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M.D. ROWSWELL

KERR

MATTAGAMI LAKE MINES LIMITED

Matagami, Que.

INTER-OFFICE MEMORANDUM

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I.D.B.
A.H.C.
P.S.C.
W.J.
D.A.L.
S.P.
M.D.R.
J.B.S.

FROM K.V. Konigsmann

TO R.L. Coleman (3)

DATE December 30, 1976

COPY TO B.P. Wallace

SUBJECT Flotation Process for Ores

COPY TO D.J.T. Carson

from the Grum Deposit. Memo #4.

E. Kirkpatrick

FILE

Summary

Development of a flotation process for Grum ores is finally making encouraging progress. A new B-type sample, more representative of average ores, gave acceptable metallurgical results with a relatively simple flowsheet.

Careful sampling of the ore body revealed that the oxidized B-type samples which were tested during the past year, represent only a small fraction of the ore reserves. Initial results obtained with samples from other zones indicate more "normal" flotation behaviour and therefore promise better results for the bulk of the ore body.

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A.H.C.
P.S.C.
W.J.
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S.P.
M.D.R.
J.B.S.

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Results with B-4 samples.

A shipment of ore was received in September 1976, it was labelled B-4. The ore was supposedly taken from the same location as previous B samples but had a significantly different composition.

It contained more siliceous gangue, less sulphides.

There were no leach planes, the rock was hard.

Little oxidized material was found.

A new contaminant was present, significant quantities of carbonaceous material floated in the lead circuit.

It would appear that B samples come from an ore zone which is severely altered and shows high variations within very narrow bands. B-4 ores are considered more representative for ores of this zone than some previous samples. Projected plant results with this type of ore are:

	<u>Analyses; oz/t, %, ppm</u>				<u>Recoveries %</u>		
	<u>Ag</u>	<u>Pb</u>	<u>Zn</u>	<u>Hg</u>	<u>Ag</u>	<u>Pb</u>	<u>Zn</u>
Mill Feed	2.3	4.7	9.3	82			
Pb Conc.	15-20	45-55	8-10	100 (EST)	65	75	
Zn Conc		2.5	53+	500 (EST)			80
Flotation Tailings		1.0	1.4				

The laboratory flowsheet for the latest test series is shown on the opposite page. The open-circuited lead cleaners eliminated circulating loads. For plant design counter current recirculation of cleaner tailings will have to be provided. Additional re-grinding is being investigated to increase lead concentrate grades.

Detailed results are given in the appended laboratory report, pages 10 to 30 .

Sampling of the Grum ore body.

In early November 1976, D.J.T. Carson and James Paxton carried out a careful sampling of the deposit. Fourteen samples were taken of different types of ore. These samples are being examined chemically, photomicrographically and by flotation tests. An estimate was prepared by D.J.T. Carson on the percentage of the deposit represented by each sample. It is as follows:

<u>Sample No.</u>	<u>Designation</u>	<u>Description of ore</u>	<u>Percentage</u>
1	Fc	Massive, vuggy oxidized	3
2	Fc-M	Massive hard oxidized	11
3	Bc-MV	Massive vuggy strongly oxidized	2
4	Bc-MB	Massive hard oxidized	0
5	Bc-MVgg	as (3) plus 1 Kg fault gouge	1
6	Bc-MBgg	as (4) plus 1 Kg fault gouge	1
7	Bc-MVGR	as (3) plus 1 Kg graphitic phyllite	1
8	Bc-MBGR	as (4) plus 1 kg graphitic phyllite	1
9	Ec	Massive recrystallized ore, high Zn	5
10	Gc	Low grade siliceous ore	20
11	Dc	Massive banded sulphide plus some siliceous ore.	20
12	Ic	Massive banded ore plus some phyllitic bands.	20
13	Cc	Siliceous ore plus massive banded ore	15
14	Ac	Massive vuggy ore plus massive banded ore	0
			<u>100</u>

The chemical compositions of the samples are listed in Table 8, page 27 .

The bulk of the ore deposit, samples 2 and 9 through 13, has sulphide contents ranging from medium to low. This is in contrast to the B-type ores which are heavy sulphides.

Concentration of base metals and precious metals is lower on the average than in B-type ores.

Mercury contents are high throughout the deposit.

Arsenic will be a significant impurity.

A first indication of the acid generating potential of an ore is obtained by grinding a sample without reagents and measuring the concentration of thiosalts in the discharge of the laboratory mill. Results of this standard test are in line 4 of the tabulation. By this measure the bulk of the ore would have an average acid generating potential, again in contrast to B-ores which rate very high on this scale.

Each of the fourteen ore samples has been subjected to a standard flotation test. Minor modifications of collector addition were made from ore to ore, but there was no optimization of reagent combinations or fineness of grind. From these results the ores may be divided into three groups.

The first group, giving the worst results, is made up of samples 1,3,5, and 7.

Lead rougher concentrates are of low grade and high in zinc content.

Lead floats reluctantly.

Zinc is very slow to float in zinc rougher flotation or does not float at all. Consequently, tailings are very high.

A second group, giving results typical for Grum "B" ores, comprises samples 4,6,8, and 14.

Lead rougher concentrates are of low grade and cleaner flotation will not be efficient.

Zinc floats reasonably well in zinc rougher flotation, but high zinc losses in lead roughing causes low zinc recovery.

Results of rougher flotation for these two groups are in Table 9A on pages 28 and 29.

The third group includes samples 2,9,10,11,12, and 13; they represent the bulk of the deposit. Flotation response of these ores is "normal" for very fine grained mineralization. Effects of oxidation are not apparent. Table 98 on page 30 lists results for this group.

- Lead grades are still low but there is significantly less zinc floating in lead flotation.
- Zinc rougher concentrate grades are low but acceptable. Lead contamination of zinc appears also acceptable.
- Zinc recovery in roughing is good, far better than any obtained with B-type ores. Metal losses in rougher tailings are low.

The classification based on only one preliminary test series will have to be confirmed by more detailed work. It will be also of interest to compare flotation results with findings of photomicrographic work currently in progress.

Conclusion

The classification of Grum ore reserves of November 1976 changes completely the approach to metallurgical test work and plant design. Prior to November study it was held that the bulk of the Grum deposit was similar to B ores of the upper east end of the ore body, some of which are severely oxidized and altered.

All metallurgical testing of the past year was on bulk samples from this area. The worst B ores, similar to those of "group one" in the preceding paragraph, cannot really be up-graded by flotation. Saleable concentrates can be produced from the massive, hard and oxidized ores of the second group but qualities of concentrates and metal recoveries will be low.

Fortunately B ores represent less than ten percent of the total deposit, and mill design will obviously be carried out with ore samples from the bulk of the reserves. Allowance will have to be made for the treatment of some B ores, but they may have to be milled at reduced throughput since demand on grinding and flotation capacities is extreme.

A composite sample of Grum ore has been prepared from the fourteen samples according to weight distribution estimated by D.J.T. Carson. Test work with it will commence early in 1977. However, extensive testing will also have to be carried out on ore types 2 and 9 through 13, since a concentrator does not treat composite ores.

The time and effort spent on B ores during the past year was by no means futile. Mine planning, scheduling of concentrator operation will have to make allowance for the characteristics of B ores, now that the problem is identified. The experience gained in the laboratory will also facilitate development work on ores of other zones and permit rapid completion of the laboratory test phase.

K. Karpman

MATTAGAMI LAKE MINES LTD.,
CONCENTRATOR LABORATORY


VANGORDA - GRUM

SAMPLE B₄

PROGRESS REPORT #4

WORK PERFORMED OCTOBER 1, 1976 to DECEMBER 15, 1976

TESTS VAN #104-135


K. Stowe
Metallurgist
December 15, 1976

Approximately 1000 pounds of coarse ore (6 inch) were received on September 14, 1976 in a 45 gallon drum. The drum was filled to the top with water. An analysis of the water is shown in TABLE 1.

The sample was designated as B₄. It was prepared in three batches: B₄₀, B₄₁ and B₄₂.

It was obvious to the naked eye that sample B₄ was much different than any sample previously tested. Assays and flotation testwork soon confirmed this (TABLE 2). Major differences are:

1. B₄ is highly siliceous - the coarse rocks did not exhibit leach planes and were hard to crush. The work index is approximately 13 Kwh/T as opposed to 11 Kwh/T for B₃.
2. Sulphur is relatively low (less pyrite and pyrrhotite) - as a result the specific gravity is only 3.3 -3.4 (as opposed to 3.8 - 4.4).
3. Pb mineralization appears to be coarser grained.
4. There is a carbonaceous mineral present. Large quantities of collector are required to attain good Pb recovery.
5. Considerably less Zn floats with the Pb than for previous samples.

Testwork Details

An exploratory test was carried out using the reagent balance developed for the B₃ sample (see Progress Report #3). Results were disastrous as only 20% of the lead floated during the lead flotation. The lead rougher concentrate was dark coloured due to the presence of the previously mentioned carbonaceous mineral. A "prefloat" concentrate was floated in several tests to try and remove this black mineral. The concentrate averaged 2% by weight of the mill feed at an assay of 5% lead and 10% zinc.

In order to improve lead rougher recovery to acceptable levels large quantities (.1 - .15 #/T) of R-355 (the strongest xanthate - sodium amyl) were required. Aerofloat 242 was ineffective.

Lead was also very easily depressed during cleaning and additional collector (R-343) was required.

Throughout the testwork lead could not be floated selectively from the lead scavenger concentrate or lead cleaner tailings (TABLE 3). An infrasizing of the lead cleaner tailings from the last

cycle of a locked cycle test is shown in TABLE 4, along with results for the lead concentrate and zinc rougher tailings. All products are still relatively coarse (when compared to similar products from Lakefield Research and Dowa tests) indicating that additional regrinding could be required.

When lead cleaner tailings were open circuited to the zinc only a small percentage of the lead floated to contaminate the zinc concentrate. Given these three factors:

a. lead could not be floated selectively from the lead scavenger concentrate;

b. recycling of cleaner tailings did not increase lead recovery;

c. lead did not float in the zinc circuit; a new flotation philosophy was adopted, namely no recycling in the lead circuit. The lead rougher was floated hard, reground, and cleaned three times with all cleaner tailings being sent to the zinc circuit.

Although zinc losses in the rougher tailings were still extraordinarily high this allowed for an increased zinc recovery. An added benefit was the simplicity of operation of the lead circuit. The new flowsheet was developed only after many locked cycle tests had been carried out (TABLE 5). Detailed flowsheets for VAN 128-131 are shown in FIGURES 1-4 with the calculated circuit results in TABLE 6. The individual product assays for VAN-131 are listed in TABLE 7.

For samples similar to B₄ the results below now appear feasible.

	ANALYSES		% RECOVERY	
	%Pb	%Zn	Pb	Zn
Pb Concentrate	45+	8-10	75	
Zn Concentrate	2.5	52+		80
Zn Rougher Tails	1.	1.5		
Heads	4.7	9.3		

The possibility remains of improving lead concentrate grade by additional regrinding, use of higher dosages of NaCN, additional cleaning stages or other means.

Future Testwork

In order to determine which ore type (B₃ or B₄) predominates, 14-10 Kg samples were collected by D.J.T. Carson and received at Mattagami on Nov. 24, 1976. These samples show tremendous variation (TABLE 8).

Samples 10-13 and 2 are estimated to make up 86% of the Grum deposit. Five exploratory batch tests were carried out on these samples using the flowsheet of test VAN-131 (except that zinc was not cleaned). From the results (TABLE 9) the bulk of the ore appears similar to B₄. More importantly, the portion of the orebody similar to B₃ is very small.

A 35 Kg composite of the 14 samples, mixed in the ratio estimated to represent the overall orebody, has been prepared. Since most of the ore is similar to B_4 variables such as fineness of grind, depressants, and regrind will be determined for B_4 to conserve the composite. Once these variables have been fixed tests will be carried out on the composite.

TABLE 1

WATER IN DRUM

	*	* *
PPM Cu	.012	.012
PPM Zn	.404	.155
PPM Pb	.249	.054
PPM Fe	4.66	.076
PPM Mn	.632	.618
PPM CaO	98.0	95.8
PPM MgO	77.0	75.7
PPM SO ₄	286.5	
PPM SUSP. SOLIDS	15.0	
PH	6.6	

* ANALYSIS WITH SUSPENDED SOLIDS

* * ANALYSIS WITHOUT SUSPENDED SOLIDS

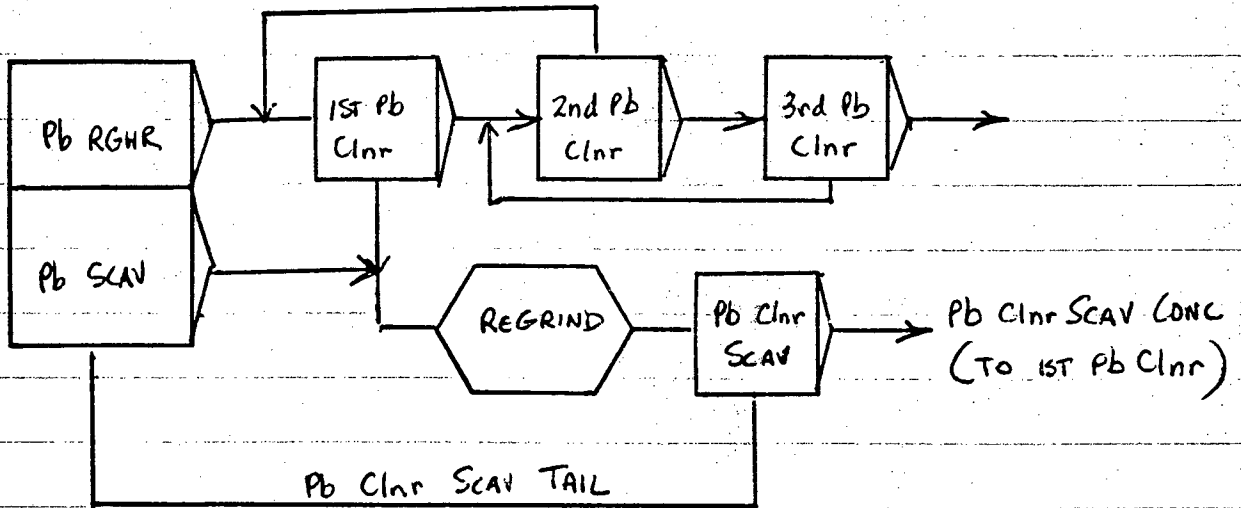
TABLE 2 -17-

SAMPLE RECEIVED SEPT. 14, 1976

SAMPLE	B ₄₀	B ₄₁	B ₄₂
SPECIFIC GRAVITY	3.3		3.4
NATURAL PH } 20 MIN GRIND			7.2
PPM S ₂ O ₃ } @ 67% SOLIDS			40
WORK INDEX kwh/T	13.5		12.6
Au oz/T	.046	.027	.031
Ag oz/T	2.05	1.64	2.3
Hg PPM	52	59	83
% Cu	.08	.06	.06
% Zn	6.9	7.0	9.4
% Pb	4.5	3.9	5.2
% Fe	15.3	14.3	15.4
% S	20.9	20.1	22.2
% Insol	49		44.5
% SiO ₂			42.0
% CaO	.38	.34	.38
% MgO	.14	.09	.12
% As	.46	.31	.26
% Ni		.06	.03
% Co		.004	.003
% Cd		.009	.01
% Cr		.076	
% Sb		.04	
TESTS #	VAN 104-121	VAN 122-124	VAN 125-131

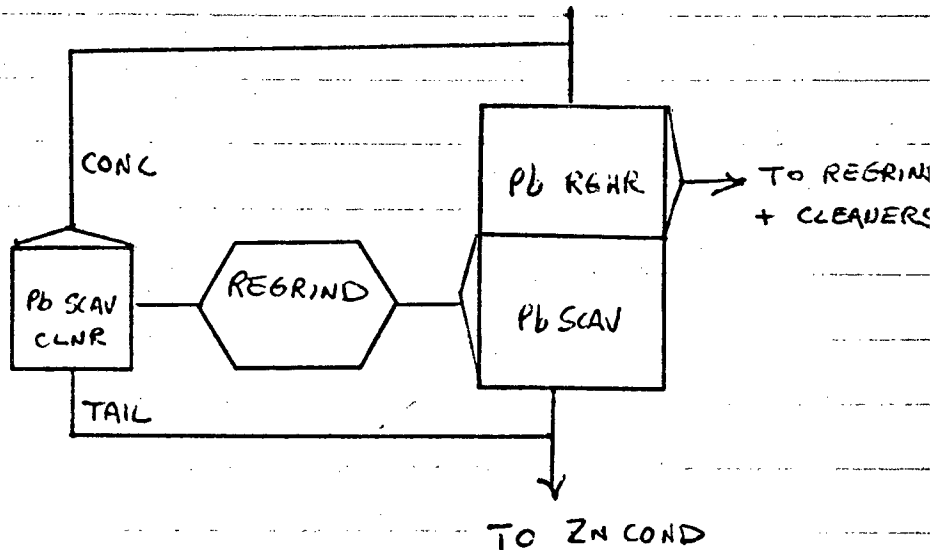
TABLE 3

VAN 123 (6 cycle test)



	WEIGHT GMS.	VAN 123 % ASSAY		% DISTRIBUTION	
		Pb	Zn	Pb	Zn
Pb CLR SCAV CONC	72	8.2	11.8	17	13
Pb CLR SCAV TAIL	530	5.2	10.5	83	87
{ 1st Pb CLR TAILS Pb SCAV CONC	602	5.6	10.7	100	100

VAN 124 (5 cycle test)



	WGT. GMS.	VAN 124 % ASSAY		% DISTRIBUTION	
		Pb	Zn	Pb	Zn
Pb SCAV CLR CONC	88	11.0	10.2	53	53
Pb SCAV CLR TAIL	78	10.9	10.1	47	47
Pb SCAV CONC	166	10.95	10.15	100	100

TABLE 4

INFRASIZING OF PRODUCTS FROM VAN-131

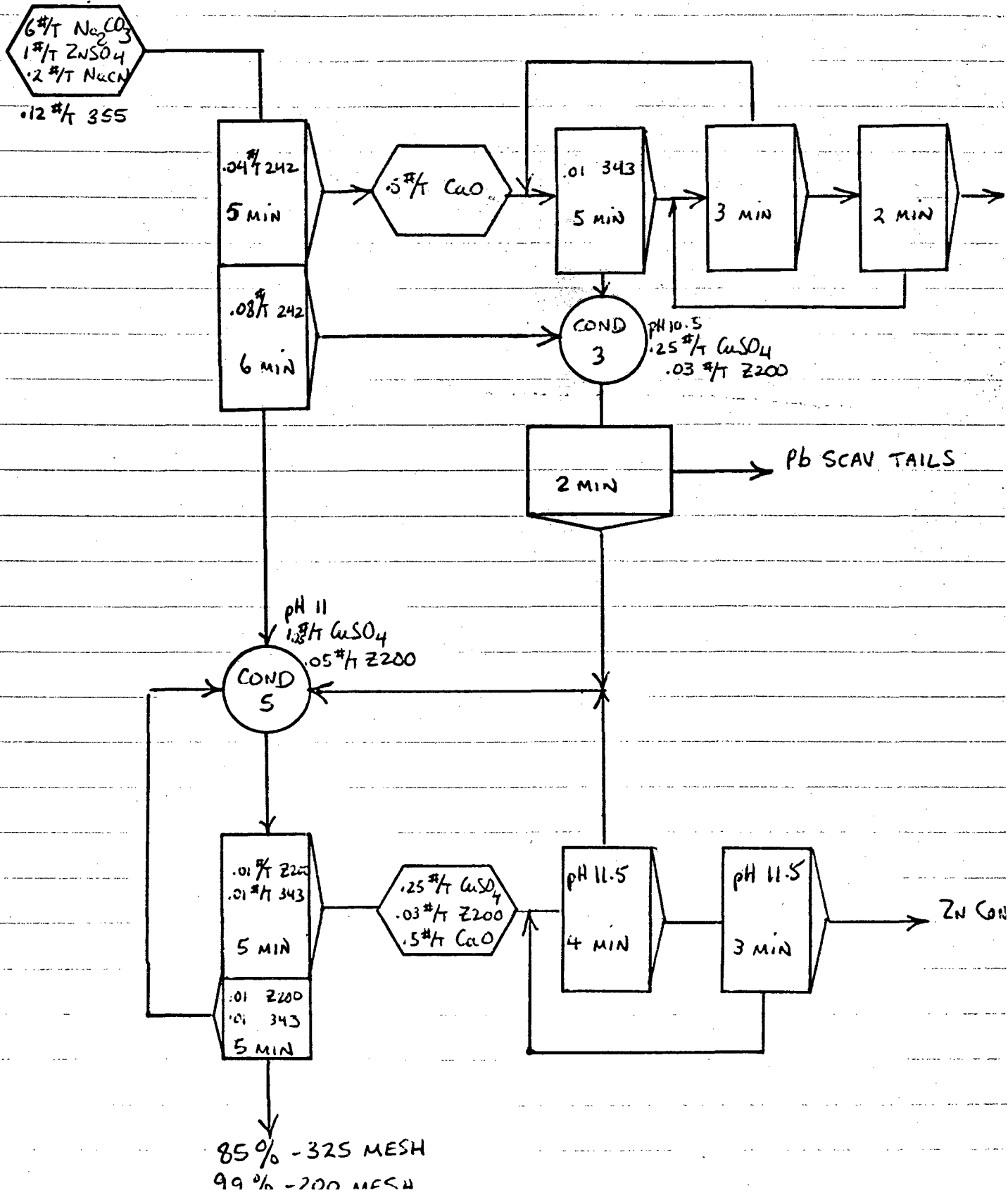
SAMPLE (TEST VAN-131)	SIZE MICRONS	WEIGHT %	% ASSAY		% DISTRIBUTION	
			Pb	Zn	Pb	Zn
1ST, 2ND AND 3RD Pb CLR TAILS CYCLE 8	+40	8.3	6.60	7.22	9.9	5.0
	+28	16.0	4.48	8.71	12.7	11.6
	+20	11.7	3.17	14.18	6.7	13.8
	+14	14.7	2.93	11.56	7.8	14.1
	+10	16.6	3.31	9.85	9.9	13.6
	-10	32.7	8.95	15.31	53.0	41.9
	HEAD	100.0	5.54	11.99	100.0	100.0
	Pb CONCENTRATES CYCLES 6-8	+40	5.1	46.38	6.93	5.6
+28		14.5	36.60	8.75	12.6	13.7
+20		18.9	36.23	10.04	16.2	20.4
+14		17.6	39.53	11.25	16.5	21.3
+10		14.1	43.73	11.39	14.6	17.3
-10		29.8	49.00	7.39	34.5	23.5
HEAD		100.0	42.23	9.31	100.0	100.0
Zn RGR TAILINGS CYCLES 6-8		+56	1.1	7.03	2.47	1.2
	+40	12.6	1.08	1.94	13.9	14.2
	+28	19.8	7.87	2.01	17.6	23.0
	+20	17.6	6.66	1.87	11.9	8.9
	+14	13.5	5.54	1.82	7.5	6.4
	+10	10.1	5.54	1.29	5.6	7.5
	-10	25.3	16.64	2.63	42.3	38.4
	HEAD	100.0	9.98	1.73	100.0	100.0

TABLE 5

LOCKED CYCLE TESTS

VAN #	DESCRIPTION	Pb CONC		Zn CONC	
		% Pb	% Pb REC	% Zn	% Zn REC
113	Pb - SODA ASH, 343,242, 4 CLNRS, Pb SCAN CONC TO HEAD OF RGRH Zn - 4 CLNRS, 1ST Zn CLNR TAILS OPEN CIRCUIT	41.5	66	56	43
114	Pb - CaO, 343,242, 4 CLNRS, Pb SCAN CONC TO HEAD OF Pb RGRH Zn - 4 CLNRS, 1ST CLNR TAIL NOT OPEN CIRCUIT	47.6	60	55	60
115	Pb - CaO, PREFLOAT CONC, 343,242, 3 CLNRS NO REGRIND OF Pb RGRH Zn - 2 CLNRS, CLOSED CIRCUIT	43.9	75	49.5	83
120	Pb - CaO, PREFLOAT, 343,242, 3 CLNRS, REGRIND OF Pb RGRH Zn - 2 CLNRS, CLOSED CIRCUIT	40	57	52	74
121	Pb - SODA ASH, 343,242, REGRIND + 3 CLNRS Zn - 3 CLNRS, CLOSED CIRCUIT	43	50	57	76
122	Pb - SODA ASH, 242,343, AS FOR VAN 123 (TABLE 3) Zn - 3 CLNRS, CLOSED CIRCUIT	55	48	55	73
123	Pb - SODA ASH, 355,242, TABLE 3 Zn - 3 CLNRS	not stable		48.5	70
124	Pb - SODA ASH, 355,242, TABLE 3 Zn - 3 CLNRS	38	61	55	75
126	Pb - CaO, 355,242, AS FOR VAN 124 (TABLE 3)	38	63	47.5	85
128	FIGURE 1	47	70	48.8	82
129	FIGURE 2	48	61	55	64
130	FIGURE 3	48	76	53.5	79
131	FIGURE 4	44	76	53	80

VAN-128
6 cycles



VAN -129
6cycles

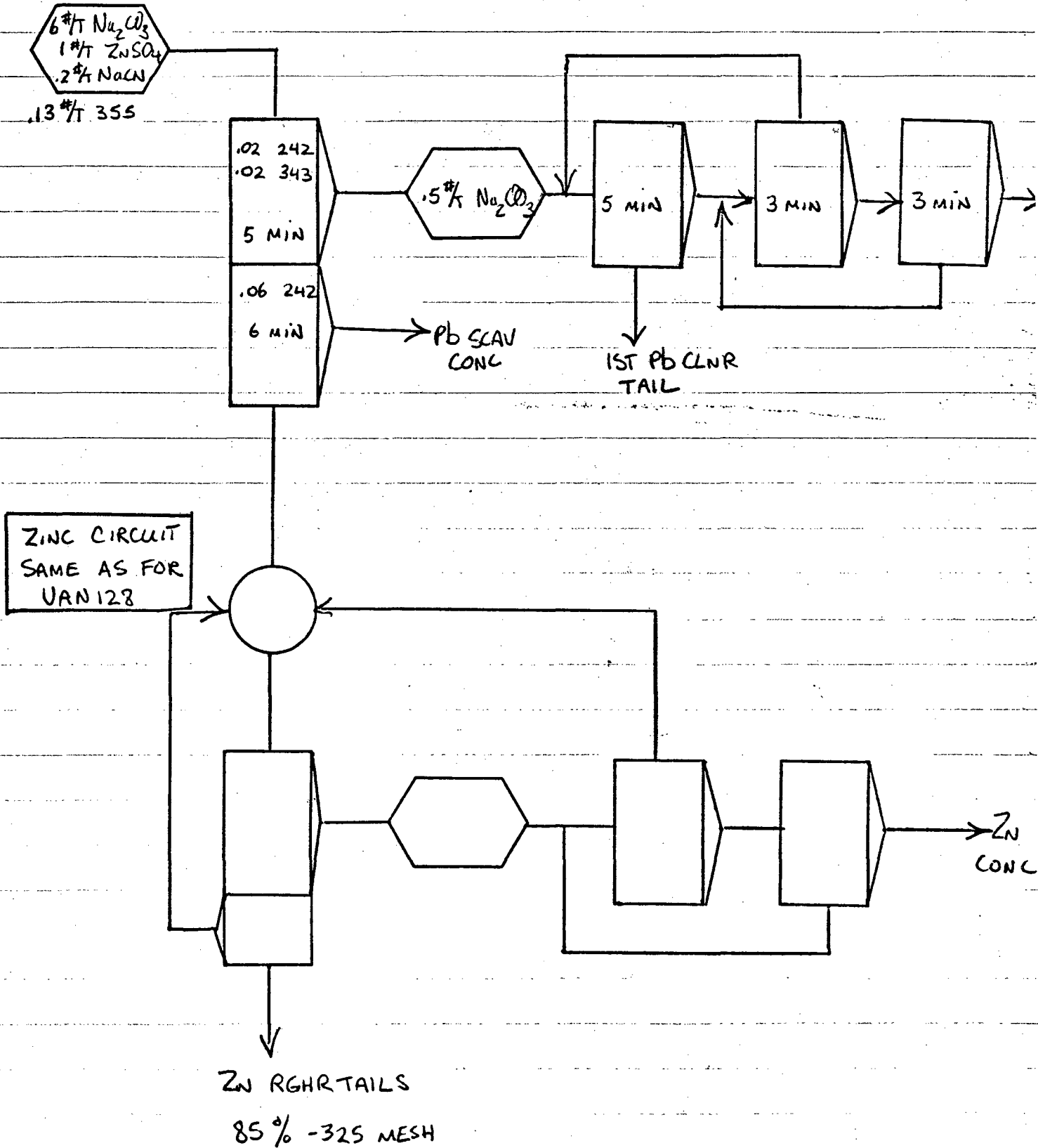


FIGURE 4

-24-

VAN-131
8 cycles

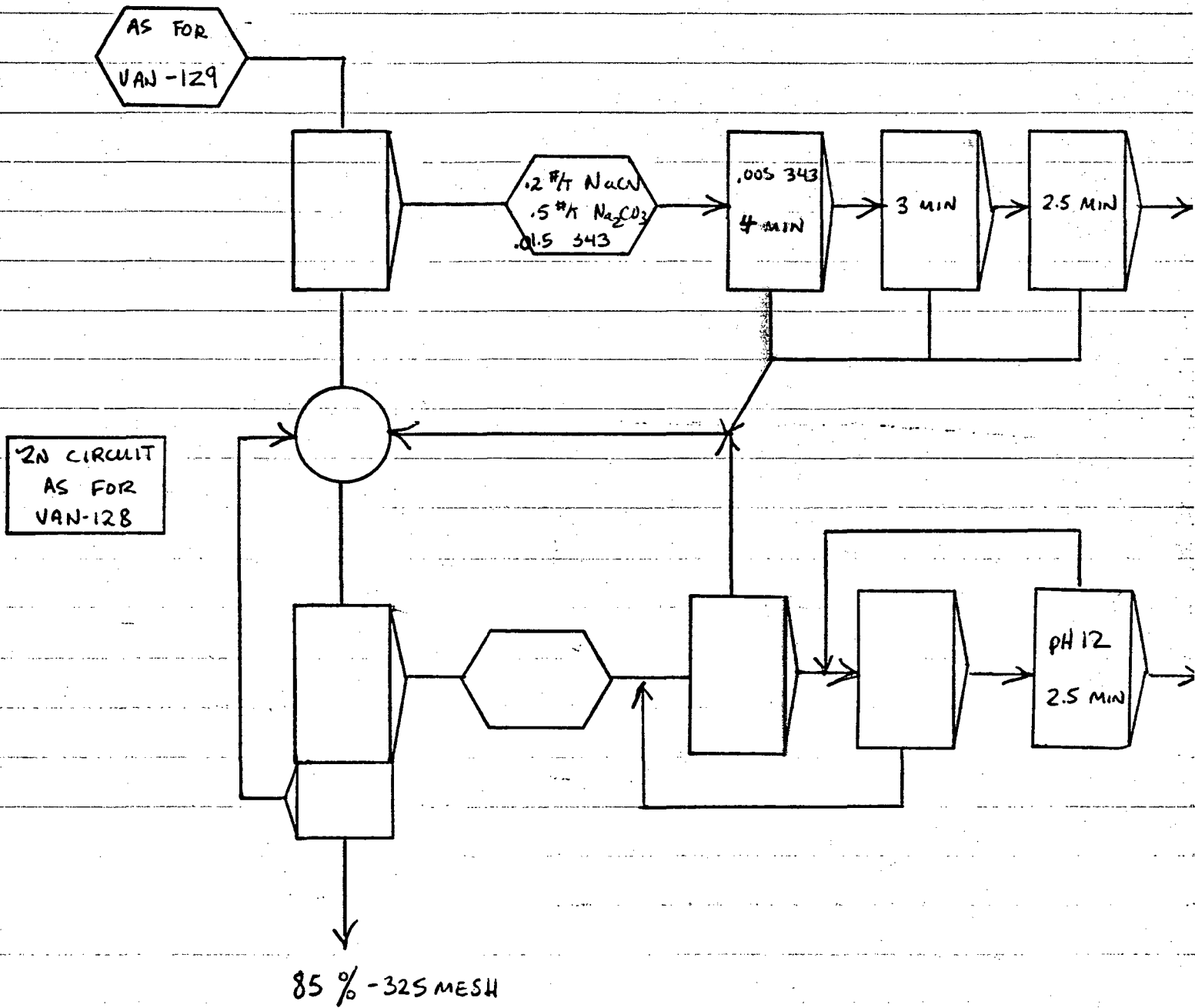


TABLE 6 -25-

CALCULATED CIRCUIT RESULTS

	WEIGHT %	% ASSAY		% DISTRIBUTION		
		Pb	Zn	Pb	Zn	
VAN 128	Pb CONCENTRATE	7.1	47.0	9.1	70	77
	Zn CONCENTRATE	15.5	2.9	48.8	9	82
	Pb SCAV TAIL	9.5	6.1	3.7	12	4
	Zn RGHR TAIL	67.9	.6	1.05	9	7
	FLOAT TAIL	11.4	1.3	1.4	21	11
HEAD	100.0	4.77	9.27	100	100	
VAN 129	Pb CONCENTRATE	5.9	48.4	8.8	61	5
	Zn CONCENTRATE	11.0	.71	55.0	2	64
	Pb CLR TAIL	12.5	10.5	12.4	28	16
	Pb SCAV CONC	5.3	2.6	12.2	3	7
	Zn RGHR TAIL	65.3	45	1.05	6	8
HEAD	100.0	4.68	9.45	100	100	
VAN 130	Pb CONCENTRATE	7.3	48.0	9.5	76	7
	Zn CONCENTRATE	13.5	2.5	53.5	7	79
	Zn RGHR TAILS	79.2	.95	1.55	17	14
	HEAD	100.0	4.60	9.14	100	100
VAN 131	Pb CONCENTRATE	8.2	43.7	9.5	76	8
	Zn CONCENTRATE	14.2	2.5	52.9	8	80
	Zn RGHR TAILS	77.6	1.0	1.4	16	12
	HEADS	100.0	4.71	9.38	100	100

TABLE 7 -26-

DETAILED RESULTS OF A 6 CYCLE TEST

VAN - 131	WEIGHT GRAMS	% Pb	% Zn
Pb CONCENTRATE CYCLE 1	97.0	36.71	10.48
2	85.5	42.72	9.39
3	80.3	44.42	9.58
4	78.4	41.62	8.92
5	78.4	42.42	9.66
6	77.3	43.15	9.39
7	87.5	43.19	9.86
8	76.7	44.86	9.31
ZINC CONCENTRATE CYCLE 1	92.6	.71	55.73
2	124.5	1.79	52.61
3	118.7	1.66	53.65
4	92.2	1.66	50.79
5	146.1	1.89	53.16
6	143.6	2.65	52.51
7	141.1	2.54	52.56
8	136.1	2.20	53.55
ZINC ROUGHER TAILINGS CYCLE 1	560	.48	.88
2	660	.69	.90
3	800	.93	1.27
4	792	1.05	1.80
5	759	1.10	1.42
6	763	1.03	1.40
7	799	.96	1.32
8	737	1.05	1.41
HEAD	7959.4	4.64	9.15

TABLE 8

BULK B-ORES SAMPLES RECEIVED NOV. 24, 1976 BULK OF RESERVES

	1. Fe	2. Fe-M	3. Bc-MV	4. Bc-MB	5. Bc-MV _{agg}	6. Bc-MB _{agg}	7. Bc-MV _{or}	8. Bc-MB _{or}	9. Ec	10. Gc	11. Dc	12. Ic	13. Cc	14. Ac
% OF COMPOSITE	3	11	2	0	1	1	1	1	5	20	20	20	15	0
SPECIFIC GRAVITY	4.48	3.55	4.38	4.30	4.31	4.24	4.28	4.01	3.92	2.78	3.04	3.35	3.55	4.39
NATURAL pH	6.5	6.7	6.5	6.8	6.7	7.0	6.4	6.8	8.7	7.9	7.8	7.5	7.3	11.2
PM $\frac{1}{2}$ O ₃ } GRAND 70% -400 MESH @ 67% SOLIDS	158	41	599	68	650	230	550	150	96	6	46	84	74	246
Au oz/t	.036	.032	.045	.040	.047	.041	.048	.049	.055	.012	.020	.027	.036	.049
Ag oz/t	3.0	3.5	5.1	4.0	3.9	3.7	4.1	3.8	5.9	.6	1.7	2.3	1.2	3.0
% Cu	.10	.02	.24	.05	.33	.11	.28	.09	.09	.03	.08	.06	.04	.18
% Zn	14.4	18.9	16.0	15.7	12.0	15.3	12.0	14.6	16.3	3.2	6.6	9.0	4.5	5.8
% Pb	6.9	6.5	9.9	9.0	8.0	9.0	8.1	8.5	9.1	1.5	3.3	4.8	2.8	8.6
PPM Hg	183	192	183	146	132	149	146	144	267	33	91	114	49	17
% Insol	.8	36.5	5.7	10.1	7.3	11.7	12.0	17.4	13.6	81.7	63.6	48.2	42.6	4.9
% SiO ₂	.7	34.6	5.2	9.4	6.0	10.1	10.5	15.4	12.7	72.7	58.2	44.6	39.2	3.5
% Fe	29.4	10.4	25.9	23.6	27.8	22.8	26.7	20.8	16.0	3.8	8.2	11.1	20.3	30.9
% Co	.005	.003	.005	.010	.011	.011	.007	.009	.003	.002	.002	.004	.005	.012
% Cd	.02	.02	.02	.02	.02	.02	.02	.02	.03	.004	.009	.012	.006	.011
% S	40.0	21.2	38.3	35.6	36.4	33.3	36.4	31.4	27.0	5.2	12.2	19.5	24.7	35.2
% Ni	.09	.09	.09	.09	.11	.11	.09	.09	.08	.07	.08	.09	.09	.09
% As	.33	1.36	.08	.46	.48	.40	.09	.37	.10	.02	.23	.21	.42	.04
% CaO	.97	.18	.07	.28	1.1	1.1	.17	.36	4.8	.55	.90	.53	.07	3.5
% MgO	.51	.12	.02	.13	.56	.59	.10	.19	2.3	.37	.53	.30	.08	1.1
% PYRITE	54	16	50	45	51	41	50	38	28	7	15	24	40	53
DESCRIPTION	MASSIVE, VUGGY OXIDIZED	MASSIVE, HARD OXIDIZED	MASSIVE, VUGGY STRONGLY OXIDIZED	MASSIVE HARD OXIDIZED	AS (3) PLUS 1kg FAULT GOUGE	AS (4) PLUS 1kg FAULT GOUGE	AS (3) PLUS 1kg graphitic phyllite	AS (4) plus 1kg graphitic phyllite	MASSIVE RECRYSTALLIZED HIGH Zn	LOW GRADE SILICEOUS	MASSIVE BANDS BANDS ORE PLUS SILICEOUS ORE	MASSIVE BANDS BANDS BANDS BANDS	SILICEOUS ORE PLUS MASSIVE BANDS BANDS BANDS	MASSIVE VUGGY PLUS MASSIVE HARD (PLUS SHOTCRETE COATING ON SOME PIECES)

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Table 9 A

Exploratory Flotation Test Series

on

Grum Samples 1 to 14

Group one

Rougher flotation Results on samples 1,3,5, and 7.

	Weight		Analyses %		Distribution %		Remarks
	%		Pb	Zn	Pb	Zn	
<u>Sample 1</u>							
Mill Feed	100		6.38	15.03			
Lead rgh.conc.	14.77		31.86	15.74	73.7	15.5	Zinc did not float in rgh. flotation
Zinc rgh.conc.	9.74		5.29	24.75	8.1	16.0	
Zinc rgh.tailings	75.49		1.54	13.64	18.2	68.5	
<u>Sample 3</u>							
Mill Feed	100		9.51	15.90			
Lead rgh.conc.	37.23		19.88	20.32	78.0	47.6	Zinc did not float at all in rgh.flot.
Zinc rgh.conc.							
Zinc rgh.tailing	62.77		3.33	13.25	22.0	52.3	
<u>Sample 5</u>							
Mill Feed	100		8.03	11.76			
Lead rgh.conc.	26.96		21.92	16.18	73.5	37.0	Zinc did not float at all in rgh.flot.
Zinc rgh.conc.							
Zinc rgh.tailings	73.04		2.91	10.14	26.5	63.0	
<u>Sample 7</u>							
Mill Feed	100		7.82	12.59			
Lead rgh.conc.	30.30		19.79	16.31	76.6	39.2	Zinc did not float at all in rgh,flot.
Zinc rgh.conc.							
Zinc rgh.tailings	69.70		2.62	10.98	23.3	60.7	

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Group two

Rougher flotation results on samples 4,6,8, and 14

<u>Sample 4</u>							
Mill Feed	100		8.46	16.72			
Lead rgh.conc.	35.08		20.63	19.97	85.7	41.8	
Zinc rgh.conc.	28.44		2.68	33.19	9.0	56.6	
Zinc rgh.tailings	36.48		1.24	0.74	5.3	1.6	
<u>Sample 6</u>							
Mill Feed	100		8.68	16.89			
Lead rgh.conc.	38.03		19.80	22.59	86.8	50.8	
Zinc rgh.conc.	34.77		2.83	23.46	11.4	48.3	
Zinc rgh.tailings	27.18		.59	.51	1.8	.9	

Table 9 A, continued

	Weight %	Analyses %		Distribution %		Remarks
		Pb	Zn	Pb	Zn	
<u>Sample 8</u>						
Mill Feed	100	8.14	15.55			
Lead rgh.conc	31.94	21.90	21.05	85.6	43.0	
Zinc rgh.conc	29.61	2.96	28.22	10.8	55.1	
Zinc rgh.tailings	38.55	.77	.75	3.6	1.9	
<u>Sample 14</u>						
Mill Feed	100	8.32	5.66			
Lead rgh.conc.	22.91	25.65	13.76	70.7	55.7	
Zinc rgh.conc.	33.11	4.90	7.20	19.5	42.2	
Zinc rgh.tailings	43.98	1.84	.27	9.8	2.1	

TABLE 9B

TEST SAMPLE		WEIGHT %	% ASSAY		% DISTRIBUTION	
			Pb	Zn	Pb	Zn
VAN 132 (12) I _C	Pb CONCENTRATE	8.65	39.70	10.04	78.6	9.1
	Zn RGHR + SCAV CONC	28.84	1.79	29.05	11.8	88.3
	Zn RGHR TAIL	62.51	.67	.39	9.6	2.6
	HEAD	100.00	4.37	9.49	100.0	100.0
VAN 133 (11) D _C	Pb CONCENTRATE	5.98	38.11	8.27	74.5	7.1
	Zn RGHR CONC + SCAV CONC	23.48	1.66	26.81	12.7	90.3
	Zn RGHR TAIL	70.54	.56	.26	12.8	2.6
	HEAD	100.00	3.06	6.97	100.0	100.0
VAN 134 (13) G _C	Pb CONCENTRATE	4.43	34.60	3.45	61.3	3.3
	Zn RGHR CONC + SCAV CONC	19.34	2.61	20.85	20.2	85.8
	Zn RGHR TAIL	76.23	.60	.67	18.5	10.9
	HEAD	100.00	2.50	4.70	100.0	100.0
VAN 135 (10) C _C	Pb ROUGHER CONCENTRATE	5.39	18.35	6.06	74.9	10.9
	Zn RGHR CONC + SCAV CONC	10.16	.85	24.61	6.5	83.1
	Zn RGHR TAIL	84.45	.29	.22	18.6	6.0
	HEAD	100.00	1.32	3.01	100.0	100.0
VAN 136 (2) F _C -M	Pb CONCENTRATE	9.54	56.78	13.14	85.0	6.0
	Zn RGHR CONC + SCAV CONC	39.13	1.96	50.04	12.0	93.2
	Zn RGHR TAIL	51.33	.36	.34	3.0	.8
	HEAD	100.00	6.37	21.01	100.0	100.0
VAN 146 (9) E _C	Pb RGHR CONC	27.95	27.47	16.53	87.0	27.0
	Zn RGHR + SCAV. CONC	31.89	2.08	38.03	7.5	71.2
	Zn Rghr TAILING	40.17	1.20	.72	5.5	1.8
	MILL FEED	100.0	8.82	17.03	100.0	100.0