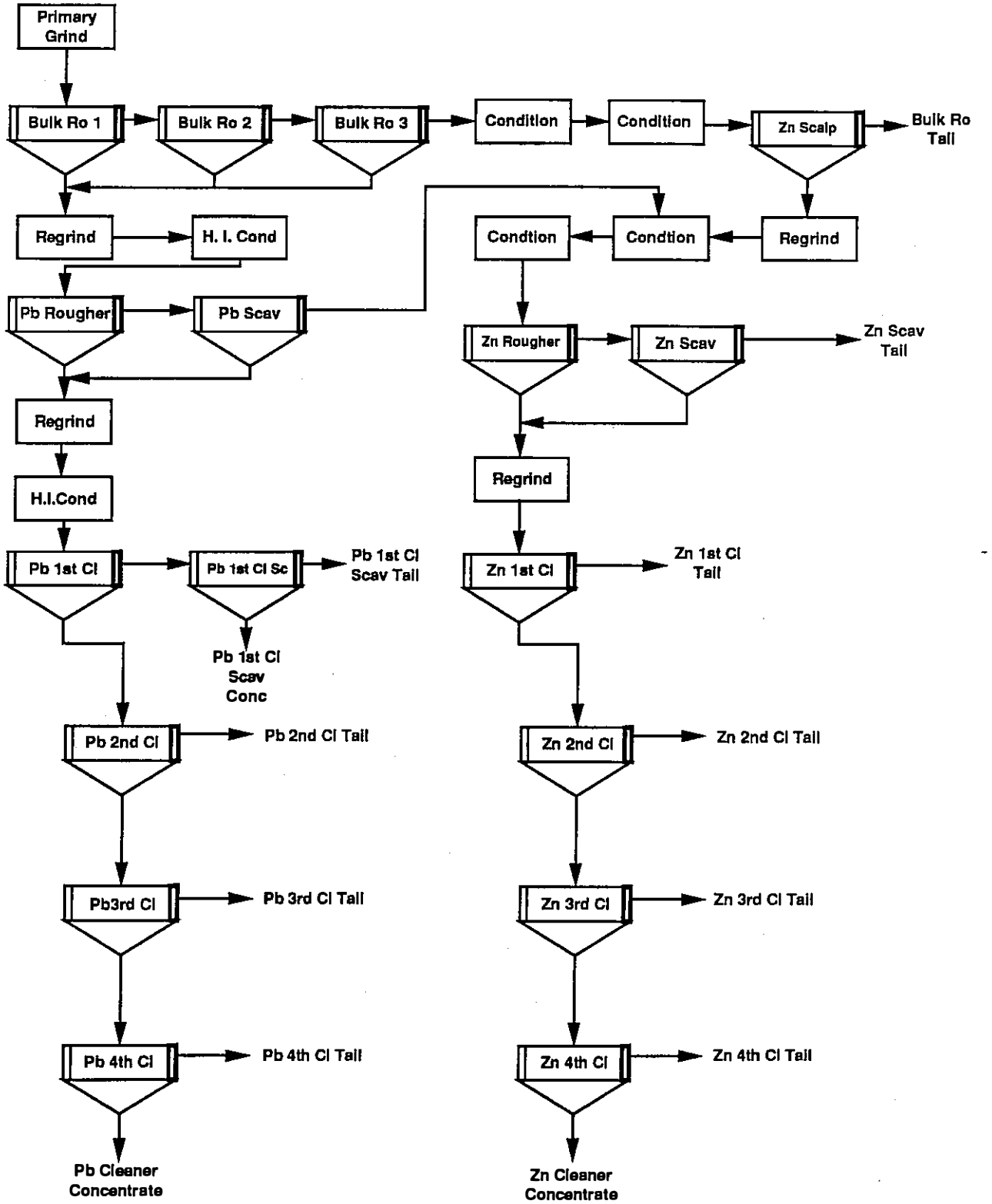
Test No. 11 - Continued

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	MIBC	Grind	Cond.	Froth	
Condition	700	-	-	-	-	-	5	-	11.7
Condition	-	1000	-	-	-	-	5	-	9.6
Zn Scalp	-	-	50	20	-	-	1	3	-
Zn Scalp Regr	500	-	-	12.5	-	15	-	-	-
	250	-	-	-	-	-	5	-	11.4-9.7
	-	1000	-	-	-	-	5	-	-
Zn Rougher	75	-	30	20	-	-	1	4	10.2
Zn Scavenger	-	-	5	7.5	-	-	-	-	-
Zn Regrind*	600	150	-	8	-	15	-	-	-
Zn 1st Cleaner	-	-	-	-	-	-	1	4	-
	-	-	-	4	-	-	1	3	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	3	-
	-	-	-	4	-	-	1	4	-
Zn 3rd Cleaner	250	-	-	-	-	-	3	4	-
	-	-	-		4	-	1	3	-
Zn 4th Cleaner	250	-	-	-	-	-	1	4	-
	-	-	-	-	4	-	1	4	-

*pebble mill

Test No. 11 Flowsheet



Test No. 11

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	94.4	4.85	56.4	3.46	163.9	70.4	1.5	13.4
2. Pb 4th Cl. Tail	34.9	1.79	21.5	7.65	112	9.9	1.2	3.4
3. Pb 3rd Cl. Tail	29.5	1.51	6.53	11.2	107.3	2.5	1.5	2.7
4. Pb 2nd Cl. Tail	54.5	2.80	3.43	11.5	93.2	2.5	2.8	4.4
5. Pb 1st Cl Scav Conc	38.9	2.00	2.56	11.2	84.6	1.3	2.0	2.9
6. Pb 1st Cl Scav Tail	206.3	10.59	1.25	15.1	70.8	3.4	14.1	12.7
7. Bulk Ro Tail	626.3	32.16	0.19	0.54	6.0	1.6	1.5	3.3
8. Zn 4th Cl Conc	294.1	15.10	0.74	54	141.2	2.9	71.9	36.0
9. Zn 4th Cl Tail	21.2	1.09	1.45	9.68	107.6	0.4	0.9	2.0
10. Zn 3rd Cl Tail	29.5	1.51	1.31	4.87	82.1	0.5	0.7	2.1
11. Zn 2nd Cl Tail	45.8	2.35	1.02	1.86	50.4	0.6	0.4	2.0
12. Zn 1st Cl Tail	104.1	5.35	0.82	1.05	50.7	1.1	0.5	4.6
13. Zn Ro Tail	367.8	18.89	0.57	0.60	33.4	2.8	1.0	10.6
Head Calc.	1947.3	100.00	3.88	11.34	59.25	100.0	100.0	100.0

Combined Products

Products 1+2	6.64	46.98	4.59	149.89	80.36	2.69	16.80
Products 1-3	8.15	39.47	5.82	141.98	82.91	4.18	19.54
Products 1-4	10.95	30.26	7.27	129.52	85.38	7.02	23.94
Products 1-5	12.95	25.99	7.88	122.59	86.70	8.99	26.80
Products 1-6	23.55	14.86	11.13	99.29	90.11	23.10	39.45
Products 8-9	16.19	0.79	51.02	138.94	3.29	72.84	37.97
Products 8-10	17.71	0.83	47.07	134.08	3.80	73.49	40.07
Products 8-11	20.06	0.85	41.77	124.27	4.41	73.88	42.07
Products 8-12	25.40	0.85	33.20	108.79	5.54	74.37	46.64
Products 8-13	44.29	0.73	19.30	76.64	8.32	75.37	57.29
Products 7+13	51.05	0.33	0.56	16.14	4.35	2.53	13.90

TEST NO. 12

Purpose: To repeat roughing conditions of Test 6, but use 500 g/t Na_2CO_3 in the primary grind and 300 g/t $Ca(OH)_2$ in the Zn scalp.

Procedure: Grind then float 3 bulk rougher concentrates and a Zn scalp.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	500	20	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	8.4
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Condition		-	-	-	-	-	300	-	5	-	-
Conditlon		-	-	-	-	1000	-	-	5	-	6.4
		350		M2030							
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

Test No. 12

Product	Weight g	Weight %	Assays,%,g/t Pb	Zn	% Distribution Pb	Zn
1.Pb,Zn Ro. Conc. 1	419.9	21.26	15.30	11.10	80.6	20.8
2.Pb,Zn Ro. Conc.2	287.8	14.57	2.97	17.20	10.7	22.1
3. Pb,Zn Ro. Conc. 3	472.1	23.91	0.97	19.90	5.7	41.9
4. Zn Scalp	239.2	12.11	0.84	13.60	2.5	14.5
5. Zn Tail	555.9	28.15	0.05	0.29	0.4	0.7
Head Calc.	1974.9	100.00	4.03	11.35	100.0	100.0

Comb. Prod.

Products 1+2		35.83	10.29	13.58	91.4	42.9
Products 1to3		59.74	6.56	16.11	97.1	84.8
Products 1to4		71.85	5.59	15.69	99.6	99.3

TEST NO. 13

Purpose: To repeat Test 11, but increase Na_2CO_3 in the primary grind to 1000 g/t and $Ca(OH)_2$ in the Zn scalp to 600 g/t.

Procedure: As for Test 12.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	20	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	9.4
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Condition		-	-	-	-	-	600	-	5	-	11.5
Condition		-	-	-	-	1000	-	-	5	-	9.2
		350		M2030							
Zn Scalp	1	50	-	20	-	-	-	-	2	3	9.5
	2	10	-	5	-	-	-	-	1	2	-

Test No. 13

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb,Zn Ro. Conc. 1	326.9	16.47	19.80	9.56	72.5	12.6
2.Pb,Zn Ro. Conc.2	242.5	12.22	5.72	17.69	15.5	17.4
3. Pb,Zn Ro. Conc. 3	257.8	12.99	1.50	21.90	4.3	22.8
4. Zn Scalp	428.3	21.58	1.04	26.40	5.0	45.7
5. Zn Tail	728.9	36.73	0.32	0.48	2.6	1.4
Head Calc.	1984.4	100.00	4.50	12.46	100.0	100.0

Comb. Prod.

Products 1+2		28.69	13.80	13.02	88.1	30.0
Products 1to3		41.69	9.97	15.79	92.4	52.8
Products 1to4		63.27	6.92	19.41	97.4	98.6

TEST NO. 14

Purpose: To repeat Test 12, but increase Na_2CO_3 in the primary grind to 1500 g/t and $Ca(OH)_2$ in the Zn scalp to 1000 g/t.

Procedure: As for Test 12.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1500	20	-	-	-	20	-	-	9.7
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	9.5
	2	10	-	10	15	-	-	-	1	4	9.2
	3	15	-	15	15	-	-	-	1	4.5	9.1
Condition		-	-	-	-	-	1000	-	5	-	11.5
Condition		-	-	-	-	1000	-	-	5	-	11.0
		350		M2030							
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2.5	9.8

Test No. 14

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb,Zn Ro. Conc. 1	283.3	14.33	23.20	8.56	75.5	10.5
2.Pb,Zn Ro. Conc.2	136.3	6.89	6.57	15.20	10.3	9.0
3. Pb,Zn Ro. Conc. 3	164.8	8.34	1.92	17.20	3.6	12.3
4. Zn Scalp	565.6	28.61	1.08	26.90	7.0	66.1
5. Zn Tail	827.0	41.83	0.37	0.58	3.5	2.1
Head Calc.	1977.0	100.00	4.40	11.65	100.0	100.0

Comb. Prod.

Products 1+2		21.22	17.80	10.72	85.8	19.5
Products 1to3		29.56	13.32	12.55	89.5	31.8
Products 1to4		58.17	7.30	19.61	96.5	97.9

TEST NO. 21

Purpose: Bulk flotation + Pb circuit flotation as for Test 8. Zinc circuit flotation as for Test 11.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB THM	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	60	24	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	-	3	-
3	15	15	12.5	-	-	-	-	3	-
Ro Conc Regr	-	20	-	1200	200	50	-	-	-
H.I. Condition	50	20	20	-	-	-	20	-	-
Pb Rougher	-	-	5	-	-	-	-	4.3	10.1
Pb Scavenger	10	10	5	-	-	-	-	2	-
Pb 1st Cleaner	10	-	-	-	30	-	1	5	-
	2.5	-	2.5	-	-	-	1	2	-
Pb 2nd Cleaner	10	5	2.5	-	20	-	1	4	-
Pb 3rd Cleaner	10	5	2.5	-	20	-	1	3.5	-
Pb 4th Cleaner	5	-	-	-	30	-	1	3	-

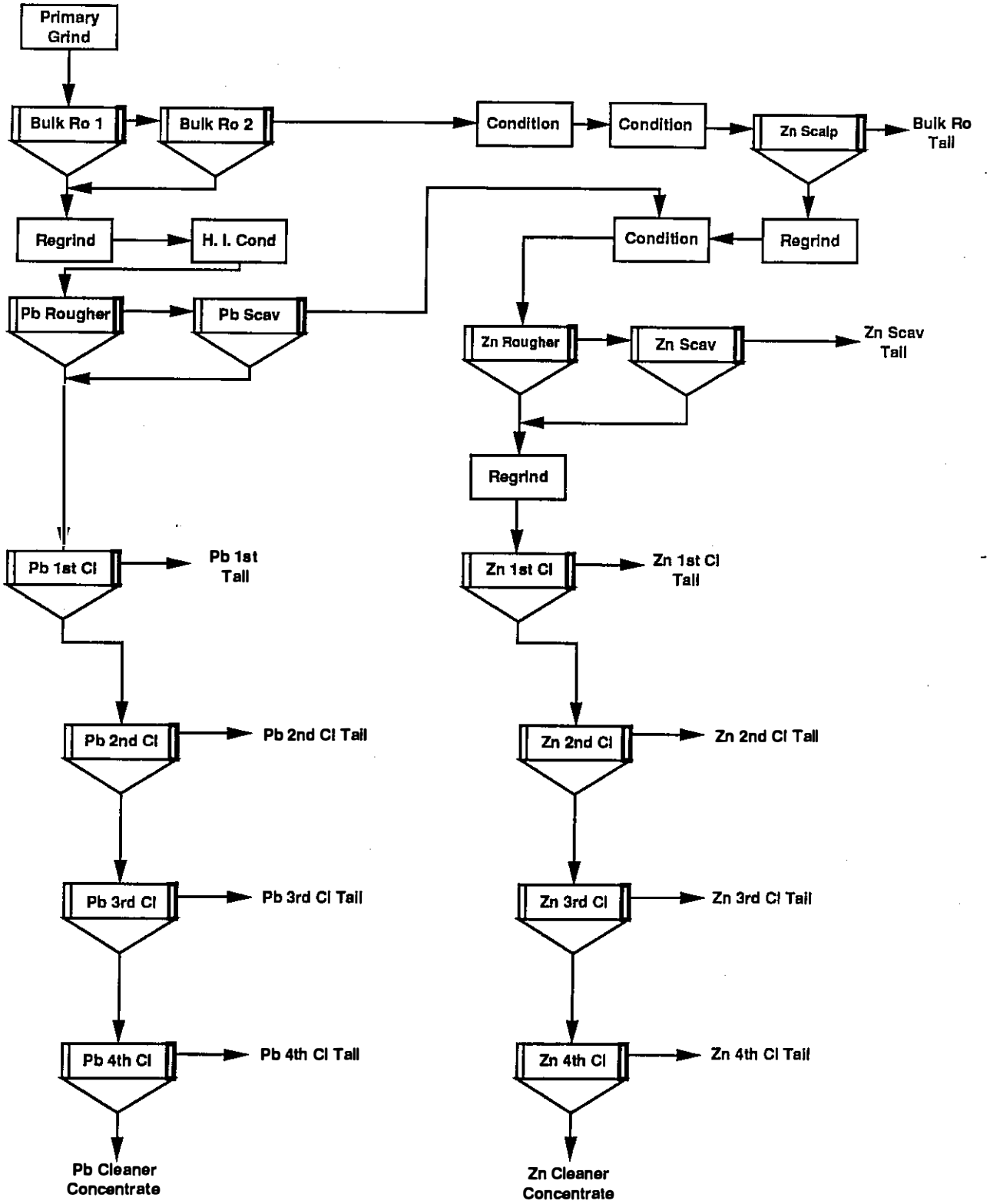
Test No. 21 - Continued

ZN CIRCUIT:

	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	350	M2030	MIBC	Grind	Cond.	Froth	
Conditlon	700	-	-	-	-	-	5	-	11.4
Conditlon	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	1	3	-
Zn Scalp Regr	500	-	-	12.5	-	15	-	-	-
Zn Rougher	75	-	30	20	-	-	1	6.3	10.2
Zn Scavenger	-	-	5	7.5	-	-	1	3.5	-
Zn Regrind*	600	150	-	8	-	15	-	-	-
Zn 1st Cleaner	-	-	-	-	-	-	1	4	10.2
	-	-	-	4	-	-	1	3	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	3	-
	-	-	-	4	-	-	1	4	-
Zn 3rd Cleaner	250	-	-	-	-	-	3	4	-
	-	-	-	-	4	-	1	3	-
Zn 4th Cleaner	250	-	-	-	-	-	1	4	11.0
	-	-	-	-	4	-	1	4	-

*pebble mill

Test No. 21 Flowsheet



Test No. 21

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cleaner. Conc.	137.6	7.11	48.0	6.85	81.5	4.3
2.Pb 4th Cl. Tail	25.7	1.33	5.52	6.64	1.8	0.8
3. Pb 3rd Cl. Tall	9.0	0.47	4.72	4.11	0.5	0.2
4. Pb 2nd Cl. Tail	30.1	1.56	2.92	7.30	1.1	1.0
5. Pb 1st Cl. Tail	172.0	8.89	1.52	14.3	3.2	11.3
6. Zn Cl. Conc.	192.2	9.93	0.62	56.1	1.5	51.3
7. Zn 4th Cl. Tail	36.0	1.86	0.98	43.4	0.4	7.2
8. Zn 3rd Cl. Tall	46.6	2.41	1.00	34.1	0.6	7.3
9. Zn 2nd Cl. Tail	54.5	2.82	1.13	18.1	0.8	4.5
10. Zn 1st Cl. Tail	243.2	12.57	0.89	5.00	2.7	5.6
11. Zn Scav. Tall.	351.5	18.16	0.99	3.18	4.3	5.1
12. Zn Scalp. Tail	637.0	32.91	0.22	0.48	1.7	1.4
Head Calc.	1935.4	100.00	4.19	11.25	100.0	100.0

Combined Products

Products 1+2	8.44	41.31	6.82	83.2	5.1
Products 1-3	8.90	39.40	6.68	83.8	5.3
Products 1-4	10.46	33.98	6.77	84.8	6.3
Products 1-5	19.34	19.07	10.23	88.1	17.6
Products 6+7	11.79	0.68	55.78	1.9	58.5
Products 6-8	14.20	0.73	52.10	2.5	65.8
Products 6-9	17.01	0.80	46.48	3.2	70.3
Products 6-10	29.58	0.84	28.86	5.9	75.9
Products 6-11	47.74	0.90	19.09	10.2	81.0
Products 6-12	80.66	0.62	11.50	11.9	82.4
Products 11-12	51.07	0.49	1.44	6.0	6.5

TEST NO. 25

Purpose: To conduct the first in a series of test to examine the effect of fineness of primary grind.

Procedure: Grind, float 3 bulk rougher concentrates, then condition twice and float a zinc scalp concentrate.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	15	-	-	9.3
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	-
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	8.9
Conditlon		-	-	-	-	-	1600	-	5	-	10.9
Conditlon		-	-	-	-	1000	-	-	5	-	9.2.
		A350		M2030							
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

Test No. 25

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb,Zn Ro. Conc. 1	458.1	23.17	14.70	11.10	85.0	22.5
2.Pb,Zn Ro. Conc.2	128.0	6.48	2.63	17.50	4.2	9.9
3. Pb,Zn Ro. Conc. 3	247.6	12.53	1.02	20.50	3.2	22.4
4. Zn Scalp	351.3	17.77	0.94	27.40	4.2	42.5
5. Zn Tail	791.7	40.05	0.34	0.76	3.4	2.7
Head Calc.	1976.7	100.00	4.01	11.45	100.0	100.0

Comb. Prod.

Products 1+2		29.65	12.06	12.50	89.2	32.4
Products 1to3		42.18	8.78	14.87	92.4	54.8
Products 1to4		59.95	6.46	18.59	96.6	97.3

TEST NO. 26

Purpose: As for Test 25, with a finer grind.

Procedure: As for Test 25.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab bail mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	30	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	9.2
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Conditlon		-	-	-	-	-	600	-	5	-	10.9
Conditlon		-	-	-	-	1000	-	-	5	-	9.1
		A350		M2030							-
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

Test No. 26

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb,Zn Ro. Conc. 1	184.9	9.29	19.90	7.18	47.0	5.8
2.Pb,Zn Ro. Conc.2	150.6	7.57	17.20	11.90	33.1	7.8
3. Pb,Zn Ro. Conc. 3	181.2	9.11	3.74	17.20	8.7	13.6
4. Zn Scalp	586.5	29.48	0.91	27.60	6.8	70.9
5. Zn Tail	886.1	44.54	0.39	0.47	4.4	1.8
Head Calc.	1989.3	100.00	3.93	11.48	100.0	100.0

Comb. Prod.

Products 1+2		16.87	18.69	9.30	80.1	13.7
Products 1to3		25.97	13.45	12.07	88.8	27.3
Products 1to4		55.46	6.78	20.33	95.6	98.2

TEST NO. 27

Purpose: As for Test 26, with a finer grind.

Procedure: As for Test 25.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	40	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	-
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Condition		-	-	-	-	-	600	-	5	-	-
Condition		-	-	-	-	1000	-	-	5	-	-
		A350		M2030							
Zn Scalp	1	50	-	20	-	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

Test No. 27

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb,Zn Ro. Conc. 1	157.7	7.96	13.40	7.74	27.3	5.4
2.Pb,Zn Ro. Conc.2	193.5	9.77	21.00	9.93	52.5	8.5
3. Pb,Zn Ro. Conc. 3	187.4	9.46	4.24	16.50	10.3	13.7
4. Zn Scalp	531.3	26.83	0.83	29.90	5.7	70.5
5. Zn Tail	910.6	45.98	0.36	0.45	4.2	1.8
Head Calc.	1980.5	100.00	3.91	11.38	100.0	100.0

Comb. Prod.

Products 1+2	17.73	17.59	8.95	79.8	13.9
Products 1to3	27.20	12.94	11.57	90.1	27.7
Products 1to4	54.02	6.93	20.67	95.8	98.2

TEST NO. 28

Purpose: As for Test 27, but with a finer grind.

Procedure: As for Test 25.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 50 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage		Reagents Added, grams per tonne						Time, minutes			pH
		317	Na_2CO_3	3418A TH	MIBC	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind		50	1000	20	-	-	-	50	-	-	-
Bulk Rougher	1	25	-	-	25	-	-	-	2	4	-
	2	10	-	10	15	-	-	-	1	4	-
	3	15	-	15	12.5	-	-	-	1	4	-
Conditlon		-	-	-	-	-	600	-	5	-	-
Conditlon		-	-	-	-	1000	-	-	5	-	-
		A350		M2030							
Zn Scalp	1	50	-	20	5	-	-	-	2	3	-
	2	10	-	5	-	-	-	-	1	2	-

Test No. 28

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb,Zn Ro. Conc. 1	117.8	5.93	11.00	7.27	16.8	3.8
2.Pb,Zn Ro. Conc.2	131.0	6.59	17.30	9.82	29.4	5.7
3. Pb,Zn Ro. Conc. 3	211.5	10.64	14.90	12.70	40.9	12.0
4. Zn Scalp	441.3	22.20	0.93	38.10	5.3	74.9
5. Zn Taii	1086.2	54.64	0.53	0.74	7.5	3.6
Head Calc.	1987.8	100.00	3.87	11.29	100.0	100.0

Comb. Prod.

Products 1+2		12.52	14.32	8.61	46.3	9.5
Products 1to3		23.16	14.58	10.49	87.2	21.5
Products 1to4		45.36	7.90	24.00	92.5	96.4

TEST NO. 34

Purpose: To examine the effect of regrind fineness of bulk concentrate for Pb grade and recovery.

Procedure: Grind then float a Bulk Rougher Conc and a Zn Scalp Conc. Regrind the Bulk concentrate 20 minutes, High Intensity conditioning, and float 3 Pb rougher concentrates.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	pH
Grind	50	1000	20	-	-	30	-	-	9.1
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	20	-	200	20	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	8.8
2	10	5	-	-	-	-	1	2	-

Test No. 34

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	125.1	6.30	45.80	4.60	75.7	2.5
2.Pb Ro. Conc.2	113.7	5.73	5.60	13.60	8.4	6.7
3. Pb Ro. Conc. 3	84.6	4.26	1.33	15.50	1.5	5.6
4. Pb Ro. Tail	159.9	8.05	1.19	13.20	2.5	9.1
5. Zn Scalp Conc.	577.1	29.06	0.88	29.80	6.7	74.0
6. Zn Scalp Tail	925.5	46.60	0.42	0.53	5.1	2.1
Head Calc.	1985.9	100.00	3.81	11.70	100.0	100.0

Comb. Prod.

Products 1+2	12.02	26.66	8.89	84.1	9.1
Products 1to3	16.28	20.03	10.62	85.6	14.8
Products 1to4	24.34	13.80	11.47	88.1	23.9
Products 5+6	75.66	0.60	11.77	11.9	76.1

Test No: 34 Lead Regrind Product S.G.- 4.74

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.7µ	0.00	0.0	0.0	100.0
23.8	0.34	0.7	0.7	99.3
16.6	2.42	4.8	5.5	94.5
11.4	8.48	17.0	22.5	77.5
8.8	5.31	10.6	33.1	66.9
-8.8	33.45	66.9	100.0	-
Total	50.00	100.0	-	-

K80 = 12 µm

TEST NO. 35

Purpose: As for Test 34, with a coarser regrind.

Procedure: As for Test 34.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab bali mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	9.2
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	20	-	200	10	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	9.0
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 35

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	159.5	8.06	39.40	8.77	78.6	6.1
2.Pb Ro. Conc.2	124.0	6.27	4.55	18.40	7.1	10.0
3. Pb Ro. Conc. 3	96.6	4.88	1.41	13.70	1.7	5.8
4. Pb Ro. Tail	155.6	7.87	1.13	9.55	2.2	6.5
5. Zn Scalp Conc.	520.1	26.29	0.85	30.30	5.5	69.3
6. Zn Scalp Tail	922.4	46.63	0.43	0.54	5.0	2.2
Head Calc.	1978.2	100.00	4.04	11.50	100.0	100.0

Comb. Prod.

Products 1+2	14.33	24.16	12.98	85.6	16.2
Products 1to3	19.21	18.38	13.16	87.3	22.0
Products 1to4	27.08	13.37	12.11	89.5	28.5
Products 5+6	72.92	0.58	11.27	10.5	71.5

Test No: 35 Lead Regrind Product

S.G.- 4.78

Mesh	Weight	% Weight		
	Grams	Ind.	Cum.	Passing
30.4µ	0.40	0.8	0.8	99.2
23.6	1.30	2.6	3.4	96.6
16.5	6.40	12.8	16.2	83.8
11.3	10.44	20.9	37.1	62.9
6.7	4.68	9.3	46.4	53.6
-8.7	26.80	53.6	100.0	-
Total	50.00	100.0	-	-

K80 = 16 µm

TEST NO. 36

Purpose: As for Test 35, with a finer regrind.

Procedure: As for Test 34.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	9.1
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	20	-	200	15	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 36

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	126.3	6.37	50.10	4.97	76.6	2.6
2.Pb Ro. Conc.2	85.8	4.33	6.88	15.80	7.1	5.7
3. Pb Ro. Conc. 3	71.5	3.60	1.71	18.60	1.5	5.6
4. Pb Ro. Tail	190.7	9.61	1.35	11.00	3.1	8.8
5. Zn Scalp Conc.	510.9	25.76	0.86	34.70	5.3	74.1
6. Zn Scalp Tail	998.2	50.33	0.52	0.80	6.3	3.3
Head Calc.	1983.4	100.00	4.16	12.07	100.0	100.0

Comb. Prod.

Products 1+2	10.69	32.62	9.35	83.8	8.3
Products 1to3	14.30	24.82	11.68	85.3	13.8
Products 1to4	23.91	15.39	11.41	88.4	22.6
Products 5+6	76.09	0.64	12.28	11.6	77.4

Test No: 36 Lead Regrind Product

S.G.- 4.79

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.4µ	0.00	0.0	0.0	100.0
23.6	0.63	1.3	1.3	98.7
16.5	3.94	7.9	9.1	90.9
11.3	9.54	19.1	28.2	71.8
8.7	5.18	10.4	38.6	61.4
-8.7	30.71	61.4	100.0	-
Total	50.00	100.0	-	-

K80 = 13 µm

TEST NO. 37

Purpose: As for Test 34, with a finer regrind.

Procedure: As for Test 34.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	9.0
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	20	-	200	30	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	8.8
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 37

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	116.2	5.85	54.30	3.88	74.7	1.9
2.Pb Ro. Conc.2	92.5	4.66	8.70	9.30	9.5	3.7
3. Pb Ro. Conc. 3	79.7	4.02	1.59	11.50	1.5	3.9
4. Pb Ro. Tail	241.9	12.19	1.33	18.20	3.8	18.8
5. Zn Scalp Conc.	497.0	25.04	0.89	32.50	5.2	69.1
6. Zn Scalp Tail	957.7	48.25	0.46	0.61	5.2	2.5
Head Calc.	1985.0	100.00	4.25	11.77	100.0	100.0

Comb. Prod.

Products 1+2	10.51	34.09	6.28	84.2	5.6
Products 1to3	14.53	25.11	7.72	85.7	9.5
Products 1to4	26.72	14.26	12.50	89.5	28.4
Products 5+6	73.28	0.61	11.51	10.5	71.6

Test No: 37 Lead Regrind Product S.G.- 4.81

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.3µ	0.00	0.0	0.0	100.0
23.5		0.0	0.0	100.0
16.4	1.82	3.6	3.6	96.4
11.3	7.84	15.7	19.3	80.7
8.7	5.11	10.2	29.5	70.5
-8.7	35.23	70.5	100.0	-
Total	50.00	100.0	-	-

K80 = 11 µm

TEST NO. 38

Purpose: As for Test 37, with a finer regrind.

Procedure: As for Test 34.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	-
2	20	-	10	7.5	-	-	-	-	-
3	20	-	10	5.0	-	-	-	-	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 38

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	109.7	5.54	56.50	3.61	74.2	1.6
2.Pb Ro. Conc.2	78.2	3.95	9.01	8.78	8.4	2.9
3. Pb Ro. Conc. 3	63.8	3.22	1.73	9.97	1.3	2.6
4. Pb Ro. Tail	264.8	13.37	1.64	17.90	5.2	19.7
5. Zn Scalp Conc.	554.2	27.99	0.98	30.90	6.5	71.2
6. Zn Scalp Tail	909.6	45.93	0.40	0.51	4.4	1.9
Head Calc.	1980.3	100.00	4.22	12.14	100.0	100.0

Comb. Prod.

Products 1+2	9.49	36.74	5.76	82.6	4.5
Products 1to3	12.71	27.86	6.83	83.9	7.1
Products 1to4	26.08	14.42	12.50	89.1	26.9
Products 5+6	73.92	0.62	12.02	10.9	73.1

Test No: 38 Lead Regrind Product

S.G.- 4.83

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.3µ.	0.00	0.0	0.0	100.0
23.5	0.22	0.4	0.4	99.6
16.4	1.17	2.3	2.8	97.2
11.3	4.87	9.7	12.5	87.5
8.7	4.31	8.6	21.1	78.9
-8.7	39.43	78.9	100.0	-
Total	50.00	100.0	-	-

K80 = 9 µm

TEST NO. 39

Purpose: As for Test 34, with a finer regrind.

Procedure: As for Test 34.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	20	-	200	50	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 39

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	107.8	5.40	56.40	3.24	72.4	1.5
2.Pb Ro. Conc.2	72.9	3.65	9.99	7.47	8.7	2.3
3. Pb Ro. Conc. 3	68.0	3.41	2.02	8.59	1.6	2.4
4. Pb Ro. Tail	309.4	15.50	1.60	17.30	5.9	22.4
5. Zn Scalp Conc.	546.9	27.39	0.94	30.30	6.1	69.3
6. Zn Scalp Tall	891.7	44.66	0.50	0.59	5.3	2.2
Head Calc.	1996.7	100.00	4.21	11.98	100.0	100.0

Comb. Prod.

Products 1+2	9.05	37.68	4.95	81.0	3.7
Products 1to3	12.46	27.93	5.94	82.7	6.2
Products 1to4	27.95	13.33	12.24	88.6	28.5
Products 5+6	72.05	0.67	11.88	11.4	71.5

Test No: 39 Lead Regrind Product

S.G.- 4.78

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.4µ	0.00	0.0	0.0	100.0
23.6	0.58	1.2	1.2	98.8
16.5	1.77	3.5	4.7	95.3
11.3	4.07	8.1	12.8	87.2
8.7	4.10	8.2	21.0	79.0
-8.7	39.48	79.0	100.0	-
Total	50.00	100.0	-	-

K80 = 9 µm

TEST NO. 43

Purpose: First in a series of tests to examine the effects of secondary collector. No secondary collector was used in this test.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	A317	Na_2CO_3	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	-	-	30	-	-	9.2
Bulk Rougher 1	40	-	25	-	-	2	4	-
2	30	-	15	-	-	1	4	-
3	25	-	12.5	-	-	1	4	-
Bulk Conc Regrind	-	1200	-	200	40	-	-	-
H.I. Conditioning	50	-	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	1	-
2	20	-	7.5	-	-	1	3	-
3	20	-	5	-	-	1	3	-
Zinc Circuit:	350	M2030	$CuSO_4$	$Ca(OH)_2$				
Condition	-	-	-	600	-	5	-	-
	-	-	1000	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	2	3	-
2	10	5	-	-	-	1	2	-

Test No. 43

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	110.1	5.55	50.30	3.03	72.6	1.5
2.Pb Ro. Conc.2	89.6	4.52	7.78	7.35	9.1	2.9
3. Pb Ro. Conc. 3	73.7	3.72	1.92	8.77	1.9	2.8
4. Pb Ro. Tail	270.5	13.64	1.56	13.10	5.5	15.5
5. Zn Scalp Conc.	489.3	24.68	0.68	34.60	4.4	73.9
6. Zn Scalp Tail	949.6	47.89	0.52	0.83	6.5	3.4
Head Calc.	1982.8	100.00	3.85	11.55	100.0	100.0

Comb. Prod.

Products 1+2	10.07	31.22	4.97	81.8	4.3
Products 1to3	13.79	23.32	5.99	83.6	7.2
Products 1to4	27.43	12.50	9.53	89.2	22.6
Products 5+6	72.57	0.57	12.31	10.8	77.4

TEST NO. 44

Purpose: As for Test 38, with alternate secondary collector LSB/THM.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB/THM	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 44

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	117.6	5.92	47.30	3.62	72.6	1.9
2.Pb Ro. Conc.2	80.2	4.04	7.99	8.29	8.4	2.9
3. Pb Ro. Conc. 3	87.7	4.41	1.75	10.80	2.0	4.2
4. Pb Ro. Tail	288.1	14.50	1.76	14.40	6.6	18.3
5. Zn Scalp Conc.	506.2	25.48	0.80	31.60	5.3	70.5
6. Zn Scalp Tail	906.7	45.64	0.43	0.57	5.1	2.3
Head Calc.	1986.5	100.00	3.86	11.43	100.0	100.0

Comb. Prod.

Products 1+2	9.96	31.36	5.51	81.0	4.8
Products 1to3	14.37	22.27	7.14	83.0	9.0
Products 1to4	28.87	11.97	10.79	89.6	27.3
Products 5+6	71.13	0.56	11.69	10.4	72.7

TEST NO. 45

Purpose: As for Test 38, with alternate collector 242.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	242	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	12	15	-	-	1	4	-
3	15	-	16	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	12	7.5	-	-	1	3	-
3	20	-	8	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 45

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	139.7	6.98	43.20	5.00	75.0	3.1
2.Pb Ro. Conc.2	126.0	6.29	5.00	8.82	7.8	4.9
3. Pb Ro. Conc. 3	104.7	5.23	1.36	11.00	1.8	5.1
4. Pb Ro. Tail	329.9	16.48	1.30	19.90	5.3	28.8
5. Zn Scalp Conc.	458.8	22.92	1.03	28.00	5.9	56.4
6. Zn Scalp Tail	842.7	42.10	0.40	0.48	4.2	1.8
Head Calc.	2001.8	100.00	4.02	11.38	100.0	100.0

Comb. Prod.

Products 1+2	13.27	25.08	6.81	82.8	7.9
Products 1to3	18.50	18.38	8.00	84.6	13.0
Products 1to4	34.98	10.33	13.60	89.9	41.8
Products 5+6	65.02	0.62	10.18	10.1	58.2

TEST NO. 46

Purpose: As for Test 38, with aiternate collector 3418A.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	3418A	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 46

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	138.4	6.92	42.20	4.33	77.2	2.6
2.Pb Ro. Conc.2	132.1	6.60	4.68	9.48	8.2	5.5
3. Pb Ro. Conc. 3	101.2	5.06	1.15	10.40	1.5	4.6
4. Pb Ro. Tail	342.3	17.11	1.06	21.50	4.8	32.4
5. Zn Scalp Conc.	419.6	20.98	0.81	28.80	4.5	53.2
6. Zn Scalp Tail	866.6	43.33	0.33	0.43	3.8	1.6
Head Calc.	2000.2	100.00	3.78	11.36	100.0	100.0

Comb. Prod.

Products 1+2	13.52	23.88	6.85	85.4	8.1
Products 1to3	18.58	17.69	7.81	86.9	12.8
Products 1to4	35.70	9.72	14.37	91.7	45.2
Products 5+6	64.30	0.49	9.69	8.3	54.8

TEST NO. 47

Purpose: As for Test 38, with alternate collector LSB.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	10.2
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	10.2
2	20	-	10	7.5	-	-	1	3	-
3	20	-	10	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	9.0
2	10	5	-	-	-	-	1	2	-

Test No. 47

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	116.4	5.85	51.90	3.96	73.8	2.0
2.Pb Ro. Conc.2	88.7	4.46	7.14	8.54	7.7	3.2
3. Pb Ro. Conc. 3	78.1	3.92	1.78	10.20	1.7	3.4
4. Pb Ro. Tail	258.3	12.98	1.68	15.20	5.3	16.7
5. Zn Scalp Conc.	544.5	27.36	0.99	31.50	6.6	72.9
6. Zn Scalp Tail	904.1	45.43	0.44	0.47	4.9	1.8
Head Calc.	1990.1	100.00	4.11	11.82	100.0	100.0

Comb. Prod.

Products 1+2	10.31	32.54	5.94	81.6	5.2
Products 1to3	14.23	24.06	7.12	83.3	8.6
Products 1to4	27.21	13.38	10.97	88.6	25.3
Products 5+6	72.79	0.65	12.13	11.4	74.7

TEST NO. 51

Purpose: As for Test 38, with alternate collector SP117 GR.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	317	Na_2CO_3	SP117 GR	MIBC	PKD-C	Grind	Cond.	Froth	pH
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	10	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	12	7.5	-	-	1	3	-
3	20	-	8	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 51

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	128.6	6.49	43.10	4.62	72.4	2.6
2.Pb Ro. Conc.2	61.9	3.12	7.35	10.50	5.9	2.9
3. Pb Ro. Conc. 3	64.4	3.25	2.16	11.90	1.8	3.4
4. Pb Ro. Tail	214.7	10.84	2.48	12.00	7.0	11.4
5. Zn Scalp Conc.	549.6	27.74	0.95	31.90	6.8	77.2
6. Zn Scalp Tail	962.2	48.56	0.48	0.60	6.0	2.5
Head Calc.	1981.4	100.00	3.86	11.45	100.0	100.0

Comb. Prod.

Products 1+2	9.61	31.48	6.53	78.4	5.5
Products 1to3	12.86	24.08	7.89	80.2	8.9
Products 1to4	23.70	14.20	9.77	87.1	20.2
Products 5+6	76.30	0.65	11.98	12.9	79.8

TEST NO. 52

Purpose: As for Test 38, with alternate collector LSB GR.

Procedure: As for Test 38.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB GR	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	30	-	-	-
Bulk Ro 1	25	-	-	25	-	-	2	4	-
2	10	-	12	15	-	-	1	4	-
3	15	-	15	12.5	-	-	1	4	-
Bulk Conc Regr	-	1200	-	-	200	40	-	-	-
H.I. Condition	50	-	20	20	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	1	-
2	20	-	12	7.5	-	-	1	3	-
3	20	-	8	5.0	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	2	3	-
2	10	5	-	-	-	-	1	2	-

Test No. 52

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	101.7	5.13	52.90	2.75	70.5	1.2
2.Pb Ro. Conc.2	72.2	3.64	7.44	7.37	7.0	2.4
3. Pb Ro. Conc. 3	70.2	3.54	2.18	8.74	2.0	2.7
4. Pb Ro. Tail	219.7	11.09	2.02	12.20	5.8	11.9
5. Zn Scalp Conc.	512.3	25.85	0.98	34.40	6.6	78.3
6. Zn Scalp Tail	1005.5	50.74	0.61	0.76	8.0	3.4
Head Calc.	1981.6	100.00	3.85	11.35	100.0	100.0

Comb. Prod.

Products 1+2	8.78	34.03	4.67	77.6	3.6
Products 1to3	12.32	24.87	5.84	79.6	6.3
Products 1to4	23.41	14.04	8.85	85.4	18.3
Products 5+6	76.59	0.73	12.11	14.6	81.7

TEST NO. 53

Purpose: To examine the effect of cyanide in the grind, with aitemate collector LSB CU.

Procedure: Similar to Test 38, but with cyanide and LSB CU.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	317	Na_2CO_3	LSB CU	MIBC	PKD-C	NaCN	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	150	30	-	-	-
Bulk Rougher 1	25	-	-	25	-	-	-	2	4	-
2	-	-	-	-	-	-	-	1	4	-
3	-	-	-	-	-	-	-	1	4	-
Bulk Conc Regrind	-	1200	-	-	200	-	40	-	-	-
H.I. Conditioning	50	-	20	20	-	-	-	-	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	1	-
2	20	-	12	7.5	-	-	-	1	3	-
3	20	-	8	7.5	-	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$						
Condition	-	-	-	600	-	-	-	5	-	-
	-	-	1000	-	-	-	-	5	-	-
Zn Scalp 1	50	20	-	-	-	-	-	2	3	-
Zn Scalp 2	10	5	-	-	-	-	-	1	2	-

Test No. 53

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	107.2	5.40	51.70	3.15	73.6	1.5
2.Pb Ro. Conc.2	85.5	4.31	6.80	8.43	7.7	3.3
3. Pb Ro. Conc. 3	78.0	3.93	1.82	10.30	1.9	3.7
4. Pb Ro. Tail	259.9	13.09	1.49	15.00	5.1	17.8
5. Zn Scalp Conc.	505.8	25.48	0.92	30.90	6.2	71.4
6. Zn Scalp Tail	948.9	47.80	0.43	0.54	5.4	2.3
Head Calc.	1985.3	100.00	3.79	11.03	100.0	100.0

Comb. Prod.

Products 1+2	9.71	31.78	5.49	81.4	4.8
Products 1to3	13.64	23.15	6.88	83.3	8.5
Products 1to4	26.73	12.54	10.86	88.4	26.3
Products 5+6	73.27	0.60	11.10	11.6	73.7

TEST NO. 54

Purpose: As for Test 47, with a coarser primary grind and Increased soda ash.

Procedure: Similar to Test 47.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	317	Na_2CO_3	LSB	MIBC	PKD-C	Grind	Cond.	Froth	pH
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	25	-	-	1	4	-
2	10	-	10	10	-	-	1	4	9.5
3	20	-	20	10	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	150	40	-	-	-
H.I. Condition	50	-	20	20	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	1	3	-
2	-	-	-	5	-	-	1	5	-
3	-	-	5	5	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	9.5

Test No. 54

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	231.8	11.63	28.00	7.66	84.4	8.0
2.Pb Ro. Conc.2	77.8	3.90	2.39	11.20	2.4	3.9
3. Pb Ro. Conc. 3	26.7	1.34	1.31	11.80	0.5	1.4
4. Pb Ro. Tail	376.5	18.89	0.79	14.20	3.9	24.2
5. Zn Scalp Conc.	441.1	22.13	0.81	30.20	4.6	60.2
6. Zn Scalp Tail	839.5	42.11	0.39	0.58	4.3	2.2
Head Calc.	1993.4	100.00	3.86	11.09	100.0	100.0

Comb. Prod.

Products 1+2	15.53	21.56	8.55	86.8	12.0
Products 1to3	16.87	19.96	8.81	87.2	13.4
Products 1to4	35.76	9.83	11.66	91.1	37.6
Products 5+6	64.24	0.53	10.78	8.9	62.4

TEST NO. 55

Purpose: To repeat Test 54 but increase regrind to 50 minutes.

Procedure: As for Test 54.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	9.7
Bulk Ro 1	25	-	-	25	-	-	1	4	-
2	10	-	10	10	-	-	1	4	-
3	10	-	10	10	-	-	1	3	-
4	10	-	10	-	-	-	-	3	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	20	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	1	4.3	9.4
2	-	-	-	5	-	-	1	3	-
3	-	-	5	5	-	-	1	4.7	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 55

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	225.9	11.42	28.00	6.20	82.2	6.5
2.Pb Ro. Conc.2	37.7	1.91	2.37	9.70	1.2	1.7
3. Pb Ro. Conc. 3	30.1	1.52	1.77	12.30	0.7	1.7
4. Pb Ro. Tall	400.7	20.26	1.14	13.30	5.9	24.7
5. Zn Scalp Conc.	424.8	21.48	0.84	31.10	4.6	61.3
6. Zn Scalp Tall	858.6	43.41	0.48	1.03	5.4	4.1
Head Calc.	1977.8	100.00	3.89	10.90	100.0	100.0

Comb. Prod.

Products 1+2	13.33	24.33	6.70	83.4	8.2
Products 1to3	14.85	22.02	7.27	84.1	9.9
Products 1to4	35.11	9.97	10.75	90.0	34.6
Products 5+6	64.89	0.60	10.98	10.0	65.4

TEST NO. 56

Purpose: To repeat Test 55 conditions but substitute MIBC with AF65/MIBC mixture.

Procedure: As for Test 55.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	MIBC AF65	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	14	-	-	2	5	-
2	10	-	10	6	-	-	1	2.5	-
3	10	-	10	6	-	-	1	3.5	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	14	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5.5	-
2	-	-	5	-	-	-	1	3	-
3	-	-	5	4	-	-	1	2.5	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 56

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	264.6	13.32	24.20	7.56	83.3	9.0
2.Pb Ro. Conc.2	48.5	2.44	2.06	12.00	1.3	2.6
3. Pb Ro. Conc. 3	12.8	0.64	1.43	14.80	0.2	0.9
4. Pb Ro. Tail	342.6	17.25	0.95	15.20	4.2	23.5
5. Zn Scalp Conc.	517.6	26.06	0.98	26.50	6.6	61.8
6. Zn Scalp Tail	800.0	40.28	0.42	0.63	4.4	2.3
Head Calc.	1986.1	100.00	3.87	11.18	100.0	100.0

Comb. Prod.

Products 1+2	15.76	20.77	8.25	84.6	11.6
Products 1to3	16.41	20.01	8.51	84.8	12.5
Products 1to4	33.66	10.24	11.94	89.0	35.9
Products 5+6	66.34	0.64	10.79	11.0	64.1

Test No: 56 Lead Regrind Product

S.G.- 4.73

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
29.3	0.03	0.1	0.1	99.9
22.7	0.23	0.5	0.5	99.5
15.8	1.87	3.7	4.3	95.7
10.9	8.40	16.8	21.1	78.9
8.4	5.51	11.0	32.1	67.9
-8.4	33.96	67.9	100.0	-
Total	50.00	100.0	-	-

K80 = 11 µm

TEST NO. 57

Purpose: To repeat Test 56 but use AF65 only.

Procedure: As for Test 56.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	AF65	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	12	-	-	2	5	-
2	10	-	10	6	-	-	1	3.5	-
3	10	-	10	6	-	-	1	2.5	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	14	-	-	-	-	-
Pb Rougher 1	-	-	-	-	-	-	1	6.5	-
2	-	-	5	-	-	-	1	3	-
3	-	-	5	-	-	-	1	2.5	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	5	-

Test No. 57

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	285.2	14.34	23.30	7.62	83.3	9.6
2.Pb Ro. Conc.2	48.8	2.45	3.06	14.20	1.9	3.1
3. Pb Ro. Conc. 3	30.5	1.53	1.94	17.00	0.7	2.3
4. Pb Ro. Tail	385.0	19.36	1.03	15.70	5.0	26.8
5. Zn Scalp Conc.	442.1	22.24	0.86	28.00	4.8	54.8
6. Zn Scalp Tail	796.6	40.07	0.43	0.96	4.3	3.4
Head Calc.	1988.2	100.00	4.01	11.35	100.0	100.0

Comb. Prod.

Products 1+2	16.80	20.34	8.58	85.2	12.7
Products 1to3	18.33	18.80	9.29	86.0	15.0
Products 1to4	37.70	9.67	12.58	90.9	41.8
Products 5+6	62.30	0.58	10.61	9.1	58.2

TEST NO. 58

Purpose: To repeat Test 57, but use Flotanol C7/MIBC mixture as frother.

Procedure: As for Test 57.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1000	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	12	-	-	1	5	9.7
2	10	-	10	6	-	-	1	3	-
3	10	-	10	6	-	-	1	2.5	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	14	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	7	-
2	-	-	5	-	-	-	1	3	-
3	-	-	5	-	-	-	1	2.5	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Conditlon	-	-	-	600	-	-	5	-	-
Conditlon	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 58

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	326.1	16.47	20.70	8.27	85.9	12.1
2.Pb Ro. Conc.2	36.0	1.82	1.56	16.00	0.7	2.6
3. Pb Ro. Conc. 3	18.0	0.91	1.33	17.50	0.3	1.4
4. Pb Ro. Tail	363.0	18.33	0.86	16.70	4.0	27.3
5. Zn Scalp Conc.	434.8	21.95	0.90	27.50	5.0	53.8
6. Zn Scalp Tail	802.6	40.53	0.40	0.75	4.1	2.7
Head Calc.	1980.5	100.00	3.97	11.21	100.0	100.0

Comb. Prod.

Products 1+2	18.28	18.80	9.04	86.7	14.7
Products 1to3	19.19	17.97	9.44	87.0	16.2
Products 1to4	37.52	9.61	12.99	90.9	43.5
Products 5+6	62.48	0.58	10.15	9.1	56.5

TEST NO. 59

Purpose: To evaluate the depressant system of Na_2CO_3 and NaCN in lead roughing.

Procedure: As for Test 58.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	C7/MIBC	NaCN	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	19	-	-	1	5.7	9.7
2	12	-	12	7	-	-	1	4	-
3	10	-	10	5	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	14	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	7	-
2	-	-	5	-	-	-	1	4	-
3	5	-	5	-	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	11.0
Condition	-	-	1000	-	-	-	5	-	8.8
Zn Scalp	50	23	-	-	-	-	2	3	8.8

Test No. 59

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	259.7	13.07	25.10	6.63	83.1	7.4
2.Pb Ro. Conc.2	38.1	1.92	1.60	12.80	0.8	2.1
3. Pb Ro. Conc. 3	22.5	1.13	1.50	13.30	0.4	1.3
4. Pb Ro. Tail	320.0	16.11	1.05	13.80	4.3	19.1
5. Zn Scalp Conc.	539.4	27.15	0.90	28.90	6.2	67.3
6. Zn Scalp Tail	807.0	40.62	0.51	0.82	5.2	2.9
Head Calc.	1986.7	100.00	3.95	11.67	100.0	100.0

Comb. Prod.

Products 1+2	14.99	22.09	7.42	83.9	9.5
Products 1to3	16.12	20.65	7.83	84.3	10.8
Products 1to4	32.23	10.85	10.81	88.6	29.9
Products 5+6	67.77	0.67	12.07	11.4	70.1

TEST NO. 60

Purpose: As for Test 59, but with lime and cyanide in the lead roughing.

Procedure: As for Test 58.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	317	Na_2CO_3	LSB	CZ MIBC	NaCN	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	16	-	-	-	1	5	9.6
2	10	-	10	6	-	-	-	1	3	-
3	10	-	10	6	-	-	-	1	3	9.0
Bulk Conc Regrind	-	-	-	-	150	300	50	-	-	-
H.I. Conditioning	50	-	20	14	-	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	7	-
2	-	-	5	-	-	-	-	1	3	-
3	-	-	5	-	-	-	-	1	3	8.3
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$						
Condition	-	-	-	600	-	-	-	5	-	10.7
	-	-	1000	-	-	-	-	5	-	9.3
Zn Scalp	50	20	-	-	-	-	-	2	3	-

Test No. 60

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	255.2	12.84	19.60	7.91	65.5	9.4
2.Pb Ro. Conc.2	46.0	2.31	8.51	12.80	5.1	2.8
3. Pb Ro. Conc. 3	40.1	2.02	7.32	16.10	3.8	3.0
4. Pb Ro. Tail	308.8	15.54	3.62	14.00	14.6	20.2
5. Zn Scalp Conc.	533.0	26.82	0.98	25.10	6.8	62.6
6. Zn Scalp Tail	804.1	40.46	0.38	0.52	4.0	2.0
Head Calc.	1987.2	100.00	3.84	10.76	100.0	100.0

Comb. Prod.

Products 1+2	15.16	17.91	8.66	70.7	12.2
Products 1to3	17.17	16.66	9.53	74.5	15.2
Products 1to4	32.71	10.47	11.65	89.2	35.4
Products 5+6	67.29	0.62	10.32	10.8	64.6

TEST NO. 61

Purpose: As for Test 59, with $Ca(OH)_2$ and PKD-C.

Procedure: As for Test 58.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	317	Na_2CO_3	LSB	C7 MIBC	PKD-C	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	19	-	-	-	1	5.7	9.6
2	12	-	12	7	-	-	-	1	4	-
3	10	-	10	5	-	-	-	1	4	9.1
Bulk Conc Regrind	-	-	-	-	150	300	50	-	-	-
H.I. Conditioning	50	-	20	14	-	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	7	-
2	-	-	5	-	-	-	-	1	4	8.6
3	5	-	5	-	-	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$						
Condition	-	-	-	600	-	-	-	5	-	11.2
	-	-	1000	-	-	-	-	5	-	8.9
Zn Scalp	50	20	-	-	-	-	-	2	3	-

Test No. 61

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	272.1	13.66	22.90	9.30	81.6	11.1
2.Pb Ro. Conc.2	65.1	3.27	2.13	16.40	1.8	4.7
3. Pb Ro. Conc. 3	25.4	1.28	1.78	17.80	0.6	2.0
4. Pb Ro. Tail	300.6	15.09	1.24	10.60	4.9	13.9
5. Zn Scalp Conc.	569.7	28.60	0.95	26.70	7.1	66.5
6. Zn Scalp Tail	758.9	38.10	0.40	0.58	4.0	1.9
Head Calc.	1991.8	100.00	3.83	11.49	100.0	100.0

Comb. Prod.

Products 1+2	16.93	18.89	10.67	83.5	15.7
Products 1to3	18.20	17.69	11.17	84.0	17.7
Products 1to4	33.30	10.23	10.91	88.9	31.6
Products 5+6	66.70	0.64	11.78	11.1	68.4

TEST NO. 62

Purpose: To evaluate the depressant system Na_2CO_3-NaCN-Na_2S in the lead roughing.

Procedure: As for Test 58.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	317	Na_2CO_3	LSB	CZ MIBC	PKD-C	Na_2S	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	19	-	-	-	1	5	9.7
2	12	-	12	7	-	-	-	1	4	-
3	10	-	10	5	-	-	-	1	4	-
Bulk Conc Regrind	-	300	-	-	150	350	-	-	-	-
H.I. Conditioning	50	-	20	14	-	-	-	-	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	7	-
2	-	-	5	-	-	-	-	1	4	9.9
3	5	-	5	-	-	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$						
Condition	-	-	-	600	-	-	-	5	-	-
	-	-	1000	-	-	-	-	5	-	8.9
Zn Scalp	50	23	-	-	-	-	-	2	3	-

Test No. 62

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	324.6	16.24	20.30	7.92	85.5	11.4
2.Pb Ro. Conc.2	49.4	2.47	1.57	13.10	1.0	2.9
3. Pb Ro. Conc. 3	37.6	1.88	1.34	14.70	0.7	2.5
4. Pb Ro. Tail	434.1	21.71	0.84	15.90	4.7	30.6
5. Zn Scalp Conc.	243.5	12.18	0.55	35.70	1.7	38.6
6. Zn Scalp Tail	909.9	45.52	0.54	3.49	6.4	14.1
Head Calc.	1999.1	100.00	3.86	11.28	100.0	100.0

Comb. Prod.

Products 1+2	18.71	17.83	8.60	86.5	14.3
Products 1to3	20.59	16.32	9.16	87.2	16.7
Products 1to4	42.30	8.37	12.62	91.9	47.3
Products 5+6	57.70	0.54	10.29	8.1	52.7

TEST NO. 63

Purpose: To evaluate the depressant system Na_2CO_3-PQ4/NaCN In lead roughing.

Procedure: As for Test 58.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	CZ MIBC	PQ4 NaCN	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	19	-	-	1	5	9.8
2	12	-	12	7	-	-	1	4	-
3	10	-	10	5	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	150	50	-	-	-
H.I. Condition	50	-	20	14	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	7	9.3
2	-	-	5	-	-	-	1	4	-
3	5	-	5	-	-	-	1	3	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	11.3
Condition	-	-	1000	-	-	-	5	-	9.1
Zn Scalp	50	20	-	-	-	-	2	3.5	-

Test No. 63

Product	Weight		Assays,%,g/t		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	327.0	16.41	19.60	7.92	84.5	11.0
2.Pb Ro. Conc.2	31.5	1.58	1.35	15.00	0.6	2.0
3. Pb Ro. Conc. 3	24.8	1.24	1.10	19.60	0.4	2.1
4. Pb Ro. Tail	257.9	12.94	0.97	14.10	3.3	15.5
5. Zn Scalp Conc.	518.1	26.00	0.91	30.20	6.2	66.7
6. Zn Scalp Tail	833.2	41.82	0.46	0.75	5.1	2.7
Head Calc.	1992.5	100.00	3.81	11.77	100.0	100.0

Comb. Prod.

Products 1+2	17.99	18.00	8.54	85.1	13.1
Products 1to3	19.24	16.90	9.26	85.4	15.1
Products 1to4	32.18	10.49	11.21	88.7	30.6
Products 5+6	67.82	0.63	12.04	11.3	69.4

TEST NO. 64

Purpose: To repeat conditions of Test 54 but combine Pb rougher concentrate and clean 4 times.

Procedure: As for Test 54, but clean the Pb rougher concentrate 4 times.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	25	-	-	1	4	9.7
2	10	-	10	10	-	-	1	4	-
3	20	-	20	10	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	150	40	-	-	-
H.I. Condition	50	-	20	20	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5.5	9.6
2	-	-	-	5	-	-	1	2.5	-
3	-	-	5	5	-	-	1	2.0	-
Pb 1st Cleaner	-	-	5	-	-	-	1	2.0	-
Pb 1st Cl Scav	-	-	5	-	-	-	1	2.0	-
Pb 2nd Cleaner	-	-	-	-	40	-	1	3.0	-
	-	-	2	2	-	-	-	2.0	-
Pb 3rd Cleaner	-	-	-	-	20	-	1	2.0	-
	-	-	2	2	-	-	-	1.5	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 64

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	104.2	5.25	54.6	2.99	74.5	1.4
2. Pb 3rd Cl. Tail	37.2	1.87	10.4	8.57	5.1	1.4
3. Pb 2nd Cl. Tail	46.7	2.35	3.4	10.3	2.1	2.1
4. Pb 1st Cl. Tail	125.0	6.30	1.69	11	2.8	6.1
5. PbScav. Conc.	18.7	0.94	1.3	12.6	0.3	1.0
6. Pb Scav Tail	338.8	17.07	0.94	13.7	4.2	20.6
7. Zn Scalp Conc.	556.6	28.05	0.98	26.4	7.1	65.3
8. Zn Scalp Tail	757.2	38.16	0.40	0.57	4.0	1.9
Head Calc.	1984.4	100.00	3.85	11.33	100.0	100.0

Combined Products

Products 1+2	7.13	42.97	4.46	79.6	2.8
Products 1-3	9.48	33.15	5.91	81.6	4.9
Products 1-4	15.78	20.59	7.94	84.4	11.1
Products 1-5	16.72	19.50	8.20	84.7	12.1
Products 1-6	33.79	10.12	10.98	88.9	32.7
Products 7+8	66.21	0.65	16.79	11.1	67.3

TEST NO. 65

Purpose: To repeat Test 64 but use LSB/Thiourea in place of LSB.

Procedure: As for Test 64.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB/TH	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	25	-	-	1	4	9.6
2	10	-	10	10	-	-	1	3	-
3	20	-	20	10	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	150	40	-	-	-
H.I. Condition	50	-	20	20	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4.7	-
2	-	-	-	5	-	-	1	2.0	-
3	-	-	5	5	-	-	1	4.5	-
Pb 1st Cleaner	-	-	5	-	-	-	1	2.0	-
Pb 1st Cl Scav	-	-	5	-	-	-	1	2.0	-
Pb 2nd Cleaner	-	-	-	-	40	-	1	3.0	-
	-	-	2	2	-	-	-	2.0	-
Pb 3rd Cleaner	-	-	-	-	20	-	1	2.3	-
	-	-	2	2	-	-	-	2.0	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 65

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	106.2	5.34	53.7	2.72	74.1	1.3
2. Pb 3rd Cl. Tail	28.9	1.45	13.5	7.17	5.1	0.9
3. Pb 2nd Cl. Tail	36.0	1.81	4.52	9.2	2.1	1.5
4. Pb 1st Cl. Tail	137.3	6.90	1.91	10.7	3.4	6.5
5. PbScav. Conc.	15.1	0.76	1.62	14	0.3	0.9
6. Pb Scav Tail	411.4	20.67	0.87	15.7	4.7	28.6
7. Zn Scalp Conc.	475.0	23.87	1.00	27.7	6.2	58.2
8. Zn Scalp Tail	780.0	39.20	0.41	0.62	4.2	2.1
Head Calc.	1989.9	100.00	3.87	11.36	100.0	100.0

Combined Products

Products 1+2	6.79	45.10	3.67	79.2	2.2
Products 1-3	8.60	36.56	4.84	81.3	3.7
Products 1-4	15.50	21.14	7.45	84.7	10.2
Products 1-5	16.26	20.22	7.75	85.0	11.1
Products 1-6	36.93	9.39	12.20	89.7	39.7
Products 7+8	63.07	0.63	17.63	10.3	60.3

TEST NO. 66

Purpose: To repeat Test 65, but evaluate the zinc circuit.

Procedure: As for Test 65.

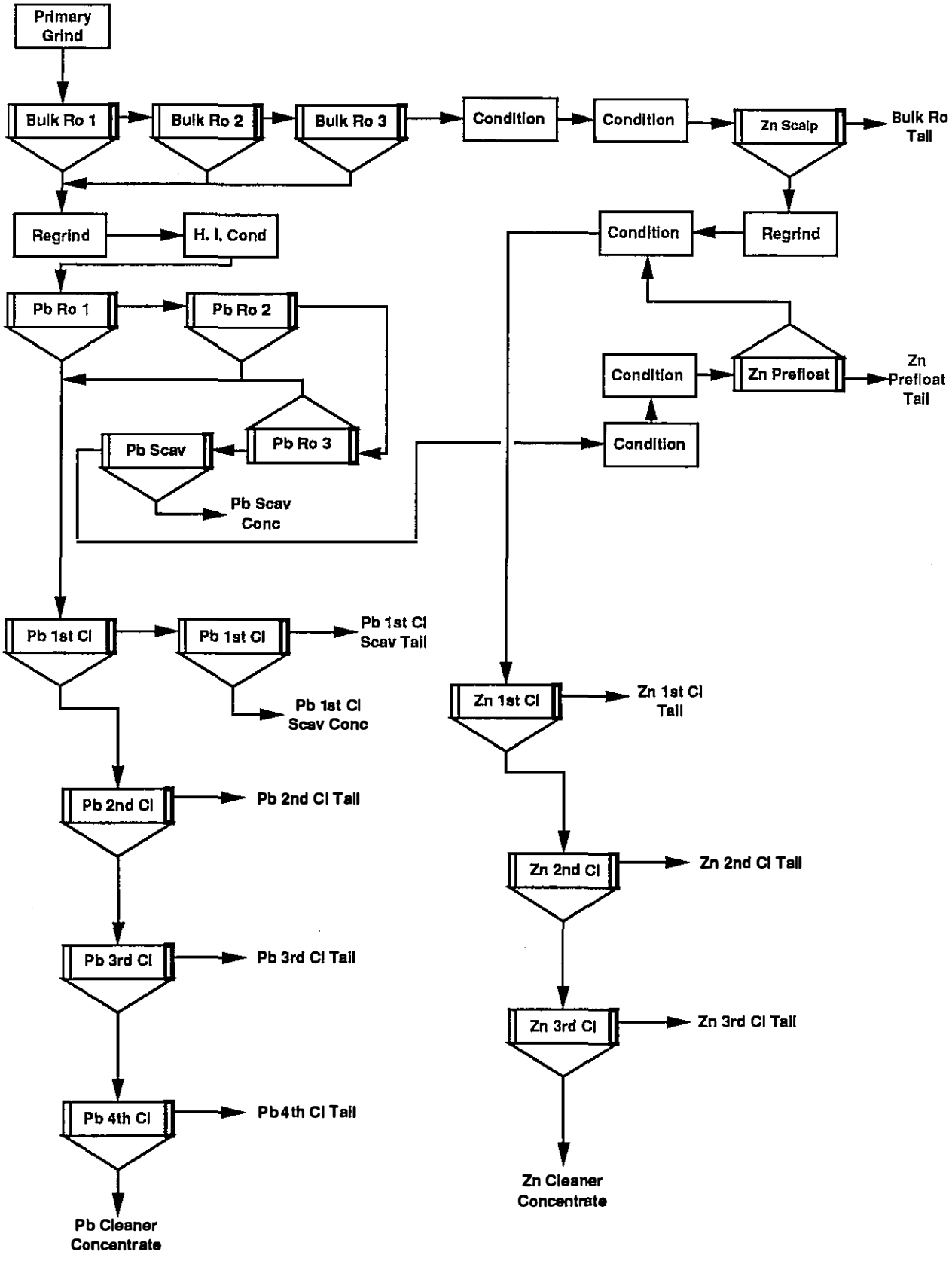
Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	A317	Na_2CO_3	LSB Thiourea	MIBC	PKD-C	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	25	-	-	-	-	1	4	9.7
2	10	-	10	10	-	-	-	-	1	3	-
3	20	-	20	10	-	-	-	-	1	4	-
Bulk Conc Regrind	-	300	-	-	150	-	-	40	-	-	-
H.I. Conditioning	50	-	20	20	-	-	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	-	4.5	-
2	-	-	-	5	-	-	-	-	-	2.0	-
3	-	-	5	5	-	-	-	-	-	3.0	-
Pb Scavenger	-	-	10	-	-	-	-	-	-	2.0	-
Condition	-	-	-	-	-	500	-	-	1	-	7.3
Condition	-	-	-	-	-	-	300	-	5	-	-
Pb 1st Cleaner	-	-	5	-	-	-	-	-	1	4.5	-
Pb 1st Cl Scav	-	-	5	-	-	-	-	-	1	1.5	-
Pb 2nd Cleaner	-	-	-	-	40	-	-	-	1	4	-
	-	-	2	2	-	-	-	-	1	1.5	-
Pb 3rd Cleaner	5	-	5	-	20	-	-	-	1	4	-
	-	-	2	2	-	-	-	-	1	2	-
Pb 4th Cleaner	2.5	-	-	-	10	-	-	-	-	-	-
	-	-	2	2	-	-	-	-	-	-	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$	DF250						
Zn Prefloat	10	12.5	-	-	-	-	-	-	1	4	-
	-	-	-	-	5	-	-	-	-	3	-
Condition	-	-	-	600	-	-	-	-	5	-	-
Condition	-	-	1000	-	-	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	-	-	2	3	-
Zn Scalp Conc Reg	-	5	100	250	-	-	-	20	-	-	-
Zn 1st Cleaner	-	-	-	50	5	-	-	-	-	3	10.2
	-	5	-	-	5	-	-	-	-	5.5	-
Zn 2nd Cleaner	-	-	-	125	-	-	-	-	-	5.5	11.1
	-	-	-	-	2.5	-	-	-	-	1	-
Zn 3rd Cleaner	-	-	-	225	2.5	-	-	-	-	4	11.5
	-	-	-	-	2.5	-	-	-	-	1	-

Test No. 66 Flowsheet



Test No. 66

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	42.5	2.15	62.1	2.63	35.6	0.5
2. Pb 4th Cl. Tall	5.8	0.29	29.8	5.09	2.3	0.1
3. Pb 3rd Cl. Tall	18.8	0.95	25.4	5.63	6.4	0.5
4. Pb 2nd Cl. Tail	60.2	3.05	24.6	6.12	20.0	1.7
5. Pb1st Cl. Scav. Conc	32.8	1.66	14.9	8.46	6.6	1.3
6. Pb 1st Cl. Scav Tail	130.8	6.62	7.64	11.1	13.5	6.6
7. Pb Scav Conc	17.4	0.88	1.30	14.3	0.3	1.1
8. Zn 3rd Cl Conc	284.7	14.41	0.35	58.8	1.3	75.5
9. Zn 3rd Cl Tail	36.7	1.86	1.59	24.0	0.8	4.0
10. Zn 2nd Cl Tail	46.8	2.37	1.92	11.8	1.2	2.5
11. Zn 1st Cl Tall	217.3	11.00	1.32	3.13	3.9	3.1
12. Zn Prefloat Tall	269.1	13.62	1.01	0.77	3.7	0.9
13. Zn Scalp Tall	813.2	41.15	0.39	0.62	4.3	2.3
Head Calc.	1976.1	100.00	3.75	11.21	100.0	100.0

Combined Products

Products 1+2	2.44	58.22	2.93	38.0	0.6
Products 1-3	3.40	49.03	3.68	44.4	1.1
Products 1-4	6.44	37.47	4.64	64.4	2.8
Products 1-5	8.10	32.85	5.58	71.0	4.0
Products 1-6	14.72	21.51	8.06	84.5	10.6
Products 1-7	15.60	20.37	8.41	84.8	11.7
Products 8-9	16.26	0.49	54.83	2.1	79.5
Products 8-10	18.63	0.67	49.36	3.3	82.0
Products 8-11	29.63	0.91	32.20	7.2	85.1
Products 12+13	54.77	0.54	0.66	7.95	3.21

Project No: 3889 ar

Product: Zn Scalp Conc Test No: 67 S.G.- 4.28

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
270m	2.15	4.3	4.3	95.7
30.0µ	7.73	15.5	19.8	80.2
23.2	6.40	12.8	32.6	67.4
16.2	7.87	15.7	48.3	51.7
11.1	7.23	14.5	62.8	37.2
8.6	1.96	3.9	66.7	33.3
-8.6	16.66	33.3	100.0	-
Total	50.00	100.0	-	-

TEST NO. 67

Purpose: To repeat Test 66, but use C7/MIBC frother mixture.

Procedure: As for Test 66.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	A317	Na_2CO_3	LSB Thiourea	C7 MIBC	PKD-C	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	17.5	-	-	-	-	1	4	-
2	10	-	10	7.5	-	-	-	-	1	3	-
3	20	-	20	10	-	-	-	-	1	4	-
Bulk Conc Regrind	-	300	-	-	150	-	-	-	-	-	-
H.I. Conditioning	50	-	20	15	-	-	-	-	-	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	-	4.5	-
2	-	-	-	5	-	-	-	-	1	2.5	-
3	-	-	5	2.5	-	-	-	-	1	3.0	-
Pb 1st Cleaner	-	-	5	-	-	-	-	-	1	3	-
Pb 1st Cl Scav	-	-	5	-	-	-	-	-	1	2.5	-
Pb 2nd Cleaner	-	-	-	-	40	-	-	-	1	3.5	-
	-	-	2	2	-	-	-	-	1	1.0	-
Pb 3rd Cleaner	-	-	-	-	20	-	-	-	1	3.0	-
Pb 4th Cleaner	-	-	-	-	20	-	-	-	-	-	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$	DF250						
Condition	-	-	-	600	-	-	-	-	5	-	-
Condition	-	-	1000	-	-	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	-	-	2	3	-

Test No. 67

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	102.8	5.22	56.5	2.48	76.5	1.1
2. Pb 4th Cl. Tail	19.4	0.98	9.98	7.08	2.5	0.6
3. Pb 3rd Cl. Tail	25.7	1.30	4.38	9.35	1.5	1.1
4. Pb 2nd Cl. Tail	28.8	1.46	2.32	10	0.9	1.3
5. Pb1st Cl. Scav. Conc	31.8	1.61	4.25	8.81	1.8	1.3
6. Pb 1st Cl. Scav Tail	85.2	4.32	1.48	12.2	1.7	4.7
7. Pb Ro Tail	362.2	18.38	0.91	14.3	4.3	23.2
8. Zn Scalp Conc.	487.8	24.75	0.91	29.1	5.8	63.6
9. Zn Scalp Tail	827.4	41.98	0.46	0.84	5.0	3.1
Head Calc.	1971.1	100.00	3.85	11.32	100.0	100.0

Combined Products

Products 1+2	6.20	49.11	3.21	79.0	1.8
Products 1-3	7.50	41.34	4.28	80.5	2.8
Products 1-4	8.96	34.98	5.21	81.4	4.1
Products 1-5	10.58	30.29	5.76	83.1	5.4
Products 1-6	14.90	21.94	7.63	84.8	10.0
Products 1-7	33.28	10.32	11.31	89.1	33.3
Products 8+9	66.72	0.63	11.32	10.9	66.7

TEST NO. 68

Purpose: To repeat Test 67, but increase PKD-C to Bulk Conc regrind to 200 g/t.

Procedure: As for Test 67.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB/TH	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	10	10	-	-	1	3	-
3	20	-	20	10	-	-	1	4	-
Bulk Conc Regr	-	300	-	-	200	46	-	-	-
H.I. Condition	50	-	20	15	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5	-
2	-	-	-	5	-	-	1	2	-
3	-	-	5	2.5	-	-	1	2	-
Pb 1st Cleaner	-	-	5	-	-	-	1	4	-
Pb 2nd Cleaner	-	-	-	-	40	-	1	4	-
Pb 3rd Cleaner	-	-	-	-	20	-	1	2.5	-
Pb 4th Cleaner	-	-	-	-	20	-	-	2.5	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	-
Condition	-	-	1000	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 68

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	106.8	5.37	53.1	2.48	72.8	1.2
2. Pb 4th Cl. Tail	22.0	1.11	10.2	7.08	2.9	0.7
3. Pb 3rd Cl. Tail	35.4	1.78	10.7	9.35	4.9	1.5
4. Pb 2nd Cl. Tail	57.1	2.87	2.63	10	1.9	2.6
5. Pb 1st Cl. Tail	139.6	7.02	1.74	12.2	3.1	7.8
6. Pb Ro Tail	509.4	25.63	0.88	14.3	5.8	33.5
7. Zn Scalp Conc.	371.2	18.68	1.02	29.1	4.9	49.7
8. Zn Scalp Tail	745.7	37.53	0.39	0.84	3.7	2.9
Head Calc.	1987.2	100.00	3.92	10.94	100.0	100.0

Combined Products

Products 1+2	6.48	45.77	3.27	75.7	1.9
Products 1-3	8.26	38.21	4.58	80.6	3.5
Products 1-4	11.14	29.03	5.98	82.5	6.1
Products 1-5	18.16	18.47	8.38	85.6	13.9
Products 1-6	43.80	8.18	11.85	91.4	47.4
Products 7+8	56.20	0.60	10.23	8.6	52.6

TEST NO. 69

Purpose: To repeat Test 68 but increase PKD-C in regrind to 300 g/t and use only 100 g/t Na_2CO_3 in regrind.

Procedure: As for Test 68.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB/TH	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	10	10	-	-	1	3	-
3	20	-	20	10	-	-	1	3	-
Bulk Conc Regr	-	300	-	-	300	46	-	-	-
H.I. Condition	50	-	20	15	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5	-
2	-	-	-	5	-	-	1	2	-
3	-	-	5	-	-	-	1	2	-
Pb 1st Cleaner	-	-	5	-	-	-	1	4	-
Pb 2nd Cleaner	-	-	-	-	40	-	1	2.5	-
Pb 3rd Cleaner	-	-	-	-	20	-	1	3	-
Pb 4th Cleaner	-	-	-	-	10	-	1	2	-
Zn Circuit:	A350	M2030	$CuSO_4$	$Ca(OH)_2$					
Condition	-	-	-	600	-	-	5	-	10.9
Condition	-	-	1000	-	-	-	5	-	8.9
Zn Scalp	50	20	-	-	-	-	2	3	-

Test No. 69

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	114.7	5.78	50.9	2.63	77.9	1.4
2. Pb 4th Cl. Tail	11.2	0.56	9.45	9.59	1.4	0.5
3. Pb 3rd Cl. Tail	17.5	0.88	4.83	7.92	1.1	0.6
4. Pb 2nd Cl. Tail	69.6	3.50	3.65	9.40	3.4	3.0
5. Pb 1st Cl. Tail	123.9	6.24	1.70	12.6	2.8	7.1
6. Pb Ro Tail	500.7	25.21	0.87	15.6	5.8	35.6
7. Zn Scalp Conc.	386.0	19.44	0.83	28.4	4.3	49.9
8. Zn Scalp Tail	762.3	38.39	0.32	0.56	3.3	1.9
Head Calc.	1985.9	100.00	3.77	11.06	100.0	100.0

Combined Products

Products 1+2	6.34	47.21	3.25	79.3	1.9
Products 1-3	7.22	42.04	3.82	80.5	2.5
Products 1-4	10.73	29.50	5.64	83.8	5.5
Products 1-5	16.96	19.27	8.20	86.7	12.6
Products 1-6	42.18	8.27	12.62	92.5	48.1
Products 7+8	57.82	0.49	9.92	7.5	51.9

TEST NO. 70

Purpose: As for Test 68 but with increased soda ash in the bulk concentrate regrind, with alternate depressant P-3/NaCN, and with zinc cleaning.

Procedure: Bulk rougher as in Test 68.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	A317	Na_2CO_3	LSB Thiourea	C7 MIBC	PZ-3 NaCN	$CuSO_4$	$Ca(OH)_2$	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	-	-	1	4	-
2	10	-	10	10	-	-	-	-	1	2.5	-
3	20	-	20	10	-	-	-	-	1	-	-
Bulk Conc Regrind	-	1000	-	-	200	-	-	40	-	-	-
H.I. Conditioning	50	-	20	20	-	-	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	-	1	7	-
2	2	-	5	-	-	-	-	-	1	4	-
3	2	-	5	-	-	-	-	-	1	4	-
Pb 1st Cleaner	-	-	-	-	20	100	-	-	2	4	-
Pb 1st Cl Scav	4	-	5	-	-	-	-	-	1	4	-
Pb 2nd Cleaner	-	-	-	-	20	100	-	-	1	4	-
Pb 3rd Cleaner	-	-	-	-	20	100	-	-	1	4	-
Pb 4th Cleaner	-	-	-	-	20	100	-	-	1	4	-
Condition	-	-	-	-	-	500	-	-	1	-	-
Condition	-	-	-	-	-	-	300	-	5	-	-
Zn Circuit:	A350	M2030	DF250	$CuSO_4$	$Ca(OH)_2$						
Zn Prefloat	10	12.5	-	-	-	-	-	-	1	-	-
	-	-	5	-	-	-	-	-	-	-	-
Condition	-	-	-	-	600	-	-	-	5	-	11.2
Condition	-	-	-	1000	-	-	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	-	-	2	3	9.4
Zn Scalp Conc Reg	-	5	-	100	250	-	-	20	-	-	-
Pb Ro Tail, do Zn Prefloat		-	-	-	-	-	-	-	1	-	-
Condition	-	-	-	500	-	-	-	-	5	-	-
Condition	-	-	-	-	300	-	-	-	1	-	-
Zn Prefloat	10	12.5	2.5	-	-	-	-	-	1	3	-
	-	7.5	5.0	-	-	-	-	-	-	2.5	-
	5	-	-	-	-	-	-	-	-	-	-
Combine Zn Prefloat Conc & Zn Scalp Conc.											
Zn 1st Cleaner	-	-	5.0	-	50	-	-	-	1	7	10.3
	-	-	5.0	-	-	-	-	-	-	5	-
Zn 2nd Cleaner	-	-	5.0	-	125	-	-	-	-	6.5	11.1
	5	-	-	-	-	-	-	-	-	2	-
Zn 3rd Cleaner	-	-	-	-	250	-	-	-	-	6	11.5
	2.5	-	5.0	-	-	-	-	-	-	1	-

Test No. 70

Product	Weight		Assays %		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	106.6	5.40	53.5	2.37	75.1	1.1
2. Pb 4th Cl. Tail	35.3	1.79	11.2	5.84	5.2	0.9
3. Pb 3rd Cl. Tail	34.8	1.76	4.59	7.87	2.1	1.2
4. Pb 2nd Cl. Tail	53.2	2.69	2.32	10.6	1.6	2.5
5. Pb1st Cl. Scav. Conc	22.3	1.13	1.79	11.9	0.5	1.2
6. Pb 1st Cl. Scav Tail	74.1	3.75	1.25	13.6	1.2	4.5
7. Zn 3rd Cl Conc	350.4	17.74	0.56	52.6	2.6	82.2
8. Zn 3rd Cl Tail	14.7	0.74	2.05	8.67	0.4	0.6
9. Zn 2nd Cl Tail	41.4	2.10	1.80	5.15	1.0	1.0
10. Zn 1st Cl Tail	164.0	8.30	1.05	1.56	2.3	1.1
11. Zn Prefloat Tail	273.3	13.84	0.94	0.78	3.4	1.0
12. Zn Scalp Tail	804.8	40.75	0.43	0.77	4.6	2.8
Head Calc.	1974.9	100.00	3.84	11.36	100.0	100.0

Combined Products

Products 1+2	7.19	42.98	3.23	80.3	2.0
Products 1-3	8.95	35.42	4.15	82.5	3.3
Products 1-4	11.64	27.76	5.64	84.1	5.8
Products 1-5	12.77	25.46	6.19	84.6	7.0
Products 1-6	16.52	19.96	7.88	85.8	11.5
Products 7-8	18.49	0.62	50.83	3.0	82.7
Products 7-9	20.58	0.74	46.18	4.0	83.7
Products 7-10	28.89	0.83	33.35	6.2	84.8
Products 11+12	54.59	0.56	0.77	7.9	3.7

TEST NO. 71

Purpose: To duplicate Test 8 Pb conditioner, then conduct Zn flotation as in Test 70.

Procedure: As for Tests 8 and 70.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB THM	MIBC	Na_2CO_3	PKD-C	Grind	Cond.	Froth	
Grind	60	24	-	-	-	20	-	-	-
Bulk Ro 1	25	-	25	-	-	-	1	3	-
2	10	10	15	-	-	-	1	4	7.9
Ro ConcRegr	-	20	-	1200	200	50	-	-	-
H.I. Condition	50	20	20	-	-	-	20	-	-
Pb Rougher	-	-	5	-	-	-	-	4	-
	10	10	5	-	-	-	-	-	-
Pb 1st Cleaner	10	-	-	-	30	-	1	4	-
	2.5	-	2.5	-	-	-	1	1	-
Pb 2nd Cleaner	10	5	2.5	-	20	-	-	3.5	-
Pb 3rd Cleaner	10	5	2.5	-	20	-	-	3	-
Pb 4th Cleaner	5	-	-	-	30	-	-	2.5	-
Zn Circuit:	A350	M2030	DF250	$CuSO_4$	$Ca(OH)_2$				
Condition	-	-	-	-	600	-	5	-	-
Condition	-	-	-	1000	-	-	5	-	-
Zn Scalp	50	20	-	-	-	-	2	3	8.0
*Zn Scalp Conc Regrind		5	-	100	250	20	-	-	-
Pb Ro Tail, do Zn Prefloat									
Condition	-	-	-	500	-	-	5	-	-
Condition	-	-	-	-	300	-	5	-	10.1
Zn Prefloat	10	12.5	5.0	-	-	-	1	3	-
	-	7.5	5.0	-	-	-	-	2.5	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	-	-	5.0	-	50	-	1	6.5	-
	-	-	5.0	-	-	-	-	4	-
Zn 2nd Cleaner	-	-	5.0	-	125	-	-	6.5	11.1
	5	-	-	-	-	-	-	2	-
Zn 3rd Cleaner	-	-	-	-	-	-	-	5.5	11.4
	2.5	-	5.0	-	25	-	-	1	-

*pebble mill

Test No. 71

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	76.0	3.85	66.7	2.7	66.1	0.9
2. Pb 4th Cl. Tail	4.0	0.20	13.4	6.67	0.7	0.1
3. Pb 3rd Cl. Tail	16.0	0.81	8.65	6.01	1.8	0.4
4. Pb 2nd Cl. Tail	19.4	0.98	4.21	6.44	1.1	0.5
5. Pb 1st Cl. Tail	69.6	3.52	2.49	10.2	2.3	3.1
6. Zn 3rd Cl Conc	414.9	21.00	1.54	49.6	8.3	88.4
7. Zn 3rd Cl Tail	15.3	0.77	3.20	7.06	0.6	0.5
8. Zn 2nd Cl Tail	43.9	2.22	2.79	4.27	1.6	0.8
9. Zn 1st Cl Tail	223.1	11.29	1.71	2.09	5.0	2.0
10. Zn Prefloat Tail	173.8	8.80	2.11	1.13	4.8	0.8
11. Zn Scalp Tail	919.7	46.55	0.65	0.62	7.8	2.5
Head Calc.	1975.7	100.00	3.88	11.78	100.0	100.0

Combined Products

Products 1+2	4.05	64.04	2.90	66.8	1.0
Products 1-3	4.86	54.80	3.42	68.6	1.4
Products 1-4	5.84	46.30	3.93	69.6	1.9
Products 1-5	9.36	29.82	6.29	71.9	5.0
Products 6-7	21.77	1.60	48.09	9.0	88.9
Products 6-8	24.00	1.71	44.03	10.6	89.7
Products 6-9	35.29	1.71	30.61	15.5	91.7
Products 10+11	55.35	0.88	0.70	12.6	3.3

TEST NO. 72

Purpose: As for Test 71 with carbonate in the grind, replacement of xanthate with modified xanthate, and with LSB instead of LSB/THM.

Procedure: Similar to Test 71.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317 modified	LSB	Na_2CO_3	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	24	1500	-	-	20	-	-	-
Bulk Ro 1	-	-	-	12.5	-	-	1	5	9.4
2	10	8	-	-	-	-	1	4	-
Bulk Conc Reg	-	8	1000	-	200	50	-	-	-
H.I. Condition	10	8	-	12.5	-	-	10	-	-
Pb Rougher	-	-	-	-	-	-	-	5	-
Pb Scavenger	5	-	-	5	-	-	-	-	-
Pb 1st Cleaner	-	-	-	-	30	-	1	3	-
	2	4	-	2.5	-	-	1	3	-
Pb 1st Cl Scav	5	4	-	4	-	-	1	4	-
Pb 2nd Cleaner	2	-	-	2	20	-	1	4	-
Pb 3rd Cleaner	2	-	-	2	10	-	1	4	-
Pb 4th Cleaner	2	-	-	2	5	-	1	4	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	600	-	5	-	11.3
Condition	-	1000	-	-	-	-	5	-	9.3
Zn Scalp	-	-	50	10	-	-	5	3	-
	-	-	20	10	-	-	1	2	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	-
Condition	300	-	-	-	-	-	5	-	10.3
Zn Prefloat	-	-	10	12.5	5	-	2	3	-
	-	-	-	7.5	5	-	-	2.5	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	6.5	11.8
	-	-	-	-	-	-	1	4	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	5	11.8
	-	-	5	-	-	-	1	2	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.8
	-	-	2.5	-	-	-	1	1	-

*pebble mill

Test No. 72

Product	Weight		Assays %		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	95.4	4.85	55.1	3.15	69.3	1.3
2. Pb 4th Cl. Tail	6.2	0.31	17.8	6.73	1.5	0.2
3. Pb 3rd Cl. Tail	35.3	1.79	14.9	7.05	6.9	1.1
4. Pb 2nd Cl. Tail	39.0	1.98	5.98	7.37	3.1	1.3
5. Pb 1st Cl. Tail	117.2	5.95	2.57	11.9	4.0	6.2
6. Pb Scav Conc	52.0	2.64	1.47	14.9	1.0	3.4
7. Zn 3rd Cl Conc	304.8	15.48	0.49	55.5	2.0	75.0
8. Zn 3rd Cl Tail	33.7	1.71	1.55	14.6	0.7	2.2
9. Zn 2nd Cl Tail	87.5	4.44	1.32	7.19	1.5	2.8
10. Zn 1st Cl Tail	223.3	11.34	0.94	4.77	2.8	4.7
11. Zn Prefloat Tail	329.8	16.75	1.24	0.75	5.4	1.1
12. Zn Scalp Tail	644.4	32.73	0.23	0.25	2.0	0.7
Head Calc.	1968.6	100.00	3.85	11.46	100.0	100.0

Combined Products

Products 1+2	5.16	52.82	3.37	70.7	1.5
Products 1-3	6.95	43.05	4.32	77.7	2.6
Products 1-4	8.94	34.83	4.99	80.7	3.9
Products 1-5	14.89	21.93	7.76	84.7	10.1
Products 1-6	17.53	18.85	8.83	85.7	13.5
Products 7-8	17.19	0.60	51.43	2.7	77.2
Products 7-9	21.64	0.74	42.34	4.2	80.0
Products 7-10	32.98	0.81	29.42	6.9	84.7
Products 11+12	49.49	0.57	0.42	7.3	1.8

TEST NO. 73

Purpose: As for Test 71 with carbonate in the grind.

Procedure: As for Test 71.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	LSB THM	Na_2CO_3	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	24	1500	-	-	20	-	-	-
Bulk Ro 1	25	25	-	21	-	-	-	5.5	9.6
2	10	10	-	5	-	-	-	4.5	-
3	10	5	-	-	-	-	-	-	-
Bulk Conc Reg	-	20	1000	-	200	50	-	-	-
H.I. Condition	25	40	-	15	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	1	5	-
2	-	10	-	4	-	-	1	5	-
Pb Scavenger	10	5	-	4	-	-	1	3	-
Pb 1st Cleaner	-	-	-	-	10	-	1	4	-
	-	5	-	4	-	-	1	4	-
Pb 2nd Cleaner	-	-	-	-	10	-	1	4	-
	-	4	-	2	-	-	1	3	-
Pb 3rd Cleaner	-	-	-	-	5	-	1	4	-
	-	2	-	2	-	-	1	3	-
Pb 4th Cleaner	-	-	-	-	5	-	1	4	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.0
Condition	-	1000	-	-	-	-	5	-	8.5
Zn Scalp	-	-	50	20	-	-	5	3	-
	-	-	20	10	-	-	1	2	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	-
Condition	300	-	-	-	-	-	5	-	10.3
Zn Prefloat	-	-	10	12.5	5	-	2	3	-
	-	-	-	7.5	5	-	1	2.5	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	8	11.8
Zn 2nd Cleaner	250	-	-	-	-	-	1	5	11.8
	-	-	5	-	-	-	1	2	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.8
	-	-	2.5	-	-	-	1	1	-

*pebble mill

Test No. 73

Product	Weight		Assays %		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	68.1	3.44	66.2	2.00	59.9	0.6
2. Pb 4th Cl. Tail	9.8	0.49	33.5	4.84	4.4	0.2
3. Pb 3rd Cl. Tail	27.7	1.40	24.9	5.70	9.2	0.7
4. Pb 2nd Cl. Tail	32.2	1.63	8.61	7.98	3.7	1.1
5. Pb 1st Cl. Tail	64.3	3.25	3.59	10.0	3.1	2.8
6. Pb Scav Conc	46.1	2.33	2.35	11.7	1.4	2.3
7. Zn 3rd Cl Conc	285.1	14.40	0.63	55.3	2.4	68.3
8. Zn 3rd Cl Tail	58.8	2.97	1.55	18.0	1.2	4.6
9. Zn 2nd Cl Tail	66.4	3.35	1.32	5.39	1.2	1.6
10. Zn 1st Cl Tail	490.7	24.79	1.07	7.75	7.0	16.5
11. Zn Prefloat Tail	152.8	7.72	1.84	0.58	3.7	0.4
12. Zn Scalp Tail	677.8	34.24	0.32	0.33	2.9	1.0
Head Calc.	1979.8	100.00	3.80	11.66	100.0	100.0

Combined Products

Products 1+2	3.93	62.09	2.36	64.3	0.8
Products 1-3	5.33	52.33	3.23	73.4	1.5
Products 1-4	6.96	42.12	4.34	77.1	2.6
Products 1-5	10.21	29.86	6.14	80.2	5.4
Products 1-6	12.54	24.75	7.18	81.6	7.7
Products 7-8	17.37	0.79	48.92	3.6	72.9
Products 7-9	20.72	0.87	41.88	4.8	74.5
Products 7-10	45.51	0.98	23.29	11.7	90.9
Products 11+12	41.95	0.60	0.38	6.6	1.4

TEST NO. 74

Purpose: As for Test 72 with reduced collector and a shorter grind.

Procedure: Similar to Test 72.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317 modified	LSB	Na_2CO_3	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	35	19	1500	-	-	20	-	-	-
Bulk Ro 1	10	-	-	12.5	-	-	1	3	9.7
2	15	12	-	-	-	-	1	3	-
3	15	-	-	5	-	-	1	3	-
Bulk Conc Reg	25	-	1000	-	150	50	-	-	-
H.I. Condition	-	10	-	10	-	-	10	-	-
Pb Rougher 1	20	-	-	-	-	-	1	3	-
2	10	2.5	-	10	-	-	1	3	-
3	10	5	-	-	-	-	1	5	9.7
Pb 1st Cleaner	-	-	-	-	15	-	-	5	-
	15	-	-	10	-	-	-	6	-
Pb 2nd Cleaner	10	6	-	-	10	-	-	6	-
	5	-	-	2.5	-	-	-	4.5	-
Pb 3rd Cleaner	5	-	-	2.5	5	-	-	7	-
Pb 4th Cleaner	5	-	-	5	-	-	-	4	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.3
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	20	20	-	-	1	4	-
	-	-	5	-	-	-	1	2	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	-
Condition	300	-	-	-	-	-	5	-	10.0
Zn Prefloat	-	-	10	12.5	7.5	-	2	3	-
	-	-	-	7.5	5	-	-	3	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	7.5	-	1	6.5	11.4
	-	-	5	-	2.5	-	1	4	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	5.5	11.6
	-	-	5	-	5	-	1	3.5	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.8
	-	-	2.5	-	2.5	-	1	1.5	-

*rod mill

Test No. 74

Product	Weight		Assays %		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	116.7	5.97	49.4	4.39	76.0	2.3
2. Pb 4th Cl. Tail	26.4	1.35	6.24	11.70	2.2	1.4
3. Pb 3rd Cl. Tail	32.0	1.64	3.68	10.80	1.6	1.6
4. Pb 2nd Cl. Tail	26.6	1.36	2.66	9.61	0.9	1.2
5. Pb 1st Cl. Tail	77.6	3.97	2.26	12.3	2.3	4.4
6. Zn 3rd Cl Conc	333.7	17.06	0.75	55.2	3.3	84.5
7. Zn 3rd Cl Tail	33.2	1.70	2.39	6.5	1.0	1.0
8. Zn 2nd Cl Tail	56.3	2.88	1.62	1.81	1.2	0.5
9. Zn 1st Cl Tail	279.4	14.28	0.87	0.67	3.2	0.9
10. Zn Prefloat Tail	251.7	12.87	1.56	0.72	5.2	0.8
11. Zn Scalp Tail	722.3	36.93	0.33	0.45	3.1	1.5
Head Calc.	1955.9	100.00	3.88	11.15	100.0	100.0

Combined Products

Products 1+2	7.32	41.44	5.74	78.1	3.8
Products 1-3	8.95	34.54	6.66	79.7	5.4
Products 1-4	10.31	30.33	7.05	80.6	6.5
Products 1-5	14.28	22.53	8.51	82.9	10.9
Products 6-7	18.76	0.90	50.79	4.3	85.5
Products 6-8	21.64	0.99	44.27	5.5	85.9
Products 6-9	35.92	0.94	26.93	8.7	86.8
Products 10+11	49.80	0.65	0.52	8.3	2.3

TEST NO. 75

Purpose: To repeat Test 68 with regrinding of the Pb 1st cleaner concentrate and without high intensity conditioning.

Procedure: Similar to Test 68.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB TH	CZ MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	9.7
2	10	-	10	10	-	-	1	3	-
3	20	-	20	10	-	-	1	3	-
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	-	-	-	-	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	2.5	-
2	30	-	10	10	-	-	-	5.5	-
3	5	-	5	5	-	-	-	3	-
Pb Scavenger	10	-	10	2.5	-	-	-	4	-
Pb 1st Cleaner	-	-	-	-	15	-	-	4	-
	15	-	-	10	-	-	-	3	-
Pb 1st Cl Conc Regrind		100	-	-	100	10	-	-	-
Pb 2nd Cleaner	10	-	6	-	-	-	-	5	-
	5	-	-	2.5	-	-	-	3	-
Pb 3rd Cleaner	5	-	-	2.5	5	-	-	5	-
Pb 4th Cleaner	5	-	-	5	-	-	-	3	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.1
Condition	-	1000	-	-	-	-	5	-	9.0
Zn Scalp 1	-	-	50	20	-	-	2	3	-
2	-	-	20	10	-	-	1	2	-

Test No. 75

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	125.2	6.28	45.7	6.08	75.9	3.5
2. Pb 4th Cl. Tail	17.1	0.86	7.08	11.0	1.6	0.9
3. Pb 3rd Cl. Tail	40.7	2.04	5.14	15.4	2.8	2.9
4. Pb 2nd Cl. Tail	72.7	3.64	3.68	15.7	3.6	5.2
5. Pb 1st Cl. Tail	125.3	6.28	1.16	18.3	1.9	10.5
6. Pb Scav Conc	75.0	3.76	0.83	16.0	0.8	5.5
7. Pb Scav Tail	299.3	15.00	0.86	9.25	3.4	12.6
8. Zn Scalp Conc.	514.2	25.78	1.01	24.6	6.9	57.7
9. Zn Scalp Tail	725.2	36.36	0.32	0.42	3.1	1.4
Head Calc.	1994.7	100.00	3.78	11.00	100.0	100.0

Combined Products

Products 1+2	7.13	41.06	6.67	77.5	4.3
Products 1-3	9.17	33.07	8.61	80.3	7.2
Products 1-4	12.82	24.71	10.63	83.9	12.4
Products 1-5	19.10	16.97	13.15	85.8	22.8
Products 1-6	22.86	14.31	13.62	86.6	28.3
Products 1-7	37.87	8.98	11.89	90.0	40.9
Products 8+9	62.13	0.61	10.45	10.0	59.1

TEST NO. 76

Purpose: To repeat Test 75 with high intensity conditioning after the bulk concentrate regrind.

Procedure: Similar to Test 75, but with conditioning.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	LSB/TH	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	9.3
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	3.5	9.0
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	25	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4.5	-
2	-	-	5	5	-	-	1	2	-
3	5	-	-	2.5	-	-	1	2	-
Pb 1st Cleaner	-	-	-	-	15	-	-	4	-
	15	-	10	-	-	-	-	1	-
Pb 1st Cl Conc Regrind		100	-	-	100	10	-	-	-
Pb 2nd Cleaner	-	-	-	-	-	-	-	3.5	-
Pb 3rd Cleaner	-	-	-	-	5	-	-	3.5	-
Pb 4th Cleaner	-	-	-	-	10	-	-	2.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.0
Condition	-	1000	-	-	-	-	5	-	8.6
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	2	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	300	-	-	-	-	-	5	-	-
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	10	12.5	5	-	2	3	9.9
	-	-	-	7.5	5	-	1	2.5	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	9	11.6
Zn 2nd Cleaner	250	-	-	-	-	-	1	5	11.5
	-	-	5	-	-	-	1	2	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.6
	-	-	2.5	-	-	-	1	1	-

*pebble mill

Test No. 76

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	63.3	3.19	61.8	2.09	55.0	0.6
2. Pb 4th Cl. Tail	31.8	1.60	34.1	4.39	15.2	0.6
3. Pb 3rd Cl. Tail	28.4	1.43	12.80	7.11	5.1	0.9
4. Pb 2nd Cl. Tail	63.0	3.17	5.92	9.21	5.2	2.6
5. Pb 1st Cl. Tail	58.4	2.94	1.63	8.4	1.3	2.2
6. Zn 3rd Cl Conc	241.4	12.15	0.34	63.4	1.2	67.7
7. Zn 3rd Cl Tail	50.2	2.53	1.28	42.8	0.9	9.5
8. Zn 2nd Cl Tail	64.4	3.24	1.86	21.6	1.7	6.2
9. Zn 1st Cl Tail	337.6	16.99	1.20	4.32	5.7	6.5
10. Zn Prefloat Tail	310.1	15.61	1.02	1.08	4.4	1.5
11. Zn Scalp Tail	738.2	37.16	0.41	0.56	4.3	1.8
Head Calc.	1986.8	100.00	3.58	11.37	100.0	100.0

Combined Products

Products 1+2	4.79	52.54	2.86	70.2	1.2
Products 1-3	6.22	43.40	3.84	75.3	2.1
Products 1-4	9.39	30.74	5.65	80.5	4.7
Products 1-5	12.33	23.80	6.30	81.9	6.8
Products 6+7	14.68	0.50	59.85	2.1	77.2
Products 6-8	17.92	0.75	52.93	3.7	83.4
Products 6-9	34.91	0.97	29.27	9.4	89.9
Products 10+11	52.76	0.59	0.71	8.7	3.3

TEST NO. 77

Purpose: To repeat Test 76, but use 20 minute H.I. conditioning after Bulk concentrate regrind.

Procedure: As for Test 76.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	317	Na_2CO_3	LSB/TH	C7/MIBC	PKD-C	Grind	Cond.	Froth	pH
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	4	-
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	10	-	-	20	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4.5	-
2	-	-	5	5	-	-	1	2	-
3	5	-	-	2.5	-	-	1	2	-
Pb 1st Cleaner	-	-	-	-	15	-	-	5	-
Pb 1st Cl Conc Regrind		100	-	-	100	10	-	-	-
Pb 2nd Cleaner	-	-	-	-	-	-	-	2.5	-
	5	-	5	-	-	-	-	1.5	-
Pb 3rd Cleaner	-	-	-	-	5	-	-	2.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	10.9
Condition	-	1000	-	-	-	-	5	-	9.3
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	1.5	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	11.1
Condition	300	-	-	-	-	-	5	-	10.1
Zn Prefloat	-	-	10	12.5	5	-	2	3	-
	-	-	-	7.5	5	-	1	2.5	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	8	11.0
Zn 2nd Cleaner	250	-	-	-	-	-	1	5	11.3
	-	-	5	-	2.5	-	1	1.5	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.5
	-	-	2.5	-	-	-	1	1	-

Test No. 77

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	78.2	3.92	64.3	1.64	68.7	0.6
2. Pb 4th Cl. Tail	18.5	0.93	23.3	5.61	5.9	0.5
3. Pb 3rd Cl. Tail	27.2	1.36	9.00	7.42	3.3	0.9
4. Pb 2nd Cl. Tail	105.3	5.27	3.33	10.4	4.8	4.9
5. Pb 1st Cl. Tail	116.3	5.83	1.32	13.1	2.1	6.8
6. Zn 3rd Cl Conc	194.8	9.76	0.42	57.7	1.1	49.9
7. Zn 3rd Cl Tail	37.0	1.85	1.24	18.1	0.6	3.0
8. Zn 2nd Cl Tall	61.5	3.08	1.29	17.0	1.1	4.6
9. Zn 1st Cl Tail	293.2	14.69	1.13	19.8	4.5	25.7
10. Zn Prefloat Tail	279.2	13.98	0.95	0.94	3.6	1.2
11. Zn Scalp Tail	785.3	39.33	0.39	0.60	4.2	2.1
Head Calc.	1996.5	100.00	3.67	11.29	100.0	100.0

Combined Products

Products 1+2	4.84	56.46	2.40	74.6	1.0
Products 1-3	6.21	46.04	3.50	77.9	1.9
Products 1-4	11.48	26.42	6.67	82.7	6.8
Products 1-5	17.31	17.97	8.84	84.8	13.5
Products6+7	11.61	0.55	51.38	1.7	52.8
Products 6-8	14.69	0.71	44.17	2.8	57.5
Products 6-9	29.38	0.92	31.99	7.4	83.2
Products 10+11	53.32	0.54	0.69	7.8	3.3

TEST NO. 78

Purpose: To repeat Test 76, but use Procol 830/Thiourea mixture as the secondary collector.

Procedure: As for Test 76.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830* Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	9.6
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	3.5	-
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5.5	9.6
2	-	-	5	5	-	-	1	2	-
3	5	-	-	-	-	-	1	2	-
Pb 1st Cleaner	-	-	-	-	15	-	-	6	-
	-	-	2.5	-	-	-	1	0.5	-
Pb 1st Cl Conc Regrind		100	-	-	100	10	-	-	9.5
Pb 2nd Cleaner	5	-	5	-	-	-	1	6	-
Pb 3rd Cleaner	-	-	5	-	-	-	-	5'20"	8.9
Pb 4th Cleaner	-	-	2.5	-	10	-	-	4	8.7
	-	-	7.5	-	-	-	1	2.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	10.9
Condition	-	1000	-	-	-	-	5	-	9.3
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	1.5	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	300	500	-	-	-	-	5	-	10.6
Condition	-	-	-	-	-	-	5	-	9.4
Zn Prefloat	-	-	10	12.5	7.5	-	2	3.5	-
	-	-	-	7.5	5.0	-	1	2	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	8	11.1
Zn 2nd Cleaner	250	-	-	-	2.5	-	1	5	11.5
	-	-	5	-	2.5	-	1	1	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.7
	-	-	2.5	-	5.0	-	1	1	-

*CA830/Thiourea = 80:20

Test No. 78

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	67.1	3.48	65.2	1.62	62.3	0.5
2. Pb 4th Cl. Tail	8.8	0.46	22.0	4.30	2.8	0.2
3. Pb 3rd Cl. Tail	27.3	1.41	14.70	5.70	5.7	0.7
4. Pb 2nd Cl. Tail	99.2	5.14	10.5	7.57	14.8	3.5
5. Pb 1st Cl. Tail	89.0	4.61	1.36	11.7	1.7	4.8
6. Zn 3rd Cl Conc	223.4	11.58	0.33	61.1	1.0	63.1
7. Zn 3rd Cl Tail	15.6	0.81	1.56	31.6	0.3	2.3
8. Zn 2nd Cl Tail	44.8	2.32	1.40	24.0	0.9	5.0
9. Zn 1st Cl Tail	258.5	13.40	1.11	13.4	4.1	16.0
10. Zn Prefloat Tail	266.0	13.79	0.45	0.99	1.7	1.2
11. Zn Scalp Tail	829.8	43.01	0.39	0.70	4.6	2.7
Head Calc.	1929.5	100.00	3.64	11.21	100.0	100.0

Combined Products

Products 1+2	3.93	60.19	1.93	65.0	0.7
Products 1-3	5.35	48.16	2.93	70.8	1.4
Products 1-4	10.49	29.70	5.20	85.6	4.9
Products 1-5	15.10	21.04	7.19	87.3	9.7
Products 6+7	12.39	0.41	59.17	1.4	65.4
Products6-8	14.71	0.57	53.62	2.3	70.4
Products 6-9	28.11	0.83	34.45	6.4	86.4
Products 10+11	56.79	0.40	0.77	6.3	3.9

TEST NO. 79

Purpose: To repeat Test 78, but improve flotation during cleaning.

Procedure: As for Test 78.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830* Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	9.7
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	-	-
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	6	-
2	-	-	5	-	-	-	-	-	-
3	5	-	5	-	-	-	-	-	-
Pb Ro Conc Regrind		100	-	-	100	15	-	-	-
H.I. Condition	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5	-
	-	-	5	5	-	-	1	3	-
Pb 2nd Cleaner	-	-	-	-	25	-	-	-	-
Pb 3rd Cleaner									
Pb 4th Cleaner									
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.0
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	2	3	9.6
	-	-	20	10	-	-	1	1	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	10.5
Condition	300	-	-	-	-	-	5	-	9.7
Zn Prefloat	-	-	10	12.5	10	-	2	3.5	-
	-	-	-	7.5	5	-	1	2	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	1	8	10.8
	-	-	5	-	2.5	-	1	1.5	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	5	11.6
	-	-	5	-	-	-	1	2.5	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	-

*CA830/Thiourea = 80:20

Test No. 79

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	78.0	3.95	65.4	1.68	69.2	0.6
2. Pb 4th Cl. Tail	13.8	0.70	16.9	5.56	3.2	0.3
3. Pb 3rd Cl. Tail	17.7	0.90	10.9	7.23	2.6	0.6
4. Pb 2nd Cl. Tail	34.1	1.73	4.93	9.88	2.3	1.5
5. Pb 1st Cl. Tail	129.6	6.57	2.13	11.1	3.7	6.5
6. Zn 3rd Cl Conc	272.5	13.82	0.69	59.2	2.5	72.4
7. Zn 3rd Cl Tail	68.5	3.47	1.67	32.4	1.6	10.0
8. Zn 2nd Cl Tail	82.7	4.19	1.77	9.50	2.0	3.5
9. Zn 1st Cl Tail	236.1	11.97	1.04	1.61	3.3	1.7
10. Zn Prefloat Tail	197.8	10.03	1.72	0.75	4.6	0.7
11. Zn Scalp Tail	841.6	42.67	0.44	0.60	5.0	2.3
Head Calc.	1972.4	100.00	3.74	11.30	100.0	100.0

Combined Products

Products 1+2	4.65	58.1	2.26	72.3	0.9
Products 1-3	5.55	50.5	3.07	74.9	1.5
Products 1-4	7.28	39.7	4.68	77.2	3.0
Products 1-5	13.85	21.9	7.73	81.0	9.5
Products 6+7	17.29	0.89	53.8	4.1	82.4
Products6-8	21.48	1.06	45.2	6.1	85.9
Products 6-9	33.45	1.05	29.6	9.4	87.6
Products 10+11	52.70	0.68	0.63	9.6	2.9

TEST NO. 80

Purpose: To repeat Test 78 conditions, but decrease Bulk Conc Regrind to 30 minutes and high intensity condition the reground Pb rougher concentrate.

Procedure: As for Test 78.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830* Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	-	-
Bulk Conc Reg	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5	-
2	10	-	10	-	-	-	1	-	-
3	-	-	-	-	-	-	-	-	-
Pb Ro Conc Regrind		100	-	-	100	20	-	-	-
H.I. Condition	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	5	5	-	-	-	3	-
Pb 2nd Cleaner	-	-	-	-	25	-	-	2	-
Pb 3rd Cleaner	-	-	-	-	-	-	-	1.5	-
Pb 4th Cleaner	-	-	-	-	-	-	-	1.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	1	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	10.6
Condition	300	-	-	-	-	-	5	-	9.7
Zn Prefloat	-	-	25	12.5	10	-	-	-	-
	-	-	-	7.5	5	-	-	-	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	1	4.5	11.2
	-	-	5	-	2.5	-	1	1.5	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	4	-
	-	-	5	-	-	-	1	1	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	-	11.6

*CA830/Thiourea = 80:20

Test No. 80

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	68.7	3.47	70.3	1.35	67.6	0.4
2. Pb 4th Cl. Tail	21.0	1.06	19.5	5.59	5.7	0.5
3. Pb 3rd Cl. Tail	26.1	1.32	8.51	8.69	3.1	1.0
4. Pb 2nd Cl. Tail	40.7	2.06	4.19	11.9	2.4	2.2
5. Pb 1st Cl. Tail	147.3	7.44	2.26	12.0	4.7	7.9
6. Zn 3rd Cl Conc	295.0	14.91	0.82	58.8	3.4	77.7
7. Zn 3rd Cl Tail	20.4	1.03	1.95	17.6	0.6	1.6
8. Zn 2nd Cl Tall	52.5	2.65	1.61	10.3	1.2	2.4
9. Zn 1st Cl Tail	297.7	15.04	0.97	2.39	4.0	3.2
10. Zn Prefloat Tall	188.8	9.54	1.13	1.26	3.0	1.1
11. Zn Scalp Tail	820.7	41.47	0.38	0.53	4.4	1.9
Head Calc.	1978.9	100.00	3.61	11.28	100.0	100.0

Combined Products

Products 1+2	4.53	58.4	2.34	73.3	0.9
Products 1-3	5.85	47.2	3.77	76.4	2.0
Products 1-4	7.91	36.0	5.89	78.8	4.1
Products 1-5	15.35	19.6	8.85	83.5	12.0
Products 6+7	15.94	0.89	56.1	3.9	79.3
Products6-8	18.59	1.00	49.6	5.1	81.7
Products 6-9	33.63	0.98	28.5	9.2	84.9
Products 10+11	51.01	0.52	0.67	7.4	3.0

TEST NO. 81

Purpose: Locked cycle flotation.

Procedure: Similar to Test 80.

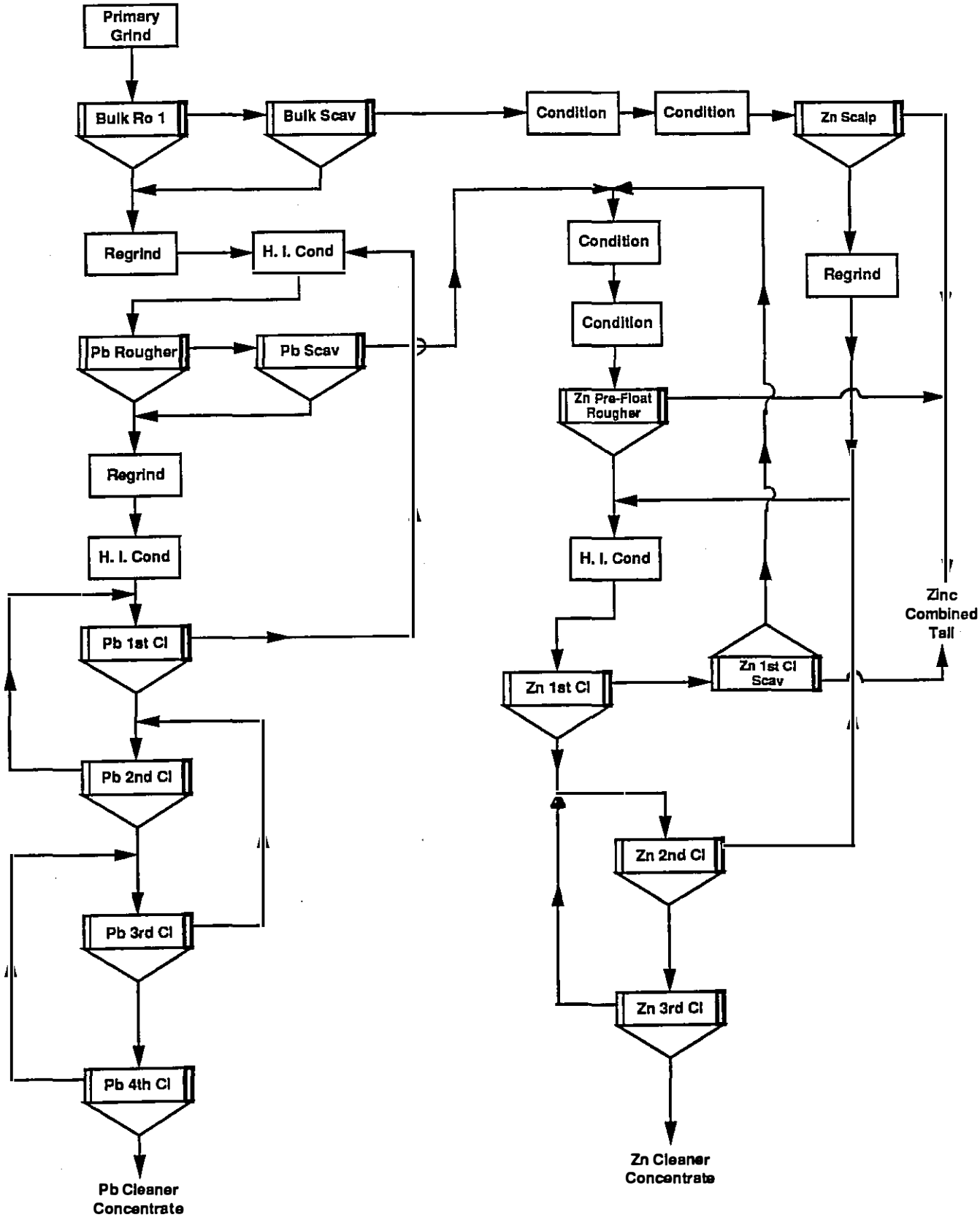
Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea	C7/MIBC	SD100 NaCN	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	8.0
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	-	10	-	-	1	2	-
Bulk Conc Regr	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	9.0
Pb Rougher 1	-	-	-	-	-	-	-	-	-
2	10	-	10	-	-	-	-	-	-
Pb Conc Regr	-	100	-	-	100	10	-	-	-
H.I. Condition	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	9.0
Pb 2nd Cleaner	-	-	-	-	50	-	-	2	9.0
Pb 3rd Cleaner	-	-	-	-	50	-	-	1.5	-
Pb 4th Cleaner	-	-	-	-	50	-	-	1.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.1
Condition	-	1000	-	-	-	-	5	-	9.6
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	40	10	-	-	1	1	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	10.6
Condition	300	-	-	-	-	-	5	-	9.4
Zn Prefloat	-	-	25	12.5	12.5	-	2	5	-
	-	-	-	7.5	5	-	1	2	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	5	11.1
	-	-	5	-	2.5	-	1	2	-
Zn 1st Cl Scav	-	-	10	5	-	-	1	4	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	4.5	11.5
	-	-	5	-	-	-	1	1.5	-
Zn 3rd Cleaner	250	-	-	-	-	-	-	-	11.6

Test No. 81 Locked Cycle Flowsheet



Test No. 81

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl Conc A	106.0	0.9	53.3	3.12	151	12.0	0.3	2.3
2. Pb Cl Conc B	125.8	1.1	49.7	3.11	150	13.3	0.3	2.7
3. Pb Cl Conc C	101.3	0.9	55.3	2.65	147	11.9	0.2	2.1
4. Pb Cl Conc D	73.3	0.6	63.2	2.04	156	9.9	0.1	1.6
5. Pb Cl Conc E	93.4	0.8	60.3	2.44	157	12.0	0.2	2.1
6. Pb Cl Conc F	119.5	1.0	52.5	2.96	146	13.3	0.3	2.5
7. Pb 4th Cl Tail F	100.2	0.9	12.6	6.97	108	2.7	0.6	1.6
8. Pb 3rd Cl Tail F	273.8	2.3	6.45	12.2	104	3.8	2.6	4.1
9. Pb 2nd Cl Tail F	197.0	1.7	4.43	14.8	107	1.9	2.3	3.0
10. Pb 1st Cl Tail F	278.4	2.4	2.25	14.6	103	1.3	3.2	4.1
11. Zn Cl Conc A	186.2	1.6	0.47	55.6	132	0.2	8.2	3.5
12. Zn Cl Conc B	328.2	2.8	0.48	56.4	134	0.3	14.6	6.3
13. Zn Cl Conc C	344.4	3.0	0.68	56.6	137	0.5	15.4	6.8
14. Zn Cl Conc D	340.6	2.9	0.62	57.0	139	0.4	15.3	6.8
15. Zn Cl Conc E	325.2	2.8	0.75	57.2	139	0.5	14.7	6.5
16. Zn Cl Conc F	300.9	2.6	0.87	58.0	138	0.6	13.8	6.0
17. Zn 3rd Cl Tail F	77.0	0.7	1.36	29.7	127	0.2	1.8	1.4
18. Zn 2nd Cl Tail F	102.7	0.9	1.43	6.68	81.8	0.3	0.5	1.2
19. Zn 1st Cl Sc Conc F	88.7	0.8	1.52	6.42	91.4	0.3	0.4	1.2
20.Zn Pre-Flt Ro Tail A	197.0	1.7	0.83	0.72	42.8	0.3	0.1	1.2
21.Zn Pre-Flt Ro Tail B	469.0	4.0	0.79	0.89	45.8	0.8	0.3	3.1
22.Zn Pre-Flt Ro Tail C	370.0	3.2	0.86	0.93	51.9	0.7	0.3	2.8
23.Zn Pre-Flt Ro Tail D	469.0	4.0	0.89	0.87	50.6	0.9	0.3	3.4
24.Zn Pre-Flt Ro Tail E	392.0	3.4	0.98	0.92	57.5	0.8	0.3	3.2
25.Zn Pre-Flt Ro Tail F	315.0	2.7	1.20	1.20	61.8	0.8	0.3	2.8
26.Zn 1st Cl Sc Tail A	103.0	0.9	0.71	1.58	41.6	0.2	0.1	0.6
27.Zn 1st Cl Sc Tail B	205.0	1.8	0.78	1.18	43.9	0.3	0.2	1.3
28.Zn 1st Cl Sc Tail C	227.0	1.9	0.79	1.10	45.4	0.4	0.2	1.5
29.Zn 1st Cl Sc Tail D	226.0	1.9	0.90	1.01	44.5	0.4	0.2	1.4
30.Zn 1st Cl Sc Tail E	292.0	2.5	0.80	0.81	47.3	0.5	0.2	2.0
31.Zn 1st Cl Sc Tail F	405.0	3.5	0.91	0.98	52.2	0.8	0.3	3.0
32. Zn Scalp Tail A	721.0	6.2	0.71	0.47	9.40	1.1	0.3	1.0
33. Zn Scalp Tail B	687.0	5.9	0.78	0.53	7.50	1.1	0.3	0.7
34. Zn Scalp Tail C	792.0	6.8	0.79	0.77	15.3	1.3	0.5	1.7
35. Zn Scalp Tail D	680.0	5.8	0.90	0.64	6.50	1.3	0.3	0.6
36 Zn Scalp Tail E	754.0	6.5	0.80	0.75	16.0	1.3	0.4	1.7
37. Zn Scalp Tail F	793.0	6.8	0.91	1.04	18.2	1.5	0.7	2.1
Head (calc)	11659.6	100.0	4.03	10.9	59.8	100.0	100.0	100.0

Combined Products

Comb Pb Conc.1 to 6	5.3	55.0	2.78	151	72.4	1.4	13.4
Comb Pb Cl Tails 7 to10	7.3	5.33	13.0	105	9.6	8.7	12.8
Comb Zn Cl.Conc. 11 to16	15.7	0.66	56.9	137	2.5	81.9	35.8
Comb Zn Cl Tails, Cl Sc Conc. 17 to 19	2.3	1.44	13.2	97.9	0.8	2.8	3.8
Comb Zn Pre-Float Ro Tails 20 to 25	19.0	0.92	0.93	51.9	4.3	1.6	16.5
Comb Zn Cl Scav Tails 26 to 31	12.5	0.84	1.04	47.1	2.6	1.2	9.8
Comb Zn Scalp Tails 32 to 37	38.0	0.82	0.71	12.4	7.7	2.5	7.9

Projected Results Cycles D, E, & F

Pb Cleaner Conc	5.5	57.8	2.55	152	79.5	1.3	14.6
Zn Cleaner Conc	17.5	0.74	57.4	139	3.2	92.4	41.9
Zn Scav. Tail	76.9	0.91	0.89	32.7	17.3	6.3	43.5
Head(calc)	100.0	4.03	10.9	57.9	100.0	100.0	100.0

TEST NO. 82

Purpose: Locked cycle flotation.

Procedure: As for Test 78.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830* Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	4	9.6
2	10	-	10	10	-	-	1	3	-
3	20	-	20	12.5	-	-	1	3.5	-
Bulk Conc Reg	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	5.5	9.6
2	-	-	5	5	-	-	1	2	-
3	5	-	-	-	-	-	1	2	-
Pb 1st Cleaner	-	-	-	-	15	-	-	6	-
	-	-	2.5	-	-	-	1	0.5	-
Pb 1st Cl Conc Regrind		100	-	-	100	10	-	-	9.5
Pb 2nd Cleaner	5	-	5	-	-	-	1	6	-
Pb 3rd Cleaner	-	-	5	-	-	-	-	5'20"	8.9
Pb 4th Cleaner	-	-	2.5	-	10	-	-	4	8.7
	-	-	7.5	-	-	-	1	2.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	10.9
Condition	-	1000	-	-	-	-	5	-	9.3
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	1.5	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	300	500	-	-	-	-	5	-	10.6
Condition	-	-	-	-	-	-	5	-	9.4
Zn Prefloat	-	-	10	12.5	7.5	-	2	3.5	-
	-	-	-	7.5	5.0	-	1	2	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
Zn 1st Cleaner	250	-	-	-	-	-	1	8	11.1
Zn 2nd Cleaner	250	-	-	-	2.5	-	1	5	11.5
	-	-	5	-	2.5	-	1	1	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.7
	-	-	2.5	-	5.0	-	1	1	-

*CA830/Thiourea = 80:20

Test No. 82

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl Conc A	84.4	0.7	56.4	2.99	164	11.2	0.2	2.0
2. Pb Cl Conc B	90.4	0.8	44.5	7.25	159	9.4	0.5	2.0
3. Pb Cl Conc C	119.9	1.0	39.0	11.8	152	11.0	1.1	2.6
4. Pb Cl Conc D	49.8	0.4	43.0	9.14	168	5.0	0.3	1.2
5. Pb Cl Conc E	57.5	0.5	52.1	6.20	180	7.0	0.3	1.5
6. Pb Cl Conc F	88.8	0.8	54.2	4.69	170	11.3	0.3	2.1
7. Pb 4th Cl Tail F	113.4	1.0	35.9	8.27	122	9.6	0.7	2.0
8. Pb 3rd Cl Tail F	130.4	1.1	21.7	11.7	115	6.6	1.2	2.1
9. Pb 2nd Cl Tail F	225.3	1.9	14.3	13.2	115	7.6	2.3	3.7
10. Pb 1st Cl Tail F	455.8	3.9	4.17	17.9	114	4.5	6.2	7.3
11. Zn Cl Conc A	281.2	2.4	0.82	60.0	133	0.5	12.8	5.3
12. Zn Cl Conc B	279.4	2.4	0.83	58.4	141	0.5	12.4	5.6
13. Zn Cl Conc C	304.8	2.6	0.66	58.3	133	0.5	13.5	5.7
14. Zn Cl Conc D	321.3	2.7	0.87	57.3	133	0.7	14.0	6.0
15. Zn Cl Conc E	318.6	2.7	1.21	55.9	126	0.9	13.5	5.7
16. Zn Cl Conc F	308.0	2.6	1.22	56.6	133	0.9	13.2	5.8
17. Zn 3rd Cl Tail F	35.6	0.3	1.43	19.0	107	0.1	0.5	0.5
18. Zn 2nd Cl Tail F	54.4	0.5	1.31	9.44	82.5	0.2	0.4	0.6
19. Zn 1st Cl Sc Conc F	104.8	0.9	1.42	20.2	114	0.3	1.6	1.7
20. Zn Pre-Flt Ro Tail A	187.0	1.6	0.80	0.79	49.8	0.4	0.1	1.3
21. Zn Pre-Flt Ro Tail B	374.4	3.2	0.77	1.05	52.1	0.7	0.3	2.8
22. Zn Pre-Flt Ro Tail C	366.4	3.1	0.77	0.86	52.5	0.7	0.2	2.7
23. Zn Pre-Flt Ro Tail D	480.3	4.1	0.78	1.09	58.3	0.9	0.4	4.0
24. Zn Pre-Flt Ro Tail E	374.0	3.2	0.96	1.99	60.2	0.8	0.6	3.2
25. Zn Pre-Flt Ro Tail F	440.6	3.7	0.83	1.39	66.5	0.9	0.5	4.1
26. Zn 1st Cl Sc Tail A	278.5	2.4	0.93	0.60	44.0	0.6	0.1	1.7
27. Zn 1st Cl Sc Tail B	274.6	2.3	1.02	0.97	45.3	0.7	0.2	1.8
28. Zn 1st Cl Sc Tail C	270.3	2.3	1.05	1.23	42.0	0.7	0.3	1.6
29. Zn 1st Cl Sc Tail D	270.5	2.3	1.11	1.28	47.9	0.7	0.3	1.8
30. Zn 1st Cl Sc Tail E	291.8	2.5	1.39	1.45	56.6	1.0	0.3	2.3
31. Zn 1st Cl Sc Tail F	250.8	2.1	1.44	1.74	47.5	0.8	0.3	1.7
32. Zn Scalp Tail A	768.5	6.5	0.32	0.49	12.0	0.6	0.3	1.3
33. Zn Scalp Tail B	689.8	5.9	0.27	0.46	10.7	0.4	0.2	1.0
34. Zn Scalp Tail C	710.4	6.0	0.27	0.45	12.6	0.5	0.2	1.3
35. Zn Scalp Tail D	762.7	6.5	0.33	0.48	13.6	0.6	0.3	1.5
36 Zn Scalp Tail E	802.2	6.8	0.40	0.48	14.2	0.8	0.3	1.6
37. Zn Scalp Tail F	750.8	6.4	0.35	0.39	10.5	0.6	0.2	1.1
Head (calc)	11767.3	100.0	3.62	11.2	60.2	100.0	100.0	100.0

Combined Products

Comb Pb Conc.1 to 6	4.2	47.7	7.23	163	55.0	2.7	11.3
Comb Pb Cl Tails 7 to10	7.9	13.0	14.7	115	28.2	10.3	15.1
Comb Zn Cl.Conc. 11 to16	15.4	0.94	57.7	133	4.0	79.4	34.0
Comb Zn Cl Tails, Cl Sc Conc. 17 to 19	1.7	1.39	17.0	104	0.6	2.5	2.9
Comb Zn Pre-Float Ro Tails 20 to 25	18.9	0.82	1.23	57.5	4.3	2.1	18.0
Comb Zn Cl Scav Tails 26 to 31	13.9	1.15	1.20	47.3	4.4	1.5	10.9
Comb Zn Scalp Tails 32 to 37	38.1	0.33	0.46	12.3	3.4	1.6	7.8

Projected Results Cycles E & F

Pb Cleaner Conc	5.3	53.4	5.28	174	78.8	2.5	15.8
Zn Cleaner Conc	18.1	1.21	56.2	129	6.1	90.7	39.7
Zn Scav. Tail	76.6	0.71	0.99	34.2	15.1	6.8	44.5
Head(calc)	100.0	3.62	11.2	58.8	100.0	100.0	100.0

TEST NO. 83

Purpose: To prepare representative tailing for percolation tests on Composite 1 ore.

Procedure: As shown below.

Feed: 2 x 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids In the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830* Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Ro 1	25	-	-	20	-	-	1	3	9.4
2	10	-	10	10	-	-	1	2.5	0/1
3	20	-	20	12.5	-	-	1	4.5	-
Bulk Conc Reg	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4	-
2	10	-	10	-	-	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030					
Condition	600	-	-	-	-	-	5	-	10.9
Condition	-	1000	-	-	-	-	5	-	9.2
Zn Scalp	-	-	50	20	-	-	-	3	-
	-	-	20	10	-	-	-	1	-
Pb Ro Tail for Zn Prefloat rougher.					H_2SO_4				
Condition	300	-	-	-	-	-	5	-	10.5
Condition	-	500	-	-	-	-	5	-	9.4
Zn Prefloat Ro1	-	-	10	12.5	10	-	2	-	-
2	-	-	-	7.5	5	-	1	-	9.2
Combine Prefloat Tail + Zn Scalp Tail for pyrite circuit for final tail.									
Pyrite Circuit:	-	-	-	-	-	-	-	-	9.2
Condition	-	-	-	-	900	-	5	-	6.5
Pyrite Float	-	-	40	-	5	-	5	-	-
	-	-	15	-	-	-	3	-	-
	-	-	10	-	2.5	-	3	-	-
	-	-	10	-	-	-	2	-	-

*CA830/Thiourea = 80:20

TEST NO. 83A

BACKFILL TESTWORK

Purpose: To prepare backfill and to determine the backfill percolation rate.

Method: The pyrite tails of Tes t83 were cycloned with a Krebs 25 mm cyclone at 5% solids. The sands were repassed twice. The final sands were filtered, the moisture determined, and a percolation test was completed.

The percolation rate was performed as follows:

- 533 g of wet cake, equivalent to 400 g of dry tailings was poured into a 3.18 cm diameter glass tube, covered at the bottom end with burlap. The pulp was allowed to settle for 5 minutes and then a constant head of water was applied. The cumulative water exiting from the bottom of the column was recorded.

Observations: The pulp compacted immediately to 22.7 cm height. The water exiting the column was consistently clear.

Results:

1. Volumetric Flowsheet = 94.1 mL/h
   Column Volume per cm of height = 7.94 mL/cm
   Percolation Rate = 94.1/7.94 = 11.9 cm/h

2. Void Ratio

$$E = \frac{(G \times V)}{Ws} - 1 = \left(\frac{3.95 \times 182.5}{400}\right) - 1 = 0.80$$

where: E = void ratio
G = specific gravity of solids
V = volume of sample, mL
Ws = dry weight of sample

TEST NO. 84

Purpose: To conduct a locked cycle test according to the conditions of Test 80.

Procedure: As shown on the attached flowsheet.

Feed: 6 x 2000 grams minus 10 mesh Composite No. 1.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea	C7/MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	7.8
Bulk Ro 1	25	-	-	20	-	-	1	4	-
2	10	-	10	10	-	-	1	2	-
Bulk Conc Reg	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	10	-	9.0
Pb Rougher 1	-	-	-	-	-	-	-	3'20"	-
2	10	-	10	-	-	-	-	-	-
Pb Ro Conc Regrind		100	-	-	100	15	-	-	-
H.I. Condition	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	1	3	9.0
Pb 2nd Cleaner	-	-	-	-	50	-	1	2	9.0
Pb 3rd Cleaner	-	-	-	-	50	-	1	1.5	-
Pb 4th Cleaner	-	-	-	-	50	-	2	1.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp	-	-	50	20	-	-	2	3	-
	-	-	20	10	-	-	1	1	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	-	500	-	-	-	-	5	-	10.6
Condition	300	-	-	-	-	-	5	-	9.7
Zn Prefloat	-	-	25	12.5	10	-	2	3	-
	-	-	-	7.5	5	-	1	3	-
Combine Zn Prefloat Conc & Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	1	4.5	11.2
	-	-	5	-	2.5	-	1	1.5	-
Zn 1st Cl Scav	-	-	5	5	-	-	1	2	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	4	-
	-	-	5	-	-	-	1	1	-
Zn 3rd Cleaner	250	-	-	-	-	-	1	3	11.6

Test No. 84

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl Conc A	71.4	0.6	70.0	1.79	11.3	0.1
2. Pb Cl Conc B	77.4	0.7	68.5	1.87	12.0	0.1
3. Pb Cl Conc C	81.4	0.7	65.1	2.00	12.0	0.1
4. Pb Cl Conc D	57.4	0.5	74.2	1.06	9.6	0.0
5. Pb Cl Conc E	76.7	0.6	69.4	1.78	12.0	0.1
6. Pb Cl Conc F	83.3	0.7	64.9	2.28	12.2	0.1
7. Pb 4th Cl Tail F	9.7	0.1	18.3	8.05	0.4	0.1
8. Pb 3rd Cl Tail F	23.7	0.2	12.2	9.40	0.7	0.2
9. Pb 2nd Cl Tall F	53.3	0.4	8.0	10.6	1.0	0.4
10. Pb 1st Cl Tall F	173.7	1.5	3.51	13.1	1.4	1.7
11. Zn Cl Conc A	275.7	2.3	0.96	55.4	0.6	11.6
12. Zn Cl Conc B	368.1	3.1	1.15	53.0	1.0	14.9
13. Zn Cl Conc C	269.0	2.3	1.19	55.2	0.7	11.3
14. Zn Cl Conc D	238.3	2.0	1.71	54.5	0.9	9.9
15. Zn Cl Conc E	286.4	2.4	1.58	54.5	1.0	11.9
16. Zn Cl Conc F	254.4	2.1	1.52	55.3	0.9	10.7
17. Zn 3rd Cl Tail F	259.8	2.2	1.92	41.4	1.1	8.2
18. Zn 2nd Cl Tall F	323.0	2.7	2.19	30.40	1.6	7.5
19. Zn 1st Cl Sc Conc F	281.6	2.4	2.20	21.1	1.4	4.5
20. Zn Pre-Fit Ro Tail A	180.4	1.5	1.01	0.76	0.4	0.1
21. Zn Pre-Fit Ro Tall B	319.3	2.7	1.15	0.92	0.8	0.2
22. Zn Pre-Fit Ro Tall C	316.4	2.7	1.34	0.97	1.0	0.2
23. Zn Pre-Fit Ro Tall D	302.5	2.5	2.05	1.39	1.4	0.3
24. Zn Pre-Fit Ro Tall E	324.1	2.7	1.70	1.66	1.2	0.4
25. Zn Pre-Fit Ro Tall F	303.8	2.6	1.58	1.29	1.1	0.3
26. Zn 1st Cl Sc Tall A	315.9	2.7	0.99	0.77	0.7	0.2
27. Zn 1st Cl Sc Tail B	375.3	3.2	1.04	0.78	0.9	0.2
28. Zn 1st Cl Sc Tall C	446.5	3.8	1.31	1.45	1.3	0.5
29. Zn 1st Cl Sc Tall D	412.6	3.5	1.68	1.81	1.6	0.6
30. Zn 1st Cl Sc Tall E	427.6	3.6	1.38	1.18	1.3	0.4
31. Zn 1st Cl Sc Tall F	572.2	4.8	1.67	2.84	2.2	1.2
32. Zn Scalp Tall A	700.5	5.9	0.39	0.55	0.6	0.3
33. Zn Scalp Tall B	671.3	5.7	0.36	0.48	0.5	0.2
34. Zn Scalp Tall C	698.6	5.9	0.43	0.48	0.7	0.3
35. Zn Scalp Tall D	853.2	7.2	0.69	0.69	1.3	0.4
36 Zn Scalp Tall E	689.6	5.8	0.41	0.48	0.6	0.3
37. Zn Scalp Tail F	698.6	5.9	0.39	0.47	0.6	0.3
Head (calc)	11872.7	100.0	3.73	11.1	100.0	100.0

Combined Products

Comb Pb Conc.1 to 6	3.8	68.3	1.84	69.1	0.6
Comb Pb Cl Tails 7 to10	2.2	5.8	12.1	3.4	2.4
Comb Zn Cl.Conc. 11 to16	14.3	1.33	54.6	5.1	70.3
Comb Zn Cl Tails, Cl Sc Conc. 17 to 19	7.3	2.11	30.7	4.1	20.2
Comb Zn Pre-Float Ro Tails 20 to 25	14.7	1.50	1.20	5.9	1.6
Comb Zn Cl Scav Tails 26 to 31	21.5	1.38	1.59	8.0	3.1
Comb Zn Scalp Tails 32 to 37	36.3	0.45	0.53	4.4	1.7

Projected Results Cycles E & F

Pb Cleaner Conc	3.9	67.1	2.04	70.7	0.7
Zn Cleaner Conc	18.2	1.55	54.9	7.6	90.6
Combined Tail	77.8	1.04	1.23	21.7	8.7
Head(calc)	100.0	3.73	11.1	100.0	100.0

TEST NO. 85

Purpose: To repeat the conditions of Test 80 on Rock Type 5.

Procedure: As for Test 80.

Feed: 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	C7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	7.5
Bulk Ro 1	25	-	-	20	-	-	1	5	-
2	10	-	-	5	-	-	-	2.5	-
Bulk Conc Reg	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4	-
2	-	-	-	-	-	-	-	-	-
Pb Ro Conc Regrind		100	-	-	200	20	-	-	-
H.I. Condition	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	3	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	3.5	-
Pb 4th Cleaner	-	-	-	-	25	-	1	3	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A350	M2030	DF250				
Condition	600	-	-	-	5	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	8.8
Zn Scalp	-	-	25	10	5	-	1	3.5	-
	-	-	5	5	-	-	1	1	-
*Zn Scalp Reg	500	100	-	5	-	30	-	-	
Pb Ro Tail, do Zn Prefloat									
Condition	500	500	-	-	-	-	5	-	-
Condition	-	-	-	-	-	-	5	-	-
Zn Prefloat	-	-	25	10	10	-	-	3	-
Combine Zn Prefloat Conc & reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	5	-
	-	-	5	5	-	-	-	2	-
Zn 1st Cl Scav	-	50	-	7.5	-	-	-	1	-
Zn 2nd Cleaner	-	-	-	-	-	-	-	7	-
Zn 3rd Cleaner	250	-	-	-	-	-	-	4.6	-

Test No. 85

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	74.5	3.80	62.2	1.82	63.9	0.5
2. Pb 4th Cl. Tail	20.0	1.02	16.2	4.96	4.5	0.4
3. Pb 3rd Cl. Tail	33.2	1.70	7.72	7.84	3.5	1.0
4. Pb 2nd Cl. Tail	57.8	2.95	2.89	10.9	2.3	2.4
5. Pb 1st Cl. Tall	220.2	11.24	1.79	12.0	5.4	10.0
6. Zn 3rd Cl Conc	360.3	18.40	0.95	51.7	4.7	70.3
7. Zn 3rd Cl Tail	52.9	2.70	1.58	18.8	1.2	3.8
8. Zn 2nd Cl Tall	70.0	3.57	1.40	8.53	1.4	2.3
9. Zn 1st Cl Tail	133.8	6.83	0.91	2.30	1.7	1.2
10. Zn Prefloat Tail	325.8	16.64	0.82	1.76	3.7	2.2
11. Zn Scalp Tail	609.8	31.14	0.93	2.69	7.8	6.2
Head Calc.	1958.3	100.00	3.70	13.54	100.0	100.0

Combined Products

Products 1+2	4.83	52.5	2.48	68.3	0.9
Products 1-3	6.52	40.8	3.88	71.9	1.9
Products 1-4	9.47	29.0	6.07	74.2	4.2
Products 1-5	20.72	14.2	9.29	79.6	14.2
Products 6+7	21.10	1.03	47.5	5.9	74.0
Products6-8	24.67	1.08	41.8	7.2	76.3
Products 6-9	31.51	1.05	33.3	8.9	77.4
Products 10+11	47.78	0.89	2.37	11.5	8.4

TEST NO. 87

Purpose: To examine the effect of carbon preflotation.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh 90% Rock Type 5, 10% Hanging Wall ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Dow 250	CA830 Thiourea 80:20	317	Na_2CO_3	PKD-C	MIBC	Grind	Cond.	Froth	
Grind	-	-	-	-	-	-	15	-	-	-
Carbon Prefloat	15	-	-	-	-	-	-	-	-	-
Bulk Rougher 1	-	10	20	1500	-	-	-	1	1	9.5
2	-	10	10	-	-	15	-	1	3	-
3	-	10	10	-	-	-	-	1	5	-
Bulk Regrind	-	-	-	300	300	-	30	-	-	-
H.I. Conditioning	-	25	50	-	-	10	-	15	-	-
Pb Rougher										
Pb Ro Regrind	-	-	-	100	200	-	20	-	-	-
H.I. Conditioning	-	20	10	-	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	-	5	-
Pb 2nd Cleaner	-	-	-	-	50	-	-	1	3	-
Pb 3rd Cleaner	-	-	-	-	50	-	-	1	3.5	-
Pb 4th Cleaner	-	-	-	-	25	-	-	1	3	-
Zn Circuit:	$CuSO_4$	M2030	$Ca(OH)_2$	317	DF250					
Condition	500	-	500	-	-	-	-	3	-	-
Condition	-	5	-	5	-	-	-	3	-	-
Zn Scalp	-	-	-	-	-	-	-	-	4	10.0
Zn Scalp Regrind	100	-	500	-	-	-	30	-	-	-
Pb Ro Tail for Zn Prefloat										
Condition	-	-	500	-	-	-	-	5	-	-
Condition	500	-	-	-	-	-	-	5	-	-
Zn Prefloat	-	10	-	25	10	-	-	-	3	-
Combine Zn Prefloat Conc + Regrind Zn Scalp Conc.										
H.I. Conditioning	-	10	250	5	-	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	1	5	-
	-	5	-	5	-	-	-	1	2	-
	50	7.5	-	-	-	-	-	1	1	-
Zn 2nd Cleaner	-	-	-	-	-	-	-	1	7	-
Zn 3rd Cleaner	-	-	250	-	-	-	-	1	4.5	-

Test No. 87

Product	Weight		Assays,%, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	49.7	2.53	73	1.33	119	56.6	0.3	3.9
2. Pb 4th Cl. Tall	6.1	0.31	29.9	5.52	113	2.8	0.1	0.4
3. Pb 3rd Cl. Tall	8.5	0.43	17.4	8.41	119	2.3	0.3	0.7
4. Pb 2nd Cl. Tail	23.1	1.17	6.63	13.1	98.4	2.4	1.3	1.5
5. Pb 1st Cl. Tall	91.8	4.67	2.35	14.1	81.1	3.4	5.4	4.9
6. Zn 3rd Cl Conc	174.2	8.86	0.67	55.4	149	1.8	39.9	16.9
7. Zn 3rd Cl Tall	14.8	0.75	1.34	27.7	118	0.3	1.7	1.1
8. Zn 2nd Cl Tail	42.2	2.15	1.33	11.5	85.7	0.9	2.0	2.4
9. Zn 1st Cl Tail	107.1	5.45	0.98	5.69	64.9	1.6	2.5	4.5
10. Zn Prefloat Tall	141.6	7.20	1.21	1.49	52.5	2.7	0.9	4.8
11. Zn Scalp Tall	1185.5	60.28	1.01	8.28	67.4	18.7	40.6	52.1
12. C Prefloat Conc.	122.0	6.20	3.43	10.1	85.2	6.5	5.1	6.8
Head Calc.	1966.6	100.00	3.26	12.3	78.0	100.0	100.0	100.0

Combined Products

Products 1+2	2.84	68.3	1.79	118	59.4	0.4	4.3
Products 1-3	3.27	61.6	2.66	118	61.7	0.7	5.0
Products 1-4	4.44	47.0	5.42	113	64.1	2.0	6.4
Products 1-5	9.11	24.1	9.87	96.7	67.5	7.3	11.3
Products 6+7	9.61	0.72	53.2	147	2.1	41.6	18.1
Products6-8	11.76	0.83	45.6	135	3.0	43.6	20.4
Products 6-9	17.20	0.88	33.0	113	4.6	46.1	25.0
Products 10+11	67.48	1.03	7.56	65.8	21.3	41.5	57.0
Products 10-12	73.69	1.23	7.77	67.4	27.9	46.6	63.7

TEST NO. 88

Purpose: To repeat the conditions of Test 85 on a new composite comprised of 10% Hanging Wall ore plus 90% Rock Type 5 ore.

Procedure: As for Test 80.

Feed: 2000 grams minus 10 mesh (Rock Type 5 90%, Hanging Wall 10%).

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	C-7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	8.0
Bulk Rougher 1	25	-	-	20	-	-	1	4	-
2	10	-	-	5	-	-	-	2	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	4.5	9.3
	5	-	5	-	-	-	-	2	-
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3.5	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	2.5	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	2.5	-
Pb 4th Cleaner	-	-	-	-	50	-	1	2.0	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	10.4
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	25	10	5	-	1	4	8.8
	-	-	10	10	5	-	1	1.5	-
Zn Scalp Regr	500	100	-	5	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	10.5
Condition	-	500	-	-	-	-	5	-	9.9
Zn Prefloat	-	-	25	5	5	-	1	3	-
Combine Zn Prefloat Conc+ Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	5.5	-
Zn 2nd Cleaner	250	-	-	-	-	-	-	4	11.5
Zn 3rd Cleaner	250	-	-	-	-	-	-	4	11.5

Test No. 88

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	69.3	3.48	59.5	1.93	63.1	0.5
2. Pb 4th Cl. Tail	9.8	0.49	13.7	5.77	2.1	0.2
3. Pb 3rd Cl. Tail	33.5	1.68	8.75	7.16	4.5	1.0
4. Pb 2nd Cl. Tall	54.4	2.73	2.94	9.5	2.4	2.1
5. Pb 1st Cl. Tail	202.2	10.15	1.59	10.8	4.9	9.0
6. Zn 3rd Cl Conc	344.8	17.30	0.87	53.5	4.6	75.8
7. Zn 3rd Cl Tall	34.7	1.74	1.8	9.1	1.0	1.3
8. Zn 2nd Cl Tall	69.2	3.47	1.45	4.3	1.5	1.2
9. Zn 1st Cl Tail	267.7	13.43	1.15	1.84	4.7	2.0
10. Zn Prefloat Tail	206.1	10.34	0.78	1.09	2.5	0.9
11. Zn Scalp Tail	701.0	35.18	0.82	2.04	8.8	5.9
Head Calc.	1992.7	100.00	3.28	12.21	100.0	100.0

Combined Products

Products 1+2	3.97	53.8	2.41	65.1	0.8
Products 1-3	5.65	40.4	3.82	69.6	1.8
Products 1-4	8.38	28.2	5.67	72.0	3.9
Products 1-5	18.53	13.6	8.48	77.0	12.9
Products 6+7	19.04	0.96	49.4	5.5	77.1
Products6-8	22.52	1.03	42.5	7.1	78.3
Products 6-9	35.95	1.08	27.3	11.8	80.3
Products 10+11	45.52	0.81	1.82	11.3	6.8

TEST NO. 89

Purpose: To repeat the conditions of Test 88 on a new composite comprised of 10% Hanging Wall ore plus 90% Rock Type 4 ore.

Procedure: As for Test 88.

Feed: 2000 grams minus 10 mesh (Rock Type 4 90%, Hanging Wall 10%).

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	C-7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Rougher	25	-	-	20	-	-	1	4	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	4.5	9.6
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	9.6
Pb 1st Cleaner	-	-	-	-	-	-	-	2.5	-
	5	-	5	5	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	2.5	9.4
Pb 3rd Cleaner	-	-	-	-	50	-	1	2	-
Pb 4th Cleaner	-	-	-	-	50	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	25	10	5	-	1	-	9.3
	-	-	10	10	5	-	1	-	-
Zn Scalp Regr	500	100	-	5	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	10.5
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	-	-	-	-	1	1	-
	-	-	15	5	5	-	1	5.5	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	5	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	3	11.5
Zn 3rd Cleaner	250	-	-	-	-	-	1	3	11.5

Test No. 89

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	49.4	2.53	71	1.61	80.1	0.5
2. Pb 4th Cl. Tail	3.8	0.19	13.5	7.28	1.2	0.2
3. Pb 3rd Cl. Tail	4.8	0.25	6.24	8.32	0.7	0.3
4. Pb 2nd Cl. Tail	29.5	1.51	3.3	9.11	2.2	1.8
5. Pb 1st Cl. Tail	123.8	6.34	1.56	10.1	4.4	8.3
6. Zn 3rd Cl Conc	222.7	11.41	0.61	55.8	3.1	82.9
7. Zn 3rd Cl Tail	15.3	0.78	1.04	6.71	0.4	0.7
8. Zn 2nd Cl Tall	43.0	2.20	0.73	3.06	0.7	0.9
9. Zn 1st Cl Tail	212.4	10.88	0.45	0.89	2.2	1.3
10. Zn Prefloat Tail	221.2	11.33	0.53	0.69	2.7	1.0
11. Zn Scalp Tail	1026.3	52.57	0.099	0.31	2.3	2.1
Head Calc.	1952.2	100.00	2.24	7.68	100.0	100.0

Combined Products

Products 1+2	2.73	66.9	2.02	81.3	0.7
Products 1-3	2.97	61.9	2.54	82.0	1.0
Products 1-4	4.48	42.1	4.75	84.2	2.8
Products 1-5	10.82	18.4	7.89	88.6	11.1
Products 6+7	12.19	0.64	52.6	3.5	83.6
Products6-8	14.39	0.65	45.1	4.2	84.5
Products 6-9	25.27	0.56	26.0	6.4	85.7
Products 10+11	63.90	0.18	0.38	5.0	3.1

TEST NO. 90

Purpose: To repeat the conditions of Test 88 but use $Ca(OH)_2$ in place of Na_2CO_3 and replace C-7/MIBC with A65 frother.

Procedure: As for Test 88.

Feed: 2000 grams minus 10 mesh (Rock Type 5 90%, Hanging Wall 10%).

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	$Ca(OH)_2$	CA830 Thiourea	A65	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	11.2
Bulk Rougher 1	25	-	-	20	-	-	1	5	-
2	10	-	10	-	-	-	1	2	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	1.5	10.6
	30	-	20	-	-	-	1	5	-
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	6	-
	15	-	5	-	-	-	1	2	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	5	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	3.5	-
Pb 4th Cleaner	-	-	-	-	50	-	1	-	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	11.4
Zn Rougher 1	-	-	25	10	5	-	1	4	-
2	-	-	10	10	-	-	1	3	-
3	-	-	15	10	-	-	1	2.5	-
Zn Scalp Regr	500	100	-	5	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	11.5
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	25	5	5	-	1	5.5	11.5
	-	-	15	5	-	-	1	2	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	4	11.2
	-	-	10	10	-	-	1	3.5	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	7	11.4
Zn 3rd Cleaner	250	-	-	-	-	-	1	6	11.7

Test No. 90

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	82.4	4.20	45.2	7.5	53.0	2.4
2. Pb 4th Cl. Tall	20.8	1.06	7.02	24.4	2.1	2.0
3. Pb 3rd Cl. Tall	26.3	1.34	5.92	24.7	2.2	2.6
4. Pb 2nd Cl. Tail	46.4	2.37	3.63	28	2.4	5.1
5. Pb 1st Cl. Tail	171.8	8.76	2.74	28.8	6.7	19.4
6. Zn 3rd Cl Conc	276.9	14.12	1.44	46.2	5.7	50.2
7. Zn 3rd Cl Tail	79.8	4.07	2.34	12.1	2.7	3.8
8. Zn 2nd Cl Tall	115.6	5.89	2.05	5.77	3.4	2.6
9. Zn 1st Cl Tail	326.6	16.65	1.26	1.38	5.9	1.8
10. Zn Prefloat Tail	104.0	5.30	1.35	2.23	2.0	0.9
11. Zn Scalp Tall	710.9	36.24	1.38	3.29	14.0	9.2
Head Calc.	1961.5	100.00	3.58	12.98	100.0	100.0

Combined Products

Products 1+2	5.26	37.5	10.91	55.1	4.4
Products 1-3	6.60	31.1	13.71	57.3	7.0
Products 1-4	8.97	23.8	17.48	59.7	12.1
Products 1-5	17.73	13.4	23.07	66.5	31.5
Products 6+7	18.19	1.64	38.6	8.3	54.0
Products6-8	24.08	1.74	30.5	11.7	56.6
Products 6-9	40.73	1.54	18.6	17.6	58.4
Products 10+11	41.54	1.38	3.15	16.0	10.1

TEST NO. 91

Purpose: To repeat Test 85 on Rock Type 4 ore.

Procedure: As indicated below.

Feed: 2000 grams minus 10 mesh Rock Type 4 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	C-7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	1	4	9.4
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	3	-
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	2.5	9.3
	5	-	5	7.5	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	3	9.2
Pb 3rd Cleaner	-	-	-	-	50	-	1	2.5	-
Pb 4th Cleaner	-	-	-	-	75	-	1	2.5	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	25	10	5	-	1	2.5	9.3
Zn Scalp Regr	500	100	-	5	-	20	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	-
Condition	-	500	-	-	-	-	5	-	10.4
Zn Prefloat	-	-	-	-	-	-	-	3	-
	-	-	10	5	7.5	-	1	-	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	6	11.3
Zn 2nd Cleaner	250	-	-	-	-	-	1	4	11.6
Zn 3rd Cleaner	250	-	-	-	-	-	1	4	11.7

Test No. 91

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	52.2	2.68	77.6	1	80.2	0.3
2. Pb 4th Cl. Tall	4.3	0.22	21	6.56	1.8	0.2
3. Pb 3rd Cl. Tail	3.7	0.19	9.73	8.62	0.7	0.2
4. Pb 2nd Cl. Tall	21.5	1.10	4.94	9.48	2.1	1.2
5. Pb 1st Cl. Tail	87.4	4.49	1.99	10.7	3.4	5.6
6. Zn 3rd Cl Conc	237.8	12.20	0.58	58.1	2.7	83.5
7. Zn 3rd Cl Tail	12.8	0.66	1.45	12.7	0.4	1.0
8. Zn 2nd Cl Tall	24.3	1.25	1.06	4.7	0.5	0.7
9. Zn 1st Cl Tail	131.6	6.75	0.59	1.47	1.5	1.2
10. Zn Prefloat Tall	351.0	18.01	0.57	0.71	4.0	1.5
11. Zn Scalp Tall	1022.0	52.45	0.13	0.75	2.6	4.6
Head Calc.	1948.6	100.00	2.59	8.50	100.0	100.0

Combined Products

Products 1+2	2.90	73.3	1.42	82.0	0.5
Products 1-3	3.09	69.4	1.87	82.7	0.7
Products 1-4	4.19	52.4	3.87	84.8	1.9
Products 1-5	8.68	26.4	7.40	88.3	7.6
Products 6+7	12.86	0.62	55.8	3.1	84.4
Products6-8	14.11	0.66	51.3	3.6	85.1
Products 6-9	20.86	0.64	35.1	5.1	86.3
Products 10+11	70.46	0.24	0.74	6.6	6.1

TEST NO. 92

Purpose: To repeat Test 89 but use 20 % Hanging Wall material with 80 % Rock Type 4 ore as the composite.

Procedure: As for Test 89.

Feed: 2000 grams minus 10 mesh (80% Rock Type 4 - 20% Hanging Wall ore).

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	C-7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	1	5	9.3
2	5	-	-	5	-	-	1	1	-
Bulk Regrind	-	300	-	-	300	33	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4	9.4
2	5	-	5	-	5	-	1	2	-
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	-	20	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5	9.0
	5	-	5	-	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	3	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	2.5	9.1
Pb 4th Cleaner	-	-	-	-	50	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	10.9
Condition	-	1000	-	-	-	-	5	-	9.0
Zn Rougher	-	-	25	10	5	-	1	3.5	-
Zn Scalp Regr	500	100	-	5	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	10.8
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	15	5	5	-	1	3.5	10.2
	-	-	-	-	5	-	-	-	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	4.5	11.2
	-	-	-	-	5	-	1	1	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	3.5	11.3
Zn 3rd Cleaner	250	-	-	-	-	-	1	3	-

Test No. 92

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	38.8	1.97	75.9	0.95	74.5	0.3
2. Pb 4th Cl. Tail	4.0	0.20	31.7	4.45	3.2	0.1
3. Pb 3rd Cl. Tail	8.1	0.41	9.35	6.3	1.9	0.4
4. Pb 2nd Cl. Tall	26.5	1.35	3.42	7.78	2.3	1.5
5. Pb 1st Cl. Tail	94.5	4.81	1.4	9.34	3.3	6.6
6. Zn 3rd Cl Conc	190.2	9.67	0.48	57	2.3	81.2
7. Zn 3rd Cl Tail	14.9	0.76	1.59	13.4	0.6	1.5
8. Zn 2nd Cl Tail	24.7	1.26	1.24	4.77	0.8	0.9
9. Zn 1st Cl Tail	148.7	7.56	0.67	1.16	2.5	1.3
10. Zn Prefloat Tail	170.7	8.68	0.66	0.79	2.9	1.0
11. Zn Scalp Tall	1245.6	63.33	0.18	0.56	5.7	5.2
Head Calc.	1966.7	100.00	2.01	6.79	100.0	100.0

Combined Products

Products 1+2	2.18	71.8	1.28	77.7	0.4
Products 1-3	2.59	61.8	2.08	79.6	0.8
Products 1-4	3.94	41.8	4.03	81.9	2.3
Products 1-5	8.74	19.6	6.95	85.3	8.9
Products 6+7	10.43	0.56	53.8	2.9	82.7
Products6-8	11.68	0.63	48.6	3.7	83.5
Products 6-9	19.25	0.65	29.9	6.2	84.8
Products 10+11	72.01	0.24	0.59	8.5	6.2

TEST NO. 93

Purpose: To repeat Test 88 but use 80% Rock Type 5 + 20% Hanging Wall ore.

Procedure: As for Test 88.

Feed: 2000 grams minus 10 mesh (80% Rock Type 5 - 20% Hanging Wall ore).

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	317	Na_2CO_3	CA830 Thiourea 80:20	C-7 MIBC 1:1	PKD-C	Grind	Cond.	Froth	pH
Grind	50	1500	20	-	-	15	-	-	7.9
Bulk Rougher 1	25	-	-	20	-	-	1	3.5	-
2	-	-	-	-	-	-	1	1.5	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4	9.2
2	5	-	5	-	-	-	1	1	-
Pb Conc Regr	-	100	-	-	200	-	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	8.8
	5	-	5	-	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	3.5	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	3	9.2
Pb 4th Cleaner	-	-	-	-	50	-	1	1	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	350	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher 1	-	-	25	10	5	-	1	4.5	8.3
2	-	-	10	10	5	-	1	3	-
Zn Scalp Regr	500	100	-	5	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	-
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	25	5	5	-	-	-	10.1
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	5	-
Zn 2nd Cleaner	250	-	-	-	-	-	1	4	11.2
Zn 3rd Cleaner	250	-	-	-	-	-	1	3	-

Test No. 93

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	43.2	2.19	72.7	1.04	55.9	0.2
2. Pb 4th Cl. Tall	7.0	0.35	36.9	3.49	4.6	0.1
3. Pb 3rd Cl. Tall	12.9	0.65	14.7	5.25	3.4	0.3
4. Pb 2nd Cl. Tall	32.8	1.66	6.53	7.18	3.8	1.1
5. Pb 1st Cl. Tall	113.5	5.75	2.35	9.12	4.7	4.8
6. Zn 3rd Cl Conc	340.6	17.26	1.08	53	6.5	83.7
7. Zn 3rd Cl Tall	22.0	1.11	2.46	11.3	1.0	1.2
8. Zn 2nd Cl Tail	50.7	2.57	1.8	4.43	1.6	1.0
9. Zn 1st Cl Tail	293.8	14.89	1.22	1.8	6.4	2.5
10. Zn Prefloat Tail	259.4	13.14	0.87	1.03	4.0	1.2
11. Zn Scalp Tail	797.7	40.42	0.57	1.05	8.1	3.9
Head Calc.	1973.6	100.00	2.85	10.93	100.0	100.0

Combined Products

Products 1+2	2.54	67.7	1.38	60.5	0.3
Products 1-3	3.20	56.9	2.17	63.8	0.6
Products 1-4	4.86	39.7	3.89	67.6	1.7
Products 1-5	10.61	19.4	6.72	72.4	6.5
Products 6+7	18.37	1.16	50.5	7.5	84.9
Products6-8	20.94	1.24	44.8	9.1	85.9
Products 6-9	35.83	1.23	26.9	15.5	88.4
Products 10+11	53.56	0.64	1.05	12.1	5.1

TEST NO. 94

Purpose: To repeat Test 85 but replace C-7/MIBC with Aerofroth 65.

Procedure: As for Test 85.

Feed: 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	A-65	PKD-C	Grind	Cond.	Froth	
Grind	50	1500	20	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	1	4	7.6
2	5	-	-	5	-	-	1	3	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher 1	-	-	-	-	-	-	-	4	8.6
Pb Conc Regr	-	100	-	-	200	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	8.5
	5	-	5	-	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	50	-	1	2.5	-
Pb 3rd Cleaner	-	-	-	-	50	-	1	2	9.1
Pb 4th Cleaner	-	-	-	-	50	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	600	-	-	-	-	-	5	-	11.1
Condition	-	1000	-	-	-	-	5	-	10.3
Zn Scalp 1	-	-	40	10	7.5	-	-	3	-
2	-	-	5	5	5	-	-	1.5	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	10.6
Condition	-	500	-	-	-	-	5	-	9.6
Zn Prefloat	-	-	25	10	10	-	-	5	-
Combine Zn Prefloat Conc+ Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	-	-	-
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	10.7
Zn 2nd Cleaner	250	-	-	-	5	-	-	5	10.8
Zn 3rd Cleaner	250	-	-	-	-	-	-	4	-

Test No. 94

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	108.6	5.52	47.9	2.48	69.7	1.0
2. Pb 4th Cl. Tail	14.1	0.72	4.88	6.63	0.9	0.3
3. Pb 3rd Cl. Tail	35.2	1.79	3.91	7.69	1.8	1.0
4. Pb 2nd Cl. Tail	57.1	2.90	1.47	8.47	1.1	1.8
5. Pb 1st Cl. Tail	178.9	9.09	1.35	9.98	3.2	6.6
6. Zn 3rd Cl Conc	377.9	19.19	0.85	56.3	4.3	78.3
7. Zn 3rd Cl Tail	30.2	1.53	3.02	16.8	1.2	1.9
8. Zn 2nd Cl Tail	63.7	3.24	2.84	7.95	2.4	1.9
9. Zn 1st Cl Tail	376.6	19.13	1.64	2.89	8.3	4.0
10. Zn Prefloat Tail	309.1	15.70	0.78	1.26	3.2	1.4
11. Zn Scalp Tail	417.6	21.21	0.66	1.22	3.7	1.9
Head Calc.	1969.0	100.00	3.79	13.8	100.0	100.0

Combined Products

Products 1+2	6.23	43.0	2.96	70.6	1.3
Products 1-3	8.02	34.3	4.01	72.5	2.3
Products 1-4	10.92	25.5	5.20	73.6	4.1
Products 1-5	20.01	14.6	7.37	76.8	10.7
Products 6+7	20.73	1.01	53.4	5.5	80.1
Products6-8	23.96	1.26	47.2	8.0	82.0
Products 6-9	43.09	1.43	27.6	16.2	86.0
Products 10+11	36.91	0.71	1.24	6.9	3.3

TEST NO. 95

Purpose: To repeat Test 94 but increase Na_2CO_3 to 2500 g/t in the primary grind. Also increase PKD/NaCN In Pb rougher concentrate regrind to 300 g/t.

Procedure: As for Test 94.

Feed: 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	A-65	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	1	3.5	9.1
2	10	-	10	5	-	-	1	2.5	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	50	-	25	10	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	4	9.0
Pb Conc Regr	-	100	-	-	300	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3.5	9.1
Pb 2nd Cleaner	-	-	-	-	75	-	1	2	-
Pb 3rd Cleaner	-	-	-	-	75	-	1	2.5	-
Pb 4th Cleaner	-	-	-	-	75	-	1	-	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	1200	-	-	-	-	-	5	-	11.5
Condition	-	1000	-	-	-	-	5	-	10.7
Zn Scalp 1	-	-	40	10	7.5	-	1	4	-
2	-	-	5	5	5	-	-	2.5	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	500	-	-	-	-	-	5	-	-
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	-	-	25	10	10	-	-	-	9.7
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	5	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	6	-
Zn 2nd Cleaner	250	-	-	-	-	-	-	-	-
Zn 3rd Cleaner	250	-	-	-	-	-	-	-	11.4

Test No. 95

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	90.6	4.51	56.5	2.13	67.7	0.7
2. Pb 4th Cl. Tail	11.5	0.57	14.9	5.24	2.3	0.2
3. Pb 3rd Cl. Tail	30.4	1.51	7.4	7.95	3.0	0.9
4. Pb 2nd Cl. Tail	96.1	4.79	4.23	9.82	5.4	3.4
5. Pb 1st Cl. Tail	254.4	12.67	1.83	13.4	6.2	12.3
6. Zn 3rd Cl Conc	388.4	19.35	0.68	53.7	3.5	75.3
7. Zn 3rd Cl Tail	39.9	1.99	1.77	10.3	0.9	1.5
8. Zn 2nd Cl Tail	76.6	3.82	1.68	4.75	1.7	1.3
9. Zn 1st Cl Tail	306.2	15.25	1.09	1.63	4.4	1.8
10. Zn Prefloat Tail	326.0	16.24	0.79	1.08	3.4	1.3
11. Zn Scalp Tail	387.3	19.29	0.32	0.94	1.6	1.3
Head Calc.	2007.4	100.00	3.77	13.8	100.0	100.0

Combined Products

Products 1+2	5.09	51.8	2.48	69.9	0.9
Products 1-3	6.60	41.6	3.74	72.9	1.8
Products 1-4	11.39	25.9	6.29	78.3	5.2
Products 1-5	24.06	13.2	10.04	84.4	17.5
Products 6+7	21.34	0.78	49.7	4.4	76.8
Products6-8	25.15	0.92	42.8	6.1	78.1
Products 6-9	40.41	0.98	27.3	10.5	79.9
Products 10+11	35.53	0.53	1.00	5.0	2.6

TEST NO. 96

Purpose: To conduct a locked cycle test on Rock Type 5 ore.

Procedure: As shown in the attached flowsheet. As for Tes t95, but with MIBC* (flowsheet as for Test 81).

Feed: 6 x 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill for each 2000 gram charge.

***The initial cycle was run with A65, but due to poor selectivity, MIBC was used in the remaining cycles.**

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	-
Bulk Rougher 1	10	-	-	20	-	-	1	5	8.9
2	15	-	-	-	-	-	1	2.5	-
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	20	-	10	5	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	3	9.1
Pb Scavenger	10	-	5	-	-	-	1	1.5	-
Pb Conc Regr	-	100	-	-	300	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	9.1
	5	-	-	-	-	-	-	1	-
Pb 2nd Cleaner	-	-	-	-	75	-	1	2	9.2
Pb 3rd Cleaner	-	-	-	-	75	-	1	-	-
Pb 4th Cleaner	-	-	-	-	75	-	1	-	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	1200	-	-	-	-	-	5	-	11.1
Condition	-	1000	-	-	-	-	5	-	-
Zn Scalp 1	-	-	40	10	7.5	-	1	3	-
2	-	-	5	5	5	-	-	2.5	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	750	-	-	-	-	-	5	-	11.5
Condition	-	500	-	-	-	-	5	-	11.0
Zn Prefloat	-	-	25	10	10	-	-	5	-
	-	-	5	5	5	-	1	2.5	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	15	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	11 +
	-	-	5	5	5	-	1	1.5	-
Zn 1st Cl Scav	-	-	5	5	5	-	1	3	-
Zn 2nd Cleaner	500	-	-	-	-	-	-	4	11.5
	-	-	2.5	2.5	2.5	-	1	1	-
Zn 3rd Cleaner	500	-	-	-	2.5	-	-	3	11.6

Test No. 96

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl Conc A	82.3	0.7	58	2.1	-	11.0	0.1	-
2. Pb Cl Conc B	84.7	0.7	57.8	2.05	-	11.2	0.1	-
3. Pb Cl Conc C	102.8	0.9	49.2	2.66	-	11.6	0.2	-
4. Pb Cl Conc D	85.6	0.7	55.8	2.16	-	11.0	0.1	-
5. Pb Cl Conc E	74.8	0.6	56.5	2.15	-	9.7	0.1	-
6. Pb Cl Conc F	67.5	0.6	53.4	2.57	-	8.3	0.1	-
7. Pb 4th Cl Tail F	30.9	0.3	25.5	4.81	-	1.8	0.1	-
8. Pb 3rd Cl Tail F	96.3	0.8	16.8	6.28	-	3.7	0.4	-
9. Pb 2nd Cl Tail F	140.6	1.2	8.25	8.54	-	2.7	0.7	-
10. Pb 1st Cl Tail F	318.3	2.7	4.14	11.1	-	3.0	2.2	-
11. Zn Cl Conc A	229.2	1.9	0.66	59.1	-	0.3	8.4	-
12. Zn Cl Conc B	258.0	2.2	1.17	56.8	-	0.7	9.1	-
13. Zn Cl Conc C	249.0	2.1	1.07	57.4	-	0.6	8.9	-
14. Zn Cl Conc D	338.9	2.9	1.32	54.7	-	1.0	11.5	-
15. Zn Cl Conc E	323.0	2.7	1.29	54.7	-	1.0	11.0	-
16. Zn Cl Conc F	359.8	3.0	1.52	53	-	1.3	11.8	-
17. Zn 3rd Cl Tail F	350.5	3.0	1.53	41.4	-	1.2	9.0	-
18. Zn 2nd Cl Tail F	732.5	6.2	1.29	36.1	-	2.2	16.4	-
19. Zn 1st Cl Sc Conc F	277.4	2.3	1.87	14.7	-	1.2	2.5	-
20. Zn Pre-Flt Ro Tail A	162.9	1.4	1.01	0.96	-	0.4	0.1	-
21. Zn Pre-Flt Ro Tail B	133.9	1.1	1.4	1.09	-	0.4	0.1	-
22. Zn Pre-Flt Ro Tail C	528.6	4.5	0.86	1.09	-	1.0	0.4	-
23. Zn Pre-Flt Ro Tail D	584.9	4.9	1.16	1.36	-	1.6	0.5	-
24. Zn Pre-Flt Ro Tail E	442.9	3.7	1.15	1.01	-	1.2	0.3	-
25. Zn Pre-Flt Ro Tail F	461.9	3.9	1.1	0.98	-	1.2	0.3	-
26. Zn 1st Cl Sc Tail A	339.5	2.9	1.48	2.16	-	1.2	0.5	-
27. Zn 1st Cl Sc Tail B	401.4	3.4	1.25	1.55	-	1.2	0.4	-
28. Zn 1st Cl Sc Tail C	492.6	4.2	1.21	2.31	-	1.4	0.7	-
29. Zn 1st Cl Sc Tail D	443.4	3.7	1.18	1.87	-	1.2	0.5	-
30. Zn 1st Cl Sc Tail E	538.6	4.5	1.44	4.69	-	1.8	1.6	-
31. Zn 1st Cl Sc Tail F	447.0	3.8	1.19	1.54	-	1.2	0.4	-
32. Zn Scalp Tail A	561.5	4.7	0.7	0.89	-	0.9	0.3	-
33. Zn Scalp Tail B	391.8	3.3	0.4	1.01	-	0.4	0.2	-
34. Zn Scalp Tail C	396.3	3.3	0.4	0.94	-	0.4	0.2	-
35. Zn Scalp Tail D	424.0	3.6	0.41	1.12	-	0.4	0.3	-
36 Zn Scalp Tail E	492.5	4.2	0.49	0.98	-	0.6	0.3	-
37. Zn Scalp Tail F	402.3	3.4	0.39	1	-	0.4	0.2	-
Head (calc)	11848.1	100.0	3.68	13.6	-	100.0	100.0	-

Combined Products

Comb Pb Conc.1 to 6	4.2	54.9	2.29	-	62.7	0.7	-
Comb Pb Cl Talls 7 to10	4.9	8.33	9.36	-	11.2	3.4	-
Comb Zn Cl.Conc. 11 to16	14.8	1.21	55.6	-	4.9	60.7	-
Comb Zn Cl Talls, Cl Sc Conc. 17 to 19	11.5	1.47	33.1	-	4.6	27.9	-
Comb Zn Pre-Float Ro Talls 20 to 25	19.5	1.08	1.11	-	5.7	1.6	-
Comb Zn Cl Scav Talls 26 to 31	22.5	1.29	2.46	-	7.9	4.1	-
Comb Zn Scalp Talls 32 to 37	22.5	0.48	0.98	-	2.9	1.6	-

Projected Results Cycles D, E, & F

Pb Cleaner Conc	4.8	55.3	2.28	-	72.4	0.8	-
Zn Cleaner Conc	22.7	1.38	54.1	-	8.5	90.3	-
Zn Scav. Tail	72.5	0.97	1.68	-	19.1	8.9	-
Head(calc)	100.0	3.68	13.6	-	100.0	100.0	-

TEST NO. 97

Purpose: As for Test 95, but with Hanging Wall dilution.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh (90% Rock Type 5 + 20% Hanging Wall) ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	A-65	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	9.2
Bulk Rougher 1	10	-	-	20	-	-	1	1.5	-
2	10	-	-	-	-	-	1	4	-
3	15	-	-	-	-	-	1	1	9.1
4	10	-	10	5	-	-	1	3	9.1
5	10	-	10	-	-	-	1	3	9.1
Bulk Regrind	-	300	-	-	300	30	-	-	-
H.I. Condition	20	-	10	5	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	3	9.6
Pb Scavenger	10	-	5	-	-	-	1	1.5	9.5
Pb Conc Regr	-	100	-	-	300	20	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	9.5
	5	-	-	-	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	75	-	1	2	9.6
Pb 3rd Cleaner	-	-	-	-	75	-	1	2	9.7
Pb 4th Cleaner	-	-	-	-	75	-	1	2	9.8
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	800	-	-	-	-	-	5	-	10.8
Condition	245	1000	-	-	-	-	5	-	11.0
Zn Scalp 1	-	-	40	10	7.5	-	1	3	10.9
2	100	-	5	5	10	-	-	3	10.9
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	750	-	-	-	-	-	5	-	11.6
Condition	-	500	-	-	-	-	5	-	11.4
Zn Prefloat	-	-	25	10	10	-	1	5	-
	-	-	5	5	5	-	1	2.5	11.0
Combine Zn Prefloat Conc + Reground Zn Scalp Conc. for H.I. and cleaning.									
H.I. Condition	250	-	15	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	11.5
	-	-	5	5	5	-	1	1.5	11.3
Zn 1st Cl Scav	-	-	5	5	5	-	1	3	11.3
Zn 2nd Cleaner	500	-	-	-	-	-	-	4	11.7
	-	-	2.5	2.5	2.5	-	1	1.5	11.7
Zn 3rd Cleaner	500	-	-	-	2.5	-	-	3	12.0

Test No. 97

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	29.5	1.51	53.2	2.77	25.3	0.3
2. Pb 4th Cl. Tail	34.1	1.74	38.7	3.85	21.3	0.5
3. Pb 3rd Cl. Tail	52.5	2.68	17.9	6	15.1	1.3
4. Pb 2nd Cl. Tail	35.3	1.80	7.76	8.97	4.4	1.3
5. Pb 1st Cl. Tail	96.5	4.93	5.06	9.1	7.9	3.6
6. Zn 3rd Cl Conc	359.8	18.37	0.76	53	4.4	78.1
7. Zn 3rd Cl Tail	106.4	5.43	1.79	17.3	3.1	7.5
8. Zn 2nd Cl Tail	86.1	4.40	1.73	3.42	2.4	1.2
9. Zn 1st Cl Scav Conc	58.9	3.01	1.8	2.9	1.7	0.7
10. Zn 1st Cl Scav Tail	189.3	9.67	0.89	0.72	2.7	0.6
11. Zn Prefloat Tail	130.5	6.66	0.97	0.67	2.0	0.4
12. Zn Scalp Tail	779.3	39.80	0.77	1.42	9.7	4.5
Head Calc.	1958.2	100.00	3.17	12.5	100.0	100.0

Combined Products

Products 1+2	3.25	45.4	3.35	46.6	0.9
Products 1-3	5.93	33.0	4.55	61.7	2.2
Products 1-4	7.73	27.1	5.58	66.1	3.5
Products 1-5	12.66	18.5	6.95	74.0	7.1
Products 6+7	23.81	1.00	44.9	7.5	85.6
Products6-8	28.20	1.11	38.4	9.9	86.8
Products 6-9	40.88	1.11	26.9	14.3	88.1
Products 6-10	47.54	1.09	23.2	16.3	88.4
Products 11+12	46.46	0.80	1.31	11.7	4.9

TEST NO. 98

Purpose: To repeat the conditions of Test 95 on Rock Type 5 ore, but increase the bulk conc regrind to 40 minutes, and the Pb Conc regrind to 30 minutes.

Procedure: As for Test 95.

Feed: 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab bali mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	A-65	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	-
Bulk Rougher 1	10	-	-	20	-	-	1	4.5	9.1
2	15	-	-	-	-	-	1	3	-
Bulk Regrind	-	300	-	-	300	40	-	-	-
H.I. Condition	30	-	20	2.5	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	5	9.2
Pb Scavenger	5	-	-	-	-	-	1	-	-
Pb Conc Regr	-	200	-	-	300	30	-	-	-
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5	9.6
	5	-	-	-	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	-	75	-	1	5	9.3
Pb 3rd Cleaner	-	-	-	-	75	-	1	5	9.3
Pb 4th Cleaner	-	-	-	-	75	-	1	4	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	805	-	-	-	-	-	5	-	11.0
Condition	325	1000	-	-	-	-	5	-	11.0
Zn Scalp 1	-	-	40	10	10	-	1	3	11.0
2	125	-	5	5	10	-	-	3	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	750	-	-	-	-	-	5	-	11.5
Condition	-	500	-	-	-	-	5	-	11.3
Zn Prefloat	-	-	25	10	10	-	1	5	11.3
	30	-	5	5	5	-	1	2.5	11.0
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	15	10	5	-	15	-	11.4
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	11.3
	-	-	5	5	5	-	1	1.5	-
Zn 1st Cl Scav	-	-	5	5	5	-	1	3	11.3
Zn 2nd Cleaner	500	-	-	-	-	-	1	4	11.3
	-	-	2.5	2.5	2.5	-	1	1.5	11.3
Zn 3rd Cleaner	500	-	-	-	2.5	-	1	3	11.5

Test 98

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	33.6	1.71	68.6	1.35	33.2	0.2
2. Pb 4th Cl. Tall	19.3	0.98	49.6	2.76	13.8	0.2
3. Pb 3rd Cl. Tall	21.7	1.10	22.4	5.43	7.0	0.4
4. Pb 2nd Cl. Tail	64.2	3.27	11.2	7.42	10.4	1.8
5. Pb 1st Cl. Tail	127.2	6.47	4.32	9.38	7.9	4.5
6. Zn 3rd Cl Conc	293.8	14.95	0.67	55.5	2.8	61.0
7. Zn 3rd Cl Tall	120.1	6.11	1.33	40.9	2.3	18.4
8. Zn 2nd Cl Tail	68.3	3.48	2.32	11.1	2.3	2.8
9. Zn 1st Cl. Scav. Conc.	124.5	6.33	2.18	14	3.9	6.5
10. Zn 1st Cl Tall	230.2	11.71	1.46	1.73	4.8	1.5
11. Zn Prefloat Tall	189.4	9.64	1.08	1.07	2.9	0.8
12. Zn Scalp Tall	673.1	34.25	0.88	0.81	8.5	2.0
Head Calc.	1965.4	100.00	3.53	13.61	100.0	100.0

Combined Products

Products 1+2	2.69	61.7	1.86	47.0	0.4
Products 1-3	3.80	50.2	2.90	54.0	0.8
Products 1-4	7.06	32.2	4.99	64.4	2.6
Products 1-5	13.53	18.9	7.09	72.3	7.0
Products 6+7	21.06	0.86	51.3	5.1	79.3
Products6-8	24.53	1.07	45.6	7.4	82.2
Products 6-9	42.58	1.34	28.8	16.2	90.2
Products 11+12	43.88	0.92	0.87	11.5	2.8

TEST NO. 99

Purpose: To repeat Test 98 but use MIBC in place of A-65. Also conduct test on composite of 90% Rock Type 5, 10% Hanging wall ore.

Procedure: As shown below.

Feed: 2000 grams minus 10 mesh (90% Rock Type 5 + 10% Hanging Wall) ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	-
Bulk Rougher 1	10	-	-	15	-	-	1	4	9.4
2	20	-	-	2.5	-	-	1	2.5	-
Bulk Regrind	-	300	-	-	300	40	-	-	-
H.I. Condition	30	-	20	2.5	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	4	9.5
Pb Scavenger	-	-	-	2.5	-	-	1	1	-
Pb ConcRegr	-	100	-	-	200	20	-	-	9.3
H.I. Cond	10	-	20	-	-	-	10	-	-
Pb 1st Cleaner	-	-	-	2.5	-	-	-	3	-
	5	-	-	2.5	-	-	1	1	-
Pb 2nd Cleaner	-	-	-	5	50	-	1	2.5	-
Pb 3rd Cleaner	-	-	-	-	25	-	1	2	-
Pb 4th Cleaner	-	-	-	-	50	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	820	-	-	-	-	-	5	-	11.1
Condition	240	1000	-	-	-	-	5	-	11.0
Zn Scalp 1	-	-	40	10	10	-	1	3	-
2	-	-	5	5	10	-	-	3	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	750	-	-	-	-	-	5	-	11.3
Condition	-	500	-	-	-	-	5	-	11.1
Zn Prefloat	-	-	25	10	10	-	1	5	11.2
	30	-	5	5	5	-	1	2.5	-
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	15	10	5	-	15	-	11.3
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	11.3
	-	-	5	5	5	-	1	1.5	11.3
Zn 1st Cl Scav	-	-	5	5	5	-	1	3	11.2
Zn 2nd Cleaner	500	-	-	-	-	-	1	4	11.5
	-	-	2.5	2.5	2.5	-	1	1.5	-
Zn 3rd Cleaner	500	-	-	-	2.5	-	1	3	11.9

Test 99

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	58.2	2.96	63.2	1.79	55.4	0.4
2. Pb 4th Cl. Tail	21.4	1.09	21.4	5.44	6.9	0.5
3. Pb 3rd Cl. Tail	15.5	0.79	8.04	7.5	1.9	0.5
4. Pb 2nd Cl. Tail	38.6	1.96	5.61	8.33	3.3	1.3
5. Pb 1st Cl. Tail	143.4	7.29	2.9	10.1	6.3	6.0
6. Zn 3rd Cl Conc	326.3	16.59	0.79	54.5	3.9	73.7
7. Zn 3rd Cl Tail	111.2	5.65	2.13	5.71	3.6	2.6
8. Zn 2nd Cl Tall	61.1	3.11	1.09	0.78	1.0	0.2
9. Zn 1st Cl. Scav. Conc.	75.2	3.82	1.66	24	1.9	7.5
10. Zn 1st Cl Tail	219.3	11.15	1.81	4.21	6.0	3.8
11. Zn Prefloat Tail	207.0	10.52	0.98	0.82	3.1	0.7
12. Zn Scalp Tail	689.8	35.07	0.67	0.94	7.0	2.7
Head Calc.	1967.0	100.00	3.38	12.26	100.0	100.0

Combined Products

Products 1+2	4.05	52.0	2.77	62.3	0.9
Products 1-3	4.83	44.8	3.54	64.2	1.4
Products 1-4	6.80	33.5	4.92	67.4	2.7
Products 1-5	14.09	17.7	7.60	73.7	8.7
Products 6+7	22.24	1.13	42.1	7.4	76.4
Products6-8	25.35	1.13	37.0	8.5	76.6
Products 6-9	40.32	1.37	26.7	16.3	87.9
Products 11+12	45.59	0.74	0.91	10.0	3.4

TEST NO. 100

Purpose: To conduct a locked cycle test on Rock Type 5 ore using conditions similar to Test 98.

Procedure: Similar to Test 98, but replace A-65 with MIBC.

Feed: 5 x 2000 grams minus 10 mesh Rock Type 5 ore.

Grind: 15 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	317	Na_2CO_3	CA830 Thiourea 80:20	MIBC	PKD-C	Grind	Cond.	Froth	
Grind	50	2500	20	-	-	15	-	-	-
Bulk Rougher 1	25	-	-	20	-	-	1	5	-
2	10	-	-	5	-	-	1	3	-
Bulk Regrind	-	300	-	-	300	40	-	-	-
H.I. Condition	50	-	25	-	-	-	15	-	-
Pb Rougher	-	-	-	-	-	-	-	3	-
Pb Scavenger	10	-	5	5	-	-	1	2	-
Pb ConcRegr	-	100	-	-	300	30	-	-	-
H.I. Cond	10	-	20	10	-	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	3	-
	5	-	-	5	-	-	1	1.5	-
	5	-	-	5	-	-	1	1.5	-
Pb 2nd Cleaner	-	-	-	-	75	-	1	3	-
Pb 3rd Cleaner	-	-	-	-	75	-	1	2	-
Pb 4th Cleaner	-	-	-	-	75	-	1	2	-
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	317	M2030	DF250				
Condition	~800	-	-	-	-	-	5	-	11.1
Condition	-	1000	-	-	-	-	5	-	11.0
Zn Scalp 1	-	-	40	10	10	-	1	3	-
2	-	-	5	5	10	-	-	3	-
Zn Scalp Regr	500	200	-	-	-	30	-	-	-
Pb Rougher Tail for Zn Prefloat.									
Condition	750	-	-	-	-	-	5	-	-
Condition	-	500	-	-	-	-	5	-	-
Zn Prefloat	~300	-	25	10	10	-	1	5	11.0
	-	-	5	5	5	-	1	2.5	11.1
Combine Zn Prefloat Conc + Reground Zn Scalp Conc.									
H.I. Condition	250	-	15	10	5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	7.5	-	-	4	11.4
	-	-	5	5	5	-	1	1.5	-
Zn 1st Cl Scav	-	-	5	5	5	-	1	3	-
Zn 2nd Cleaner	500	-	-	-	-	-	1	4	-
	-	-	5*	5*	5*	-	1	1.5	-
Zn 3rd Cleaner	500	-	-	-	2.5	-	1	3	12.5

*increased from 2.5 g/t in Cycle C.

Test No. 100

Product	Weight		Assays,%,g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl Conc A	33.2	0.3	72.4	1.23	-	6.6	0.03	-
2. Pb Cl Conc B	54.0	0.5	72.7	1.13	-	10.7	0.05	-
3. Pb Cl Conc C	69.6	0.7	70.1	1.3	-	13.3	0.1	-
4. Pb Cl Conc D	47.3	0.5	73.2	1.1	-	9.5	0.04	-
5. Pb Cl Conc E	78.2	0.8	65.3	1.54	-	14.0	0.1	-
6. Pb 4th Cl Tall E	35.2	0.4	34.4	3.54	-	3.3	0.1	-
7. Pb 3rd Cl Tall E	88.0	0.9	27.6	4.4	-	6.6	0.3	-
8. Pb 2nd Cl Tall E	165.6	1.7	11	6.69	-	5.0	0.8	-
9. Pb 1st Cl Tall E	315.0	3.2	2.7	9	-	2.3	2.1	-
10. Zn Cl Conc A	258.0	2.6	0.97	51.7	-	0.7	9.9	-
11. Zn Cl Conc B	250.4	2.5	1.61	42.8	-	1.1	7.9	-
12. Zn Cl Conc C	392.3	4.0	1.41	43.8	-	1.5	12.7	-
13. Zn Cl Conc D	512.5	5.2	1.43	43.8	-	2.0	16.6	-
14. Zn Cl Conc E	499.4	5.0	1.14	46.6	-	1.6	17.3	-
15. Zn 3rd Cl Tall E	341.4	3.4	1.52	33.9	-	1.4	8.6	-
16. Zn 2nd Cl Tall E	716.3	7.2	1.39	31.5	-	2.7	16.7	-
17. Zn 1st Cl Sc Conc E	147.8	1.5	1.94	5.17	-	0.8	0.6	-
18. Zn Pre-Flt Ro Tall A	324.5	3.3	1.33	1.4	-	1.2	0.3	-
19. Zn Pre-Flt Ro Tall B	521.4	5.3	1.97	5.62	-	2.8	2.2	-
20. Zn Pre-Flt Ro Tall C	466.5	4.7	1.38	2.11	-	1.8	0.7	-
21. Zn Pre-Flt Ro Tall D	388.4	3.9	1.24	1.24	-	1.3	0.4	-
22. Zn Pre-Flt Ro Tall E	370.1	3.7	1.06	0.89	-	1.1	0.2	-
23. Zn 1st Cl Sc Tall A	189.8	1.9	1.12	0.63	-	0.6	0.1	-
24. Zn 1st Cl Sc Tall B	185.9	1.9	2	1.04	-	1.0	0.1	-
25. Zn 1st Cl Sc Tall C	282.0	2.8	1.32	0.7	-	1.0	0.1	-
26. Zn 1st Cl Sc Tall D	306.5	3.1	1.16	0.68	-	1.0	0.2	-
27. Zn 1st Cl Sc Tall E	320.9	3.2	1.19	0.75	-	1.0	0.2	-
28. Zn Scalp Tall A	532.8	5.4	0.64	0.81	-	0.9	0.3	-
29. Zn Scalp Tall B	681.0	6.9	0.88	0.91	-	1.6	0.5	-
30. Zn Scalp Tall C	455.3	4.6	0.45	0.8	-	0.6	0.3	-
31. Zn Scalp Tall D	458.2	4.6	0.4	0.66	-	0.5	0.2	-
32 Zn Scalp Tall E	423.7	4.3	0.38	0.74	-	0.4	0.2	-
Head (calc)	9911.2	100.0	3.69	13.6	-	100.0	100.0	-

Combined Products

Comb Pb Conc.1 to 5	2.8	70.1	1.29	-	54.1	0.3	-
Comb Pb Cl Talls 6 to9	6.1	10.45	7.38	-	17.3	3.3	-
Comb Zn Cl.Conc. 10 to14	19.3	1.31	45.5	-	6.9	64.5	-
Comb Zn Cl Talls, Cl Sc Conc. 15 to 17	12.2	1.49	29.0	-	4.9	25.9	-
Comb Zn Pre-Float Ro Talls 18 to 23	20.9	1.44	2.50	-	8.1	3.8	-
Comb Zn Cl Scav Talls 24 to 27	13.0	1.32	0.75	-	4.6	0.7	-
Comb Zn Scalp Talls 28 to 32	25.7	0.58	0.80	-	4.1	1.5	-

Projected Results Cycles D & E

Pb Cleaner Conc	4.0	68.3	1.37	-	74.2	0.4	-
Zn Cleaner Conc	28.8	1.29	45.2	-	10.0	95.5	-
Zn Scav. Tall	67.2	0.86	0.83	-	15.7	4.1	-
Head(calc)	100.0	3.69	13.6	-	100.0	100.0	-

CONVENTIONAL FLOTATION FLOWSHEET
TEST DETAILS

TEST NO. 1

Purpose: To evaluate the effect of the chosen reagent scheme on Composite 1 ore under the preliminary test conditions of conventional flowsheet used In the development.

Procedure: Grind, then float a rougher concentrate. Regrind then clean the concentrate four times to produce a Pb concentrate. Float a zinc concentrate, regrind and use H.I. conditioning before cleaning the Zn rougher concentrate twice to produce a final Zn concentrate.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

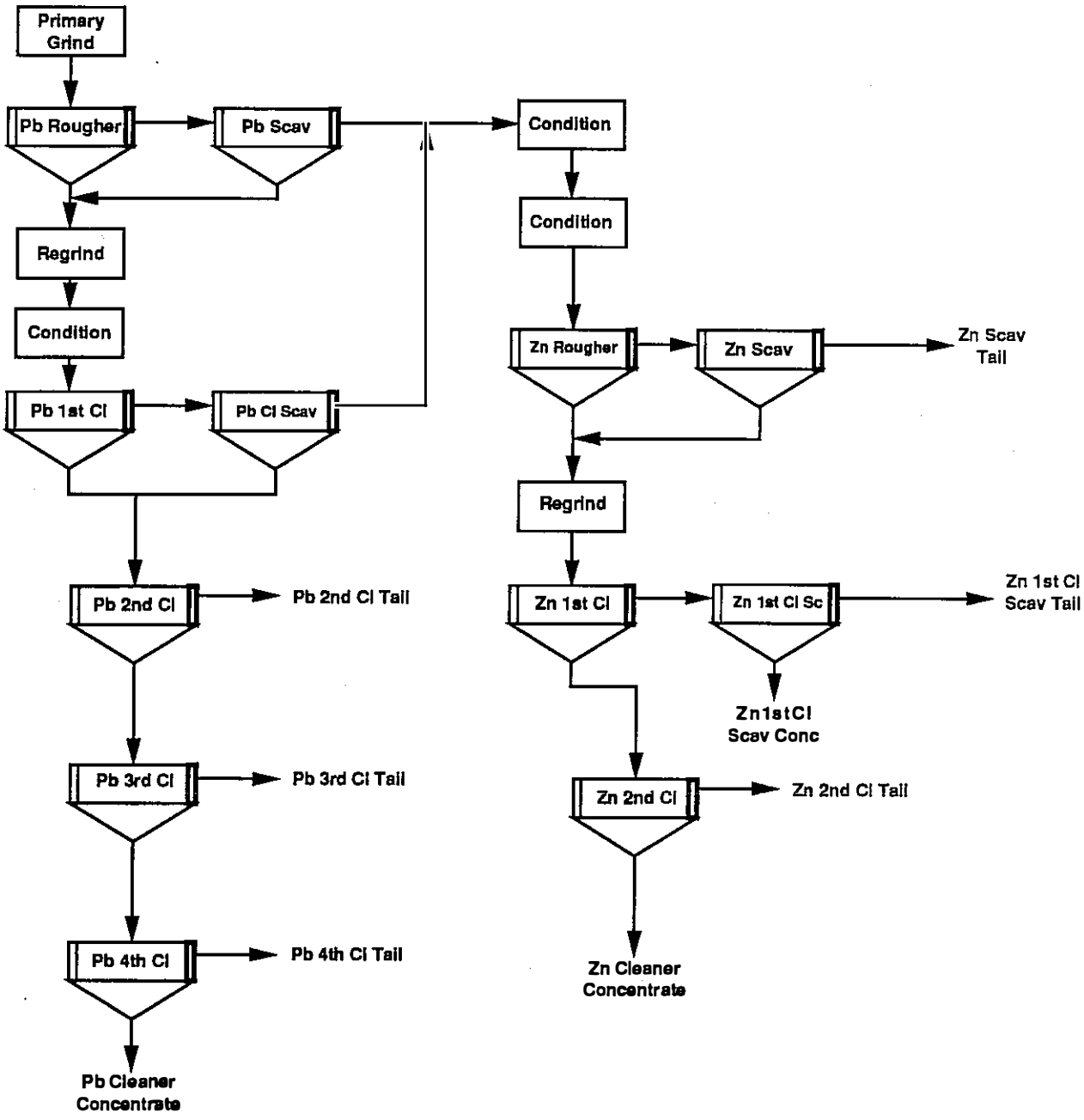
Stage	Reagents Added, grams per tonne				Time, minutes			pH
	Na_2CO_3	PKD-C	317 / 3418A	MIBC	Grind	Cond.	Froth	
Primary Grind	2000	250	8	-	40	-	-	-
Pb Rougher	-	-	35	15	-	1	5	10.5
	-	-	10	5	-	1	3	-
Pb Scavenger	-	-	5	7.5	-	1	4	-
Pb Conc Regrind	500	75	15	-	40	-	-	-
Pb 1st Cleaner	-	-	-	5	-	1	2	-
	-	-	20	-	-	1	4	-
	-	-	10	2.5	-	1	2	-
	-	-	5	-	-	-	-	-
Pb 1st Cl Scav	-	-	5	-	-	1	2	-
	-	-	5	-	-	-	-	-
Pb 2nd Cleaner	-	50	5	-	-	1	4	-
	-	-	10	-	-	1	3	-
	-	-	10	-	-	1	2	-
	-	-	5	-	-	1	2	-
Pb 3rd Cleaner	-	20	10	-	-	1	7	-
	-	-	5	2.5	-	1	2.5	-
Pb 4th Cleaner	-	25	-	2.5	-	1	5	-

Test No. 1 - Continued

Zn Circuit:

Stage	Reagents Added, grams per tonne				Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	343	DF1012	Grind	Cond.	Froth	
Condition	2000	-	-	-	-	5	-	-
	-	1500	-	-	-	5	-	-
Zn Rougher	-	-	40	10	-	1	3	11.7
	-	-	20	5	-	1	3	-
Zn Scavenger	-	-	20	2.5	-	1	2	-
Zn Conc Regrind	1000	200	-	-	30	-	-	-
H.I. Conditioning	-	-	40	2.5	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	5	-
	-	-	10	2.5	-	1	5	-
	-	-	10	-	-	1	5	-
Zn 1st Cl Scav	-	-	10	5	-	1	3	10.5
Zn 2nd Cleaner	500	-	-	-	-	1	5	11.8

Test No. 1 Flowsheet



Test No. 1

Product	Weight		Assays,%,g/t				% Distribution			
	g	%	Pb	Zn	Fe	Ag	Pb	Zn	Fe	Ag
1. Pb Cl. Conc.	103.5	5.27	52.5	4.75	13.10	198.9	72.6	2.3	4.2	16.5
2. Pb 4th Cl. Tail	25.8	1.31	6.41	5.37	32.4	138.5	2.2	0.6	2.6	2.9
3. Pb 3rd Cl. Tail	21.0	1.07	6.26	4.01	30.6	115.2	1.8	0.4	2.0	1.9
4. Pb 2nd Cl. Tail	89.1	4.54	4.67	8.22	30.1	79.9	5.6	3.4	8.2	5.7
5. Pb1st Cl. Tail	110.0	5.60	3.56	10.2	28.60	64.4	5.2	5.2	9.6	5.7
6. Zn Cl. Conc.	318.5	16.22	0.82	42.0	10.8	117.3	3.5	61.5	10.5	29.9
7. Zn 2nd Cl. Tail	147.5	7.51	1.00	33.1	16.0	109.5	2.0	22.4	7.2	12.9
8. Zn1st Cl Scav. Conc.	33.6	1.71	1.25	9.90	27.6	81.9	0.6	1.5	2.8	2.2
9. Zn1st Cl Scav. Tail	74.3	3.78	0.89	2.58	27.8	52.4	0.9	0.9	6.3	3.1
10. Zn Ro Tail	1040.3	52.98	0.41	0.38	14.6	23.1	5.7	1.8	46.5	19.2
Head Calc.	1963.6	100.00	3.81	11.08	16.62	63.64	100.0	100.0	100.0	100.0

Combined Products

Products 1+2	6.58	43.30	4.87	16.95	186.85	74.8	2.9	6.7	19.3
Products 1-3	7.65	38.13	4.75	18.86	176.84	76.6	3.3	8.7	21.3
Products 1-4	12.19	25.68	6.04	23.04	140.76	82.2	6.7	16.9	27.0
Products 1-5	17.79	18.71	7.35	24.79	116.72	87.4	11.8	26.5	32.6
Products 6+7	23.73	0.88	39.18	12.45	114.83	5.5	84.0	17.8	42.8
Products 6-8	25.44	0.90	37.21	13.47	112.62	6.0	85.5	20.6	45.0
Products 6-9	29.23	0.90	32.73	15.32	104.82	6.9	86.4	26.9	46.1
Products 6-10	82.21	0.58	11.88	14.86	52.15	12.6	88.2	73.5	67.4

Test No. 1 Zinc Rougher Tail

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.00	0.0	0.0	100.0
100	0.30	0.2	0.2	99.8
150	1.30	0.7	0.9	99.1
200	4.30	2.4	3.3	96.7
270	12.30	6.9	10.3	89.7
400	19.80	11.2	21.4	78.6
-400.0	139.50	78.6	100.0	-
Total	177.50	100.0	-	-

K80 = 39 µm

TEST NO. 15

Purpose: To evaluate the effect of primary grind fineness using the conventional flowsheet - 20 minute grind.

Procedure: Pb rougher and scavenger, as in Test 1.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 20 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	20	-	-	9.9
Pb Rougher 1	-	-	-	50	17.5	-	2	2	-
2	-	-	-	40	5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	-

Test No. 15

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	348.4	17.69	19.80	16.30	83.5	23.5
2.Pb Ro. Conc.2	297.6	15.11	1.57	27.10	5.7	33.3
3. Pb Ro. Conc. 3	222.9	11.32	1.12	18.00	3.0	16.6
4. Pb Scav Conc.	126.3	6.41	1.26	14.80	1.9	7.7
5. Pb Scav Tail	974.0	49.46	0.50	4.70	5.9	18.9
Head Calc.	1969.2	100.00	4.20	12.29	100.0	100.0

Comb. Prod.

Products 1+2	32.81	11.40	21.28	89.2	56.8
Products 1to3	44.12	8.76	20.44	92.2	73.4
Products 1to4	50.54	7.81	19.72	94.1	81.1

TEST NO. 16

Purpose: As for Test 15 - 30 minute grind.

Procedure: As for Test 15.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 30 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	30	-	-	10.0
Pb Rougher 1	-	-	-	50	15	-	2	2	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	9.6

Test No. 16

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	257.3	12.98	26.90	9.30	80.2	10.0
2.Pb Ro. Conc.2	199.0	10.04	3.44	28.50	7.9	23.7
3. Pb Ro. Conc. 3	154.4	7.79	1.33	23.60	2.4	15.2
4. Pb Scav Conc.	122.7	6.19	1.21	22.40	1.7	11.5
5. Pb Scav Tall	1249.2	63.01	0.54	7.56	7.8	39.5
Head Calc.	1982.6	100.00	4.36	12.06	100.0	100.0

Comb. Prod.

Products 1+2	23.02	16.67	17.67	88.1	33.7
Products 1to3	30.80	12.79	19.17	90.5	49.0
Products 1to4	36.99	10.85	19.71	92.2	60.5

TEST NO. 17

Purpose: As for Test 15 - 40 minute grind.

Procedure: As for Test 15.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	9.9
Pb Rougher 1	-	-	-	50	17.5	-	2	2	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	9.5

Test No. 17

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	260.6	13.13	27.10	8.24	83.9	9.1
2.Pb Ro. Conc.2	194.9	9.82	2.36	30.20	5.5	24.9
3. Pb Ro. Conc. 3	152.9	7.71	1.23	26.10	2.2	16.9
4. Pb Scav Conc.	187.1	9.43	1.00	21.80	2.2	17.2
5. Pb Scav Tail	1188.7	59.91	0.44	6.35	6.2	31.9
Head Calc.	1984.2	100.00	4.24	11.92	100.0	100.0

Comb. Prod.

Products 1+2		22.96	16.51	17.64	89.3	34.0
Products 1to3		30.66	12.67	19.76	91.6	50.8
Products 1to4		40.09	9.93	20.24	93.8	68.1

TEST NO. 18

Purpose: As for Test 15 - 50 minute grind.

Procedure: As for Test 15.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 50 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	50	-	-	9.8
Pb Rougher 1	-	-	-	50	17.5	-	2	2	-
2	-	-	-	40	7.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	9.5

Test No. 18

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	185.3	9.35	36.3	5.22	78.9	4.1
2.Pb Ro. Conc.2	137.5	6.94	5.23	17.0	8.4	10.0
3. Pb Ro. Conc. 3	117.9	5.95	1.80	25.6	2.5	12.9
4. Pb Scav Conc.	128.1	6.47	1.25	23.9	1.9	13.1
5. Pb Scav Tail	1412.0	71.28	0.50	9.92	8.3	59.9
Head Calc.	1980.8	100.00	4.30	11.81	100.0	100.0

Comb. Prod.

Products 1+2	16.30	23.07	10.24	87.3	14.1
Products 1to3	22.25	17.38	14.35	89.8	27.0
Products 1to4	28.72	13.74	16.50	91.7	40.1

TEST NO. 19

Purpose: As for Test 15 - 60 minute grind.

Procedure: As for Test 15.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 60 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	60	-	-	9.8
Pb Rougher 1	-	-	-	50	17.5	-	2	2	-
2	-	-	-	40	7.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	9.5

Test No. 19

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	159.9	8.05	40.2	8.24	75.2	6.5
2.Pb Ro. Conc.2	178.0	8.96	6.37	30.20	13.3	26.5
3. Pb Ro. Conc. 3	93.5	4.71	1.27	26.10	1.4	12.0
4. Pb Scav Conc.	81.3	4.09	1.94	21.80	1.8	8.7
5. Pb Scav Tail	1473.7	74.19	0.48	6.35	8.3	46.2
Head Calc.	1986.4	100.00	4.30	10.20	100.0	100.0

Comb. Prod.

Products 1+2	17.01	22.38	19.81	88.5	33.0
Products 1to3	21.72	17.80	21.17	89.9	45.1
Products 1to4	25.81	15.29	21.27	91.7	53.8

TEST NO. 20

Purpose: As for Test 15 - 70 minute grind.

Procedure: As for Test 15.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 70 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	70	-	-	9.8
Pb Rougher 1	-	-	-	50	17.5	-	2	2	-
2	-	-	-	40	7.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1	-
Pb Scavenger	-	-	-	20	-	-	1	1	9.4

Test No. 20

Product	g	Weight %	Assays,%,g/t Pb	Zn	% Distribution Pb	Zn
1.Pb Ro. Conc. 1	135.0	6.79	42.30	4.20	67.4	2.3
2.Pb Ro. Conc.2	160.8	8.08	9.88	9.41	18.8	6.2
3. Pb Ro. Conc. 3	92.5	4.65	2.70	15.50	2.9	5.9
4. Pb Scav Conc.	96.3	4.84	1.78	18.10	2.0	7.2
5. Pb Scav Tail	1504.6	75.64	0.50	12.60	8.9	78.3
Head Calc.	1989.2	100.00	4.26	12.17	100.0	100.0

Comb. Prod.

Products 1+2		14.87	24.68	7.03	86.2	8.6
Products 1to3		19.52	19.44	9.05	89.1	14.5
Products 1to4		24.36	15.93	10.85	91.1	21.7

TEST NO. 22

Purpose: To examine the effect of depressant system Na_2CO_3 and PKD-C.

Procedure: As for Test 17, but use 1500 g/t Na_2CO_3 and 150 g/t PKD-C.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	9.6
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-

Test No. 22

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	258.7	13.06	26.50	7.10	84.2	8.1
2.Pb Ro. Conc.2	232.3	11.73	1.94	23.60	5.5	24.2
3. Pb Ro. Conc. 3	211.3	10.67	1.11	20.10	2.9	18.8
4. Pb Scav Conc.	128.4	6.48	0.91	17.00	1.4	9.6
5. Pb Scav Tail	1149.5	58.05	0.42	7.72	5.9	39.2
Head Calc.	1980.2	100.00	4.11	11.42	100.0	100.0

Comb. Prod.

Products 1+2		24.80	14.88	14.91	89.8	32.4
Products 1to3		35.47	10.74	16.47	92.6	51.1
Products 1to4		41.95	9.22	16.55	94.1	60.8

TEST NO. 23

Purpose: To examine the effect of depressant system $Ca(OH)_2$ and NaCN.

Procedure: As for Test 22.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	pH
Grind	900	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	17.5	-	2	2.5	10.5
2	-	-	-	40	5.0	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	9.3

Test No. 23

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	224.0	11.29	25.00	16.30	72.9	16.1
2.Pb Ro. Conc.2	200.2	10.09	3.56	32.40	9.3	28.7
3. Pb Ro. Conc. 3	311.1	15.68	1.92	23.20	7.8	31.9
4. Pb Scav Conc.	270.7	13.65	1.40	11.80	4.9	14.1
5. Pb Scav Tail	977.8	49.29	0.40	2.11	5.1	9.1
Head Calc.	1983.8	100.00	3.87	11.40	100.0	100.0

Comb. Prod.

Products 1+2		21.38	14.88	23.90	82.2	44.8
Products 1to3		37.07	9.40	23.60	90.0	76.8
Products 1to4		50.71	7.25	20.43	94.9	90.9

TEST NO. 24

Purpose: To examine the effect of depressant system $Ca(OH)_2$ and PKD-C.

Procedure: As for Test 22.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	NaCN	242	317	MIBC	Grind	Cond.	Froth	
Grind	900	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	10.4
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	10.1
Pb Scavenger	-	-	-	20	-	-	1	1.5	-

Test No. 24

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1.Pb Ro. Conc. 1	248.8	12.52	21.40	20.60	72.2	22.4
2.Pb Ro. Conc.2	254.5	12.81	2.98	32.50	10.3	36.2
3. Pb Ro. Conc. 3	249.7	12.57	2.12	20.90	7.2	22.8
4. Pb Scav Conc.	219.7	11.06	1.57	9.31	4.7	9.0
5. Pb Scav Tail	1014.0	51.04	0.41	2.15	5.6	9.5
Head Calc.	1986.7	100.00	3.71	11.50	100.0	100.0

Comb. Prod.

Products 1+2	25.33	12.09	26.62	82.5	58.7
Products 1to3	37.90	8.78	24.72	89.7	81.5
Products 1to4	48.96	7.15	21.24	94.4	90.5

TEST NO. 29

Purpose: To evaluate the effect of regrind fineness on Pb recovery and grade using the conventional flowsheet.

Procedure: Grind, then float a Pb rougher and scavenger followed by a zinc rougher + scavenger. Regrind the Pb conc and clean the Pb conc four times.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	$Ca(OH)_2$	$CuSO_4$	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	-	-	2	2.5	9.8
2	-	-	-	40	2.5	-	-	-	1	1.5	-
3	-	-	-	30	-	-	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	-	-	1	1.5	-
Pb Conc Regrind	500	50	12	-	-	-	-	40	-	-	-
Pb 1st Cleaner	-	-	8	10	10	-	-	-	1	7	9.8
Pb 1st Cl Scav	-	-	-	5	-	-	-	-	1	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	-	-	1	5.5	-
Pb 3rd Cleaner	-	30	4	10	-	-	-	-	1	4	-
Pb 4th Cleaner	-	20	4	10	-	-	-	-	-	2.5	-

Test No. 29

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	116.4	5.84	51.2	5.12	76.0	2.6
2. Pb 4th Cl. Tail	11.2	0.56	10.6	6.61	1.5	0.3
3. Pb 3rd Cl. Tail	31.8	1.60	6.55	7.76	2.7	1.1
4. Pb 2nd Cl. Tail	173.1	8.69	3.27	15	7.2	11.4
5. Pb1st Cl. Scav Conc.	98.1	4.92	2.42	14.9	3.0	6.4
6. Pb 1st Cl. Scav Tall	499.5	25.07	0.72	22.5	4.6	49.4
7. Pb Scav Tall	1062.7	53.33	0.37	6.13	5.0	28.7
Head Calc.	1992.8	100.00	3.94	11.41	100.0	100.0

Combined Products

Products 1+2	6.40	47.64	5.25	77.5	2.9
Products 1-3	8.00	39.44	5.75	80.2	4.0
Products 1-4	16.69	20.61	10.57	87.4	15.5
Products 1-5	21.61	16.47	11.55	90.4	21.9
Products 1-6	46.67	8.01	17.43	95.0	71.3

Test No: 29 Lead Regrind Product

S.G.- 4.67

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.8µ	0.00	0.0	0.0	100.0
23.9	0.23	0.5	0.5	99.5
16.7	3.20	6.4	6.9	93.1
11.5	11.26	22.5	29.4	70.6
8.9	5.87	11.7	41.1	58.9
-8.9	29.44	58.9	100.0	-
Total	50.00	100.0	-	-

K80 = 13 µm

TEST NO. 30

Purpose: As for Test 29, with a 40 minute regrind..

Procedure: As for Test 29.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	9.8
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Condition	500	50	12	-	-	-	2	-	10.2
Pb 1st Cleaner	-	-	8	10	10	-	1	7	-
Pb 1st Cl Scav	-	-	-	5	-	-	-	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	-	4.5	-
Pb 3rd Cleaner	-	30	-	10	5	-	-	2	-
Pb 4th Cleaner	-	30	-	-	-	-	-	1.5	-

Test No. 30

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	232.0	11.67	25.5	19.6	76.5	20.0
2. Pb 4th Cl. Tail	60.0	3.02	4.09	25.9	3.2	6.8
3. Pb 3rd Cl. Tail	86.5	4.35	2.41	12.1	2.7	4.6
4. Pb 2nd Cl. Tail	74.0	3.72	6.1	17.8	5.8	5.8
5. Pb1st Cl. Scav Conc.	79.1	3.98	1.39	24.8	1.4	8.6
6. Pb 1st Cl. Scav Tail	304.4	15.32	0.98	12.0	3.9	16.1
7. Pb Scav Tail	1151.2	57.93	0.44	7.49	6.5	38.0
Head Calc.	1987.2	100.00	3.89	11.42	100.0	100.0

Combined Products

Products 1+2	14.69	21.10	20.89	79.6	26.9
Products 1-3	19.05	16.83	18.88	82.3	31.5
Products 1-4	22.77	15.07	18.71	88.2	37.3
Products 1-5	26.75	13.04	19.61	89.6	45.9
Products 1-6	42.07	8.65	16.84	93.5	62.0

Test No: 30 Lead Regrind Product

S.G.- 4.72

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
270m	2.09	4.2	4.2	95.8
30.7µ	5.89	11.8	16.0	84.0
23.8	5.76	11.5	27.5	72.5
16.6	8.82	17.6	45.1	54.9
11.4	8.39	16.8	61.9	38.1
8.8	3.10	6.2	68.1	31.9
-8.8	15.95	31.9	100.0	-
Total	50.00	100.0	-	-

K80 = 28 µm

TEST NO. 31

Purpose: As for Test 29, with a 10 minute regrind.

Procedure: As for Test 29.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	9.9
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Conditlon	500	50	12	-	-	10		-	-
Pb 1st Cleaner	-	-	8	10	10	-	1	7	-
Pb 1st Cl Scav	-	-	-	5	-	-	-	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	2.7	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	1.7	-
Pb 4th Cleaner	-	30	-	5	-	-	1	1.7	-

Test No. 31

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	176.2	8.95	34.4	12.4	79.1	10.2
2. Pb 4th Cl. Tail	23.3	1.18	7.2	12.8	2.2	1.4
3. Pb 3rd Cl. Tail	63.3	3.22	6.1	13.6	5.0	4.0
4. Pb 2nd Cl. Tail	119.8	6.09	2.59	12.5	4.1	7.0
5. Pb1st Cl. Scav Conc.	105.8	5.37	0.83	31.8	1.1	15.7
6. Pb 1st Cl. Scav Tail	338.1	17.18	0.63	17.4	2.8	27.4
7. Pb Scav Tail	1142.0	58.01	0.38	6.45	5.7	34.3
Head Calc.	1968.5	100.00	3.89	10.90	100.0	100.0

Combined Products

Products 1+2	10.13	31.22	12.45	81.3	11.6
Products 1-3	13.35	25.17	12.72	86.4	15.6
Products 1-4	19.44	18.10	12.65	90.4	22.6
Products 1-5	24.81	14.36	16.80	91.6	38.2
Products 1-6	41.99	8.74	17.05	94.3	65.7

Test No: 31 Lead Regrind Product S.G.- 4.64

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
31.0µ	0.80	1.6	1.6	98.4
24.1	2.78	5.6	7.2	92.8
16.8	9.68	19.4	26.5	73.5
11.5	11.46	22.9	49.4	50.6
8.9	3.92	7.8	57.3	42.7
-8.9	21.36	42.7	100.0	-
Total	50.00	100.0	-	-

K80 = 19 µm

TEST NO. 32

Purpose: As for Test 29, with a 20 minute regrind.

Procedure: As for Test 29.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Condition	500	50	12	-	-	20	2	-	-
Pb 1st Cleaner	-	-	8	10	10	-	1	7	-
Pb 1st Cl Scav	-	-	-	5	-	-	-	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	2.5	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	2	-
Pb 4th Cleaner	-	30	-	5	-	-	1	2	-

Test No. 32

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	126.0	6.37	47.2	7.52	73.6	4.2
2. Pb 4th Cl. Tail	41.5	2.10	9.79	10.9	5.0	2.0
3. Pb 3rd Cl. Tail	30.9	1.56	5.31	9.43	2.0	1.3
4. Pb 2nd Cl. Tail	121.7	6.16	3.14	10.9	4.7	5.8
5. Pb1st Cl. Scav Conc.	76.2	3.85	0.59	21.0	0.6	7.0
6. Pb 1st Cl. Scav Tail	412.3	20.86	1.53	21.8	7.8	39.5
7. Pb Scav Tail	1168.1	59.09	0.43	7.84	6.2	40.2
Head Calc.	1976.7	100.00	4.09	11.52	100.0	100.0

Combined Products

Products 1+2	8.47	37.93	8.36	78.7	6.1
Products 1-3	10.04	32.85	8.52	80.7	7.4
Products 1-4	16.19	21.55	9.43	85.4	13.3
Products 1-5	20.05	17.52	11.65	86.0	20.3
Products 1-6	40.91	9.37	16.83	93.8	59.8

Test No: 32 Lead Regrind Product

S.G.- 4.65

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
31.0µ	0.17	0.3	0.3	99.7
24.1	0.80	1.6	1.9	98.1
16.8	6.45	12.9	14.8	85.2
11.5	11.93	23.9	38.7	61.3
8.9	4.55	9.1	47.8	52.2
-8.9	26.10	52.2	100.0	-
Total	50.00	100.0	-	-

K80 = 14 µm

TEST NO. 33

Purpose: As for Test 29, but with a 30 minute regrind.

Procedure: As for Test 29.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Condition	500	50	12	-	-	30	-	-	-
Pb 1st Cleaner	-	-	8	10	10	-	1	7	-
Pb 1st Cl Scav	-	-	-	5	5	-	-	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	4.3	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	2.5	-
Pb 4th Cleaner	-	30	-	5	-	-	1	2	-

Test No. 33

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	110.6	5.58	52.4	4.46	74.5	2.2
2. Pb 4th Cl. Tail	54.5	2.75	10.4	9.38	7.3	2.3
3. Pb 3rd Cl. Tail	47.3	2.38	3.76	8.79	2.3	1.8
4. Pb 2nd Cl. Tail	103.7	5.23	2.56	13.4	3.4	6.2
5. Pb1st Cl. Scav Conc.	54.1	2.73	1.95	16.5	1.4	4.0
6. Pb 1st Cl. Scav Tail	400.0	20.17	0.78	23.7	4.0	42.1
7. Pb Ro. Tail	1213.1	61.17	0.46	7.69	7.2	41.4
Head Calc.	1983.3	100.00	3.92	11.35	100.0	100.0

Combined Products

Products 1+2	8.32	38.54	6.08	81.8	4.5
Products 1-3	10.71	30.79	6.69	84.1	6.3
Products 1-4	15.94	21.53	8.89	87.5	12.5
Products 1-5	18.67	18.67	10.00	88.8	16.4
Products 1-6	38.83	9.38	17.12	92.8	58.6

Test No: 33 Lead Regrind Product S.G.- 4.74

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
30.7µ	0.00	0.0	0.0	100.0
23.8	0.28	0.6	0.6	99.4
16.6	3.02	6.0	6.6	93.4
11.4	10.72	21.4	28.0	72.0
8.8	5.95	11.9	39.9	60.1
-8.8	30.03	60.1	100.0	-
Total	50.00	100.0	-	-

K80 = 13 µm

TEST NO. 40

Purpose: To examine the effect of High Intensity Conditioning after regrind using the conventional flowsheet.

Procedure: Grind then float a Pb rougher and scavenger concentrate, regrind it then use H.I. Conditioning and clean it four times. Recycle the Pb Scav Tail and the Pb 1st Cl Scav Tail to the Zn circuit. Condition twice, regrind then clean four times.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Pb Conc Regr	500	50	-	-	-	30	-	-	-
H.I. Condition	-	-	20	10	10	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5	-
Pb 1st Cl Scav	-	-	-	5	5	-	1	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	3.7	-
Pb 3rd Cleaner	-	30	-	10	5	-	-	3	-
Pb 4th Cleaner	-	30	-	5	-	-	-	3	-

Test No. 40

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	123.5	6.24	51.6	5.16	78.3	2.7
2. Pb 4th Cl. Tail	37.0	1.87	8.18	8.84	3.7	1.4
3. Pb 3rd Cl. Tail	38.1	1.93	6.12	7.11	2.9	1.2
4. Pb 2nd Cl. Tail	103.7	5.24	2.44	10.9	3.1	4.9
5. Pb1st Cl. Scav Conc.	42.7	2.16	2.08	13.2	1.1	2.4
6. Pb 1st Cl. Scav Tail	510.9	25.83	0.82	22.9	5.1	50.3
7. Pb Scav Tail	1122.0	56.73	0.42	7.70	5.8	37.1
Head Calc.	1977.9	100.00	4.12	11.76	100.0	100.0

Combined Products

Products 1+2	8.11	41.59	6.01	82.0	4.1
Products 1-3	10.04	34.79	6.22	84.9	5.3
Products 1-4	15.28	23.69	7.83	88.0	10.2
Products 1-5	17.44	21.02	8.49	89.1	12.6
Products 1-6	43.27	8.96	17.09	94.2	62.9

TEST NO. 41

Purpose: As for Test 40, with 20 minutes of High Intensity conditioning.

Procedure: As in Test 40, but with longer conditioning time.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids In the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	pH
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Pb Conc Regr	500	50	-	-	-	30	-	-	-
H.I. Condition	-	-	20	10	10	-	20	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	4.5	-
Pb 1st Cl Scav	-	-	-	5	5	-	1	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	4	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	3.2	-
Pb 4th Cleaner	-	30	-	5	-	-	1	3	-

Stage:	Rougher	1st Cleaner	2nd Cleaner	3rd & 4th Cleaners
Flotation Cell:	4 L	4 L	2 L	1 L
Speed rpm:	1900	1900	1500	1100

Test No. 41

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	105.3	5.32	56.4	3.28	74.0	1.5
2. Pb 4th Cl. Tail	21.1	1.07	14.8	7.3	3.9	0.7
3. Pb 3rd Cl. Tail	39.8	2.01	6.27	7.69	3.1	1.3
4. Pb 2nd Cl. Tail	67.0	3.38	3.52	10.1	2.9	2.9
5. Pb1st Cl. Scav Conc.	59.2	2.99	3.5	9.26	2.6	2.4
6. Pb 1st Cl. Scav Tail	595.4	30.07	1.11	20.5	8.2	52.6
7. Pb Scav Tail	1092.3	55.16	0.39	8.20	5.3	38.6
Head Calc.	1980.1	100.00	4.06	11.71	100.0	100.0

Combined Products

Products 1+2	6.38	49.46	3.95	77.8	2.2
Products 1-3	8.39	39.11	4.85	80.9	3.5
Products 1-4	11.78	28.89	6.36	83.9	6.4
Products 1-5	14.77	23.75	6.94	86.5	8.8
Products 1-6	44.84	8.57	16.04	94.7	61.4

TEST NO. 42

Purpose: As for Test 41, but with 30 minutes of high intensity conditioning.

Procedure: As in Test 40.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Pb Conc Regr	500	50	-	-	-	30	-	-	-
H.I. Condition	-	-	20	10	10	-	30	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	4.5	-
Pb 1st Cl Scav	-	-	-	5	5	-	1	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	3.3	-
Pb 3rd Cleaner	-	30	-	10	5	-	-	3.5	-
Pb 4th Cleaner	-	30	-	5	-	-	-	3.7	-

Test No. 42

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	98.5	4.97	59.3	3.21	72.3	1.3
2. Pb 4th Cl. Tail	11.6	0.58	16.9	7.28	2.4	0.4
3. Pb 3rd Cl. Tall	41.1	2.07	7.84	7.95	4.0	1.4
4. Pb 2nd Cl. Tall	89.0	4.49	3.54	11.4	3.9	4.3
5. Pb1st Cl. Scav Conc.	57.4	2.89	3.2	11.2	2.3	2.7
6. Pb 1st Cl. Scav Tail	586.0	29.54	1.16	23.0	8.4	57.0
7. Pb Scav Tall	1100.0	55.45	0.49	7.09	6.7	33.0
Head Calc.	1983.6	100.00	4.07	11.93	100.0	100.0

Combined Products

Products 1+2	5.55	54.83	3.64	74.7	1.7
Products 1-3	7.62	42.06	4.81	78.7	3.1
Products 1-4	12.11	27.79	7.25	82.6	7.4
Products 1-5	15.00	23.04	8.01	84.9	10.1
Products 1-6	44.55	8.53	17.95	93.3	67.0

TEST NO. 48

Purpose: To repeat Test 41, but increase the collector addition to the High Intensity conditioning.

Procedure: Similar to Test 41.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids in the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	-	50	20	-	2	2.5	-
2	-	-	-	40	2.5	-	1	1.5	-
3	-	-	-	30	-	-	1	1.5	-
Pb Scavenger	-	-	-	20	-	-	1	1.5	-
Pb Conc Regr	500	50	-	-	-	30	-	-	-
H.I. Condition	-	-	40	20	10	-	20	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	4	-
Pb 1st Cl Scav	-	-	-	5	5	-	1	2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	3.5	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	3	-
Pb 4th Cleaner	-	30	-	-	2.5	-	1	4	-

Test No. 48

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	112.4	5.67	52.6	2.98	77.6	1.5
2. Pb 4th Cl. Tail	26.6	1.34	8.15	7.56	2.8	0.9
3. Pb 3rd Cl. Tail	29.1	1.47	5.64	6.48	2.2	0.9
4. Pb 2nd Cl. Tail	94.6	4.77	2.77	8.85	3.4	3.8
5. Pb1st Cl. Scav Conc.	51.5	2.60	2.24	9.09	1.5	2.1
6. Pb 1st Cl. ScavTail	510.3	25.74	0.91	17.3	6.1	39.9
7. Pb Scav Tail	1158.1	58.41	0.42	9.74	6.4	51.0
Head Calc.	1982.6	100.00	3.84	11.17	100.0	100.0

Combined Products

Products 1+2	7.01	44.09	3.86	80.4	2.4
Products 1-3	8.48	37.44	4.31	82.6	3.3
Products 1-4	13.25	24.95	5.95	86.0	7.1
Products 1-5	15.85	21.23	6.46	87.5	9.2
Products 1-6	41.59	8.65	13.17	93.6	49.0

TEST NO. 49

Purpose: To repeat Test 48, but substitute R242 with LSB-1 modified.

Procedure: As in Test 49.

Feed: 2000 grams minus 10 mesh Composite No. 1.

Grind: 40 minutes at 65 % solids In the lab ball mill.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	LSB-1	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	20	-	-	40	-	-	-
Pb Rougher 1	-	-	25	25	20	-	2	3.5	9.6
2	-	-	20	20	2.5	-	1	3.5	-
3	-	-	5	5	-	-	1	2	-
Pb Scavenger	-	-	5	5	-	-	1	2	-
Pb Conc Regr	500	50	-	-	-	40	-	-	-
H.I. Condition	-	-	10	20	-	-	20	-	-
Pb 1st Cleaner	-	-	-	10	10	-	-	2	-
Pb 1st Cl Scav	-	-	-	10	5	-		2	-
Pb 2nd Cleaner	-	30	4	15	5	-	1	5'45"	-
Pb 3rd Cleaner	-	30	-	10	5	-	1	5'50"	-
Pb 4th Cleaner	-	30	-	5	-	-	1	4	-

Test No. 49

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	107.3	5.40	51.5	4.56	73.2	2.2
2. Pb 4th Cl. Tail	34.9	1.76	7.71	11.3	3.6	1.8
3. Pb 3rd Cl. Tail	67.9	3.42	3.98	10.7	3.6	3.3
4. Pb 2nd Cl. Tail	116.2	5.85	2.90	14.7	4.5	7.7
5. Pb1st Cl. Scav Conc.	48.7	2.45	2.39	22.8	1.5	5.0
6. Pb 1st Cl. Scav Tail	367.1	18.48	1.38	20.0	6.7	33.3
7. Pb Scav Tail	1244.5	62.64	0.42	8.28	6.9	46.7
Head Calc.	1986.6	100.00	3.80	11.11	100.0	100.0

Combined Products

Products 1+2	7.16	40.75	6.21	76.8	4.0
Products 1-3	10.58	28.87	7.66	80.4	7.3
Products 1-4	16.43	19.62	10.17	84.8	15.0
Products 1-5	18.88	17.38	11.81	86.4	20.1
Products 1-6	37.36	9.47	15.86	93.1	53.3

TEST NO. 86

Purpose: To repeat the conditions of Test 40 on Rock Type 5 ore.

Procedure: As for Test 40.

Feed: 2000 grams minus 10 mesh Rock Type 5 ore.

Conditions:

	Reagents Added, grams per tonne					Time, minutes			pH
	Na_2CO_3	PKD-C	242	317	MIBC	Grind	Cond.	Froth	
Grind	1500	150	242	-	-	40	-	-	8.0
Pb Rougher 1	-	-	-	50	20	-	1	3	-
2	-	-	-	50	7.5	-	1	5	-
3	-	-	-	10	-	-	1	1	-
Pb Conc Regrind	500	100	-	-	-	30	-	-	-
H.I. Condition	-	-	20	10	10	-	10	-	-
Pb 1st Cleaner	-	-	-	-	-	-	-	5.5	8.6
Pb 2nd Cleaner	-	100	-	-	-	-	1	3	8.5
Pb 3rd Cleaner	-	125	-	-	-	-	1	2.5	8.5
Pb 4th Cleaner	-	75	-	-	2.5	-	-	3	8.6
Pb 5th Cleaner	-	150	-	-	-	-	1	4	8.7
Zn Circuit:	$Ca(OH)_2$	$CuSO_4$	A343	DF1012					
Condition	2000	-	-	-	-	-	5	-	-
Condition	-	1500	-	-	-	-	5	-	-
Zn Rougher	-	-	40	10	-	-	1	3.5	11.5
Zn Conc Regr	1000	200	-	-	-	30	-	-	-
Zn H.I. Cond	-	-	40	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	6	-

Test No. 86

Product	Weight		Assays,%		% Distribution	
	g	%	Pb	Zn	Pb	Zn
1. Pb Cl. Conc.	54.7	2.75	44.7	3.53	33.9	0.7
2. Pb 5th Cl. Tail	69.5	3.50	27.3	4.60	26.3	1.2
3. Pb 4th Cl. Tail	53.7	2.70	5.85	10.2	4.4	2.0
4. Pb 3rd Cl. Tail	62.6	3.15	11.8	8.23	10.2	1.9
5. Pb 2nd Cl. Tail	347.4	17.48	2.82	11.9	13.6	15.3
6. Pb 1st Cl. Tail	661.3	33.28	0.73	17.0	6.7	41.5
7. Zn Cl. Conc.	177.5	8.93	0.61	51.1	1.5	33.5
8. Zn 1st Cl. Tail	98.5	4.96	0.88	5.84	1.2	2.1
9. Zn Ro. Tail	461.7	23.24	0.36	1.10	2.3	1.9
Head Calc.	1986.9	100.00	3.63	13.64	100.0	100.0

Combined Products

Products 1+2	6.25	34.96	4.13	60.2	1.9
Products 1-3	8.95	26.18	5.96	64.5	3.9
Products 1-4	12.10	22.43	6.55	74.7	5.8
Products 1-5	29.59	10.84	9.71	88.3	21.1
Products 1-6	62.87	5.49	13.57	95.0	62.5
Products 7+8	13.89	0.71	34.95	2.7	35.6
Products 7-9	37.13	0.49	13.76	5.0	37.5

GRINDABILITY DATA

BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST

Sample: Comp-1 Date: April 5, 90

Submitted by:

Mesh of Grind 100 Feed: 26.7 % Passing 100 Mesh

Cycle	New Feed (g)	Number of Revolutions	In Mill Product	In Mill Feed	Net Product	Net Per Revolution
1	2054	100	956	546	410	4.1
2	9.56	81	515	254	261	3.22
3	5.15	140	559	137	422	3.01
4	5.59	146	585	149	436	2.99
5	5.85	144	584	156	428	2.97
6	5.84	145	584	155	429	2.96
7						

Unit Volume (700mL) = 2054 g In mill: Equivalent to 2934 kg/m^3 at minus 10 mesh.

Ideal potential product =587 g

Average of last 2 periods : 854 g : 252 % circulating load.
: 2.97 Net g minus 100 mesh per revolution

Bonds Formula:

$$Wi = 44.5 / (P1)^{0.23} \times (Gbp)^{0.82} \times (10 / \sqrt{P} - 10 / \sqrt{F})$$

Where:

Wi=	Work Index (short ton basis)	= 9.13
P1 =	Screen size test in microns	= 147
Gbp =	Net grams of undersize produced per revolution of test mill	= 2.97
P =	Size in microns which 80 % of test product passes	= 113
F=	Size in microns which 80 % of test feed passes	= 1061

Company Curragh Res.

Size Distribution Analysis

LR-3889

Sample: Comp 1 -10m **Test No.:**

Size		Weight	% Retained		% Passing
Mesh (Tyler)	µm	grams	Individual	Cumulative	Cumulative
10	1,651	9.2	2.7	2.7	97.3
14	1,168	43.1	12.9	15.6	84.4
20	833	48.1	14.4	30.0	70.0
28	589	46.4	13.9	43.9	56.1
35	417	36.7	11.0	54.8	45.2
48	295	25.1	7.5	62.3	37.7
65	208	19.5	5.8	68.2	31.8
100	147	17.0	5.1	73.3	26.7
150	104	14.2	4.2	77.5	22.5
200	74	13.0	3.9	81.4	18.6
270	53	14.1	4.2	85.6	14.4
400	37	11.3	3.4	89.0	11.0
Pan	-37	36.9	11.0	100.0	0.0
Total	-	**334.6**	**100.0**	-	-
K80	**1,061.3 µm**				

Company Curragh Res.

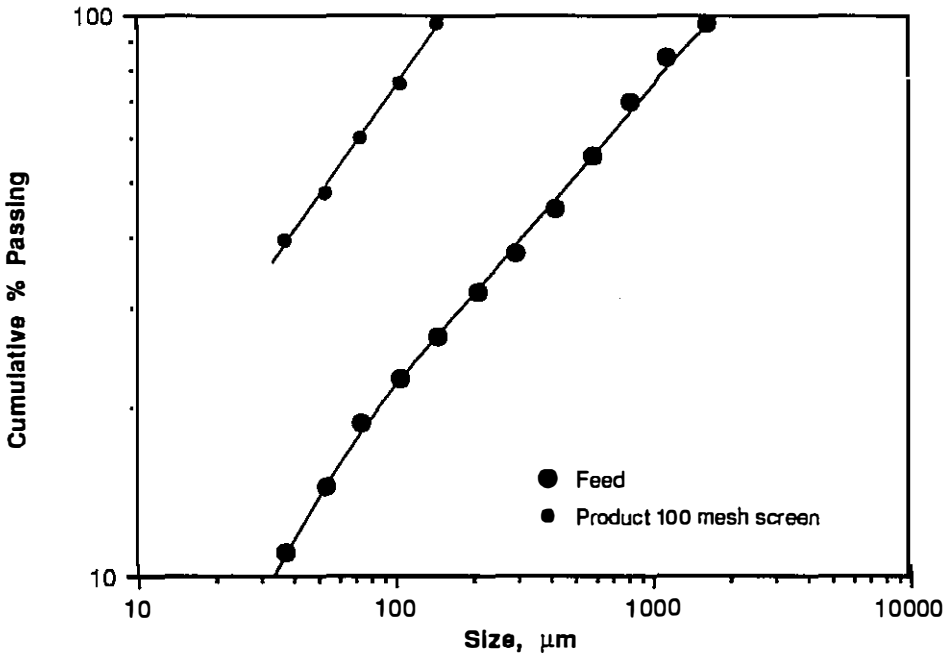
Size Distribution Analysis

LR-3889

Sample: Comp. 1 **Test No.:** B.W.I. U/S

Size		Weight	% Retained		% Passing
Mesh (Tyler)	µm	grams	Individual	Cumulative	Cumulative
65	208	.0	0.0	0.0	100.0
100	147	5.5	3.0	3.0	97.0
150	104	39.7	21.5	24.5	75.5
200	74	27.8	15.1	39.6	60.4
270	53	22.9	12.4	52.0	48.0
400	37	15.1	8.2	60.2	39.8
Pan	-37	73.4	39.8	100.0	0.0
Total	-	**184.4**	**100.0**	-	-
K80	**113.2 µm**				

Figure No. : Particle Size Analyses of Feed and 100 mesh Products



BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST

Sample: Comp-1 Date: April 9, 90

Submitted by:

Mesh of Grind 150 Feed: 22.5 % Passing 150 Mesh

Cycle	New Feed (g)	Number of Revolutions	In Mill Product	In Mill Feed	Net Product	Net Per Revolution
1	2063	150	816	462	354	2.36
2	816	172	602	183	419	2.44
3	602	186	567	135	432	2.32
4	567	199	596	127	469	2.36
5	596	193	595	134	461	2.39
6	595	191	595	133	462	2.42
7	595	188	585	133	452	2.4

Unit Volume (700mL) = 2063 g In mill: Equivalent to 2947 kg/m^3 at minus 10 mesh.

Ideal potential product = 589 g

Average of last 2 periods : 590 g : 250 % circulating load.
: 2.41 Net g minus 150 mesh per revolution

Bonds Formula:

$$Wi = 44.5 / (P1)^{0.23} \times (Gbp)^{0.82} \times (10 / \sqrt{P} - 10 / \sqrt{F})$$

Where:

Wi= Work Index (short ton basis) = 9.04

P1 = Screen size test In microns = 104

Gbp = Net grams of undersize produced per revolution of test mill = 2.41

P = Size in microns which 80 % of test product passes = 78.4

F= Size in microns which 80 % of test feed passes = 1061

Company Curragh Res.

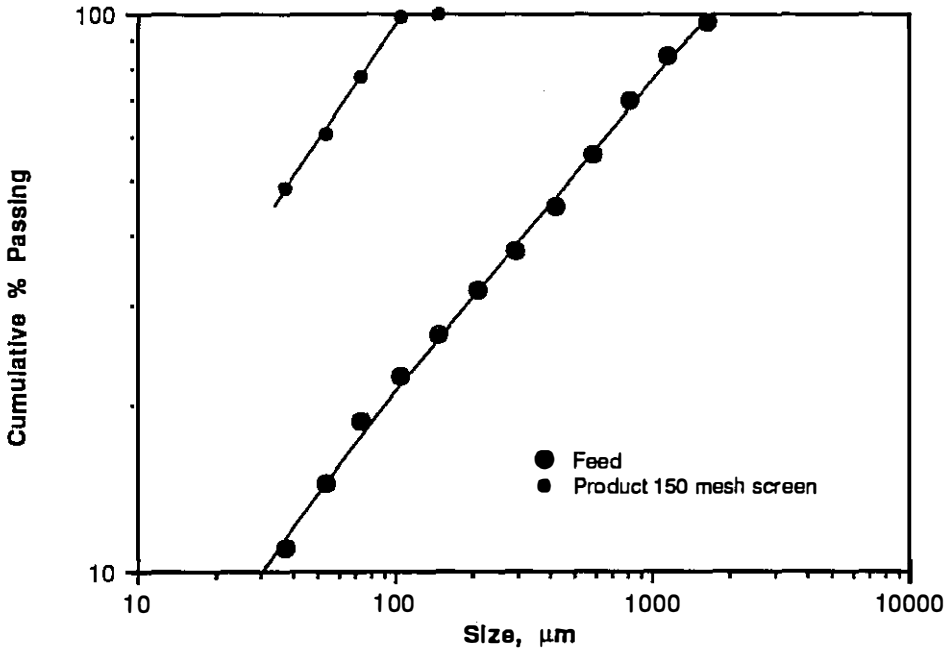
Size Distribution Analysis

LR-3889

Sample: Comp - 1 **Test No.:** B.W.I. U/S -150m

Size		Weight	% Retained		% Passing
Mesh (Tyler)	µm	grams	Individual	Cumulative	Cumulative
65	208	.0	0.0	0.0	100.0
100	147	.0	0.0	0.0	100.0
150	104	2.7	1.5	1.5	98.5
200	74	36.8	20.9	22.4	77.6
270	53	29.0	16.4	38.9	61.1
400	37	21.7	12.3	51.2	48.8
Pan	-37	86.1	48.8	100.0	0.0
Total	-	**176.3**	**100.0**	-	-
K80	**78.4 µm**				

Figure No. : Particle Size Analyses of Feed and 150 mesh Products



BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST

Sample: Comp. 1 Date: April 9, 89

Submitted by: D.L.

Mesh of Grind 200 Feed: 18.6 % Passing 200 Mesh

Cycle	New Feed (g)	Number of Revolutions				
			In Mill Product	In Mill Feed	Net Product	Net Per Revolution
1	2060	200	794	383	411	2.06
2	794	214	581	148	433	2.02
3	581	238	574	108	466	1.96
4	574	246	603	107	496	2.02
5	603	236	594	112	482	2.04
6	594	235	570	110	460	1.96
7						

Unit Volume (700mL) = 2060 g in mill: Equivalent to 2943 kg/m^3 at minus 10 mesh.

Ideal potential product = 589

Average of last 3 periods : 589 g : 250 % circulating load.
: 2.01 Net g minus 200 mesh per revolution

Bonds Formula:

$$Wi = 44.5 / (P1)^{0.23} \times (Gbp)^{0.82} \times (10 / \sqrt{P} - 10 / \sqrt{F})$$

Where:

Wi=	Work Index (short ton basis)	= 9.94
P1 =	Screen size test in microns	= 74
Gbp =	Net grams of undersize produced per revolution of test mill	= 2.01
P =	Size in microns which 80 % of test product passes	= 64.5
F=	Size in microns which 80 % of test feed passes	= 1061

Company Curragh

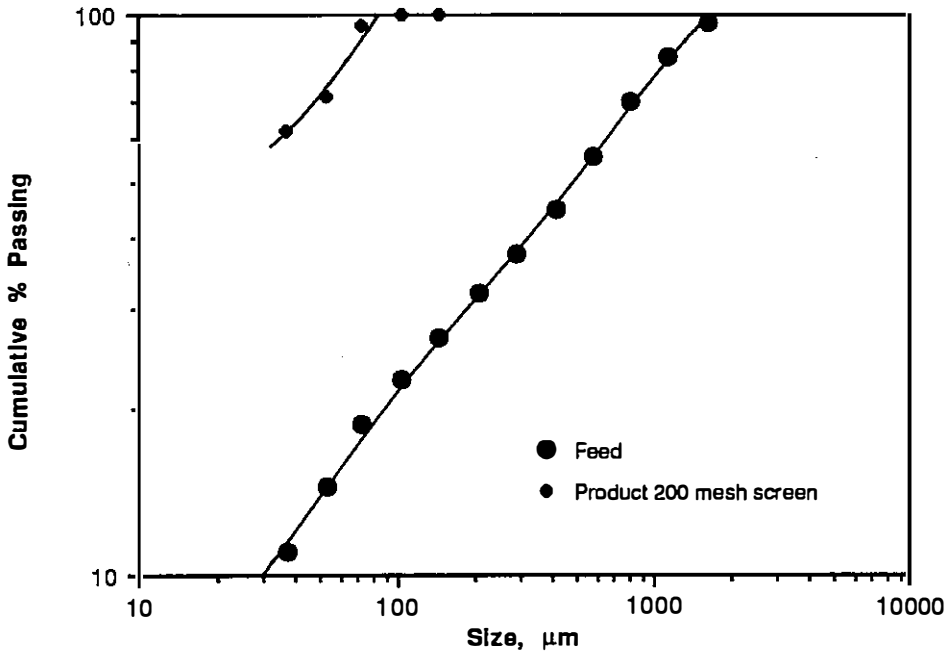
Size Distribution Analysis

LR-3889

Sample: Comp. 1 **Test No.:** B.W.I. U/S

Size		Weight	% Retained		% Passing
Mesh (Tyler)	µm	grams	Individual	Cumulative	Cumulative
65	208	.0	0.0	0.0	100.0
100	147	.0	0.0	0.0	100.0
150	104	.5	0.2	0.2	99.8
200	74	8.3	3.7	3.9	96.1
270	53	53.7	24.1	28.0	72.0
400	37	22.2	10.0	38.0	62.0
Pan	-37	138.2	62.0	100.0	0.0
Total	-	**222.9**	**100.0**	-	-
K80	**64.5 µm**				

Figure No. : Particle Size Analyses of Feed and 200 mesh Products



Primary Grinding Size Analyses

10 minute Ball Mill Grind S.G.=4.28

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	4.99	8.1	8.1	91.9
100	4.54	7.4	15.5	84.5
150	6.94	11.3	26.8	73.2
200	7.24	11.8	38.6	61.4
270	4.91	8.0	46.5	53.5
400	6.39	10.4	56.9	43.1
33.0µ	1.09	1.8	58.7	41.3
25.6	3.08	5.0	63.7	36.3
17.8	5.45	8.9	72.6	27.4
12.3	4.78	7.8	80.3	19.7
9.5	1.48	2.4	82.7	17.3
-9.5	10.61	17.3	100.0	-
Total	61.50	100.0	-	-

K80 = 130 µm

15 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.89	1.5	1.5	98.5
100	2.26	3.7	5.2	94.8
150	5.51	9.1	14.3	85.7
200	6.59	10.9	25.2	74.8
270	7.23	11.9	37.1	62.9
400	6.52	10.8	47.9	52.1
33.0µ	1.39	2.3	50.2	49.8
25.6	3.76	6.2	56.4	43.6
17.8	5.77	9.5	65.9	34.1
12.3	5.54	9.1	75.1	24.9
9.5	1.59	2.6	77.7	22.3
-9.5	13.50	22.3	100.0	-
Total	60.55	100.0	-	-

K80 = 87 µm

20 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.25	0.4	0.4	99.6
100	1.30	2.0	2.4	97.6
150	4.40	6.8	9.2	90.8
200	5.09	7.9	17.0	83.0
270	6.80	10.5	27.5	72.5
400	8.86	13.7	41.2	58.8
33.0µ	1.29	2.0	43.2	56.8
25.6	4.22	6.5	49.7	50.3
17.8	7.15	11.0	60.8	39.2
12.3	6.58	10.2	70.9	29.1
9.5	2.04	3.1	74.1	25.9
-9.5	16.78	25.9	100.0	-
Total	64.76	100.0	-	-

K80 = 67 µm

25 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.00	0.0	0.0	100.0
100	0.38	0.6	0.6	99.4
150	1.86	2.9	3.5	96.5
200	3.05	4.8	8.3	91.7
270	5.49	8.6	16.9	83.1
400	9.20	14.4	31.4	68.6
33.0µ	1.24	1.9	33.3	66.7
25.6	4.45	7.0	40.3	59.7
17.8	7.63	12.0	52.3	47.7
12.3	7.13	11.2	63.5	36.5
9.5	1.69	2.7	66.1	33.9
-9.5	21.56	33.9	100.0	-
Total	63.68	100.0	-	-

K80 = 47 µm

30 minute Ball Mill Grind S.G.=4.30

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.00	0.0	0.0	100.0
100	0.08	0.1	0.1	99.9
150	0.55	0.9	1.0	99.0
200	2.15	3.5	4.5	95.5
270	3.92	6.3	10.8	89.2
400	6.67	10.8	21.6	78.4
33.0µ	1.82	2.9	24.6	75.4
25.6	5.33	8.6	33.2	66.8
17.8	9.60	15.5	48.7	51.3
12.3	8.44	13.6	62.3	37.7
9.5	2.60	4.2	66.5	33.5
-9.5	20.69	33.5	100.0	-
Total	61.85	100.0	-	-

K80 = 38 µm

40 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
65m	0.00	0.0	0.0	100.0
100	0.00	0.0	0.0	100.0
150	0.25	0.4	0.4	99.6
200	1.13	1.8	2.1	97.9
270	3.80	5.9	8.1	91.9
400	4.35	6.8	14.8	85.2
33.0µ	2.63	4.1	18.9	81.1
25.6	5.82	9.1	28.0	72.0
17.8	10.20	15.9	43.8	56.2
12.3	9.51	14.8	58.6	41.4
9.5	3.74	5.8	64.4	35.6
-9.5	22.87	35.6	100.0	-
Total	64.30	100.0	-	-

K80 = 32 µm

50 minute Ball Mill Grind S.G.=4.30

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
200m	0.81	1.3	1.3	98.7
270	1.89	2.9	4.2	95.8
400	2.57	4.0	8.2	91.8
33.0µ	3.10	4.8	13.0	87.0
25.6	5.55	8.7	21.7	78.3
17.8	10.38	16.2	37.9	62.1
12.3	10.23	15.9	53.8	46.2
9.5	3.85	6.0	59.8	40.2
-9.5	25.77	40.2	100.0	-
Total	64.15	100.0	-	-

K80 = 27 µm

60 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
200m	0.31	0.5	0.5	99.5
270	0.82	1.3	1.8	98.2
400	3.10	5.1	6.9	93.1
33.0µ	1.93	3.2	10.1	89.9
25.6	4.46	7.3	17.4	82.6
17.8	9.48	15.5	32.9	67.1
12.3	9.48	15.5	48.4	51.6
9.5	3.12	5.1	53.5	46.5
-9.5	28.43	46.5	100.0	-
Total	61.13	100.0	-	-

K80 = 24 µm

70 minute Ball Mill Grind S.G.=4.31

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
200m	0.00	0.0	0.0	100.0
270	1.03	1.6	1.6	98.4
400	2.35	3.7	5.3	94.7
33.0µ	0.92	1.4	6.7	93.3
25.6	3.70	5.8	12.5	87.5
17.8	9.42	14.7	27.3	72.7
12.3	10.35	16.2	43.5	56.5
9.5	3.94	6.2	49.6	50.4
-9.5	32.16	50.4	100.0	-
Total	63.87	100.0	-	-

K80 = 21 µm