

NORANDA MINES LIMITED
NORANDA, QUEBEC

019807

MDA

VANGORDA PROJECT
REPORT NO. 5

SEP 08 1975

V. T.
14 E

INVESTIGATIONS ON THE "HIGH GRADE" ORE

MINERAL DRESSING LABORATORY
29 AUGUST, 1975

Marcel Larouche

MARCEL LAROUCHE
LAB TECHNOLOGIST

John F. Maissan

JOHN F. MAISSAN
ASS'T METALLURGIST

DISTRIBUTION:

MR. R.L. COLEMAN (4)
MR. P. CONDER (2)
MR. G. G. (2)

TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE NO.</u>
INTRODUCTION	1
SUMMARY	2
RESULTS	
(A) GRIND OPTIMIZATION	5
(B) STUDYING THE EFFECT OF pH	7
(C) FLOTATION TIME STUDY	9
(D) REAGENT STUDIES	11
(E) VARIOUS LEAD-ZINC SEPARATION PROCEDURES	15
(F) CYCLIC TESTS	19
(G) TABLE OF COMPLETE RESULTS OF REPORT	25
APPENDIX CONDITION AND CALCULATION DETAILS OF EACH TEST	27

INTRODUCTION

Following report No. 4 of February 26, 1975, testwork was carried out on the sample of high grade ore. Its description was presented in reports No. 3 and No. 4.

The goal of the testwork was to determine the parameters necessary to optimize the treatment process to produce lead and zinc concentrates of saleable grade.

The following parameters were investigated:

- fineness of grind
- pH level
- pyrite and sphalerite depressants for the lead flotation stage
- various collectors for galena and sphalerite
- lead flotation in a soda ash circuit.
- the effect of regrinding rougher concentrates
- lead-zinc separation techniques (i.e. de-zincing, desorption of reagents)
- cyclic testing of various circuits

SUMMARY

Sequential flotation of lead and zinc has been the most successful separation procedure found to date. The best cyclic test yielded the average third and fourth cycle results which are indicated below.

TABLE OF RESULTS

PRODUCT	ASSAYS					DISTRIBUTION			
	% WT	Pb	Zn	Cu	Fe	Pb	Zn	Cu	Fe
3rd Pb Cl Conc	7.4	57.2	10.3	0.97	6.6	79.6	8.5	48.3	2.0
3rd Zn Cl Conc	12.3	2.3	58.7	0.20	5.3	5.2	80.9	16.2	2.6
Zn Tail	80.3	1.0	1.2	0.07	29.0	15.2	10.5	35.5	95.4
Calculated Head	100.0	5.3	8.9	0.15	24.4	100.0	100.0	100.0	100.0

Of the silver present in this ore, 70% reported in the lead concentrate (23 oz/ton), 15% in the zinc concentrate (2.5 oz/ton) and the remaining 15% in the tailings.

The best reagent balance in the lead circuit included sodium cyanide, sodium sulphide, sodium sulphite and lime. In the cleaning stages a combination of sodium cyanide, lime, and zinc sulphate were found superior.

In the zinc circuit copper sulphate was used to activate the sphalerite, and lime was used as the pH modifier. Potassium dichromate was not found to be effective for the depression of lead. ✓

Lime was chosen above soda ash for pH modification because of its effectiveness in pyrite depression. ✓

The most effective collectors for this ore were found to be xanthates. In the lead circuit R303 (potassium ethyl) appeared most effective and was stage added to a total of 0.18 lb/ton. Sodium isopropyl xanthate was used in the zinc circuit, also a total of 0.18 lb/ton. ✓

The pH in the lead roughing circuit was found optimum at about 9.0. A pH of 11.0 was used in the cleaning stages. The zinc circuit worked satisfactorily with a pH of 11.0 in all stages. ✓

Microscopic examinations showed that the necessary grind for adequate liberation to produce reasonable concentrates was about 80% passing 325 mesh. For virtually complete liberation of the minerals a grind of about 100% passing 325 mesh was necessary. For this reason regrinding of rougher concentrates was employed.

It should be noted that about 1% of the 5% lead in the ore is in oxide form. It may be because of this, that it was difficult to selectively float the lead from the zinc.

Using the comparative method, the Bond work index of the ore was found to be 8.2 Kilowatt hours per short ton.

RESULTS

(A) GRIND OPTIMIZATION

A series of six grind vs recovery tests employing grinds from 42.5 to 78.5% passing 325 mesh was performed. The results showed that as the grind got finer the amount of zinc reporting to the lead concentrate decreased (from 30.7 to 20.0%). There was a corresponding increase in zinc reporting to the zinc concentrate.

A large difference in the weight floated was evident as the grind was varied. Although the tailings assays varied very little the weight floated decreased from 64.2% to 42.3% as the grind became finer.

The finest grind thus seems the most desirable. A table of results follows.

TABLEAU DES RESULTATS
A DIFFERENT BROYAGE

	% -325M	HEAD		2nd Pb Cl. Conc.				Pb Ro. Conc.					
		Assays		%Wt.	Assays		% Dist.		%Wt.	Assays		% Dist.	
		Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn
V-64	42.5	5.46	9.54	5.7	44.6	12.7	46.6	7.6	22.0	21.5	13.1	86.8	30.1
V-65	51.0	5.18	9.55	-	-	-	-	-	22.6	19.6	13.0	85.6	30.7
V-53	60.0	5.23	8.89	5.7	43.8	14.1	47.8	9.1	19.0	24.7	12.6	85.2	25.6
V-48	68.0	5.19	9.94	4.16	51.0	10.7	40.9	4.5	15.7	28.1	13.9	83.6	21.3
V-49	74.0	5.12	9.93	6.45	46.2	13.7	58.2	8.9	16.0	28.2	13.3	86.6	21.8
V-50	78.5	5.35	9.89	6.83	45.2	12.5	57.7	8.6	15.5	28.8	13.4	82.0	20.0

	2nd Zn Cl. Conc.				Zn Ro. Conc.				Repat				
	%Wt.	Assays		Dist.		%Wt.	Assays		Dist.		%Wt.	Assays	
		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn
V-64	6.3	1.5	51.9	1.7	34.3	28.4	1.2	18.2	5.9	54.1	35.2	0.32	0.86
V-65	-	-	-	-	-	19.8	1.14	23.6	4.4	48.9	31.7	0.26	0.73
V-53	11.8	1.20	39.7	2.5	52.8	19.8	1.2	26.2	4.5	58.5	50.5	0.32	0.63
V-48	9.8	1.30	52.7	2.4	51.8	20.1	1.7	32.1	6.5	64.8	53.9	0.26	0.58
V-49	9.1	0.88	56.47	1.6	51.8	15.8	1.09	40.0	3.4	63.6	57.1	0.32	0.64
V-50	10.1	1.10	52.70	2.1	53.8	18.3	1.14	35.17	3.9	65.2	57.7	0.34	0.64

(B) STUDING THE EFFECT OF pH

An investigation of the effect of pH in both lead and zinc circuits showed that the optimum pH's were 9.0 and 11.0 respectively.

From the results it was evident that a pH of 9.0 in the lead circuit was superior. At pH's lower than 9.0 pyrite and sphalerite floated very easily, even in the presence of depressants.

At a pH of 10.0 in the zinc circuit pyrite had a tendency to float. The flotation selectivity over pyrite appeared to be at a maximum at pH 11.0.

A table of results follows.

TABLEAU DES RESULTATS
DE DIFFERENT PH

	HEAD				2nd Pb Cl. Conc.				Pb Ro. Conc.					
	% 325M	Assays		pH	%wt.	Assays		% Dist.		%wt.	Assays		% Dist.	
		Pb	Zn			Pb	Zn	Pb	Zn		Pb	Zn		
7-59	73.5	5.46	9.68	7.8	9.2	31.4	33.2	52.9	31.6	12.2	27.3	30.7	61.0	32.7
7-51	73.5	5.38	9.36	8.8	-	-	-	-	-	14.8	30.0	12.9	22.5	20.4
7-60	76.5	4.96	9.47	9.9	11.4	31.6	14.5	72.6	17.4	14.7	28.0	13.7	22.2	21.3

	2nd Zn Cl. Conc.						Zn Ro. Conc.				Rejet			
	pH	%wt.	Assays		Dist.		%wt.	Assays		Dist.		%wt.	Assays	
			Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn			
7-59	10.0	9.0	2.92	12.08	4.8	11.2	18.2	2.34	7.6	7.2	14.3	36.1	0.26	0.64
7-51	11.0	-	-	-	-	-	15.1	1.28	40.2	3.6	64.2	59.4	0.22	0.62
7-60	12.0	8.1	0.78	50.7	7.5	59.8	16.8	1.1	30.8	3.6	54.6	51.7	0.26	0.54

(C) FLOTATION TIME STUDY

A study was performed to investigate the flotation rates of the lead and zinc concentrates. Concentrates were removed in one and one-half minute stages, and the resultant data is presented on the following table.

The results indicated that three minutes of roughing and three minutes of scavenging would be adequate for lead flotation. The zinc flotation stages indicated optimal flotation times of two to three minutes for both roughing and scavenging stages.

PRODUIT	WT	GOUT	ASSAY		% DISTRIBUTION		
			PB	Zn	PB	Zn	
Pb Conc 0-1½	121	6.1	43.77	11.42	52.4	7.0	
Pb Conc 1½-3	95	4.8	21.69	16.1	23.2	7.7	PB
Pb O'LL Conc 3 min	216	10.9	35.37	13.48	75.6	14.7	"ROUGHER"
Pb Conc 3-4½	119	6.0	8.03	16.8	9.5	10.1	
4½-6	77	3.9	4.42	20.1	3.4	7.8	Pb
O'LL 3-6	196	9.9	6.60	18.1	12.8	17.9	"SCAVANGER"
6-7½	95	4.8	2.41	23.1	2.3	11.1	
O'LL Conc 3-7½	292	14.7	5.23	19.7	15.1	29.0	
7½-9	74	3.7	1.0	36.2	.7	13.4	
O'LL Conc 3-9	365	18.4	4.39	23.04	15.8	42.4	
Pb O'LL Conc 0-9	581	29.3	15.91	19.48	91.4	57.0	
Pb Tail	1403	70.7	0.62	6.09	8.6	43.0	
Zn Conc 0-1½	195	9.8	1.94	33.79	3.7	33.1	
1½-3	94	4.7	.92	10.01	0.8	4.7	Zn
Zn O'LL Conc 0-3	287	14.5	1.60	26.08	4.6	37.8	"ROUGHER"
3-4½	121	6.1	.60	2.65	0.7	1.6	
O'LL CONC 0-4½	408	20.6	1.31	19.15	5.3	39.4	
4½-6	162	8.2	.48	.91	0.8	0.8	Zn
O'LL Conc 3-6	284	14.3	1.53	1.66	1.5	2.4	"SCAVANGER"
6-7½	142	7.2	0.44	0.61	0.6	0.4	
O'LL Zn Conc 0-7½	714	36.0	0.95	11.29	6.7	40.6	
Zn Tail	689	34.7	0.28	0.70	1.9	2.4	
Head	1984		5.10	10.02	100.0	100.0	

(D) REAGENT STUDIES

The emphasis in reagent studies centred on the depression of sphalerite and pyrite in the lead flotation stage. To this end the effects of sodium sulphite, zinc sulphate and sulphur dioxide were studied. Also in the lead circuit, investigations in the use of sodium sulphide and various collectors were performed.

In the zinc circuit the uses of both potassium dichromate and copper sulphate were studied.

The reagent balance which seemed to be the most effective for lead flotation included cyanide, sodium sulphite, sodium sulphide and lime (for pH adjustment). Under similar conditions sodium sulphite (test V-68) was more effective than zinc sulphate (test V-67) for zinc depression in the roughing stage. The lead concentrate increased from 27.4% lead to 37.7 while the zinc content decreased from 13.7% to 13.1 representing zinc distributions of 20.4 and 12.2% respectively.

The addition of the reagents for the lead circuit to a conditioning stage after the grind appeared to be slightly more selective.

Increases in the amount of sodium sulphite did not significantly affect the results.

In the zinc circuit copper sulphate (1.0 lb/ton) and lime for pH control gave good recoveries of the zinc minerals. Further increases in the amount of copper sulphate used did not yield improved results.

The use of potassium dichromate for lead depression in the zinc circuit was studied. No decrease in the lead content of the zinc concentrate was noted.

A complete table of results follows.

TESTS IN REAGENT SERIES

- V-51 - Sodium sulphite for zinc depression
- V-52 - use of $ZnSO_4$ and Na_2SO_3 in place of SO_2
- V-55 - increased sulphur dioxide and lime
- V-56 - Cyanide and zinc sulphate added after SO_2 conditioning
- V-61 - Soda ash for pH adjustment in the lead circuit
- V-62 - Sodium sulphide and soda ash in lead circuit
- V-63 - increased amount of sulphur dioxide in the grind
- V-66 - Sodium sulphite and sodium sulphide with lime
- V-67 - Zinc sulphate after SO_2 conditioning stage
- V-68 - Sodium sulphite after SO_2 conditioning stage
- V-69 - Sodium sulphide with zinc sulphate and lime
- V-71 - Variation in addition point of reagents
- V-72 - Sodium sulphide without the use of SO_2
- V-73 - Sodium sulphide with the use of SO_2

TABLEAU DES RESULTATS
DES DIFFERENTS REACTIFS

	HEAD				2nd Pb Cl. Conc.				Pb Ro. Conc.				
	% - 325M	Assays		%Wt.	Assays		% Dist.		%Wt.	Assays		% Dist.	
		Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn
V-51	73.5	5.38	9.36	-	-	-	-	-	14.8	30.0	12.9	22.5	20.4
V-63	70.5	5.20	9.72	-	-	-	-	-	20.6	22.4	14.5	29.2	30.8
V-52	73.5	5.07	9.17	-	-	-	-	-	19.4	22.8	12.5	27.3	26.4
V-55	75.5	4.78	9.11	-	-	-	-	-	16.6	24.2	12.6	24.1	23.0
V-56	77.0	4.67	10.06	* 3.8	52.1	9.88	53.6	4.7	11.6	32.1	12.8	79.7	14.7
V-61	76.5	5.08	9.47	-	-	-	-	-	12.9	23.6	12.9	27.7	25.2
V-62	73.5	5.14	9.36	-	-	-	-	-	19.0	23.4	13.4	26.4	27.2
V-66	72.5	4.87	9.58	-	-	-	-	-	16.2	25.1	13.4	23.5	22.7
V-67	47.0	5.15	9.83	9.0	30.1	12.9	56.7	12.7	14.7	27.4	13.7	72.2	20.4
V-68	50.5	4.85	9.14	3.1	50.4	15.1	32.2	5.1	8.5	37.7	13.1	66.0	12.2
V-69	72.5	4.79	9.88	7.3	43.4	12.0	66.6	8.9	11.0	35.2	13.7	20.2	15.3
V-71	75.5	4.95	9.95	2.1	61.24	8.98	26.0	1.9	5.2	41.1	12.4	43.2	6.5
V-72	39.0	4.90	9.75	5.2	32.7	13.8	41.1	7.4	11.6	27.5	12.8	65.2	22.4
V-73	39.0	5.06	9.81	0.8	54.9	9.12	8.7	0.7	3.8	34.1	14.4	25.6	5.6

	2nd Zn Cl. Conc.					Zn Ro. Conc.				Rejet			
	%Wt.	Assays		Dist.		%Wt.	Assays		Dist.		%Wt.	Assays	
		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn
V-51	-	-	-	-	-	15.1	1.28	40.2	3.6	64.8	59.4	0.22	0.62
V-63	-	-	-	-	-	20.3	0.98	24.3	3.2	50.7	41.7	0.22	0.64
V-52	-	-	-	-	-	22.0	0.92	22.8	4.0	54.7	35.2	0.25	0.63
V-55	-	-	-	-	-	14.3	1.18	39.1	3.5	61.8	52.7	0.32	0.66
V-56	* 11.1	1.32	48.8	3.1	53.9	16.7	1.53	36.8	5.5	61.1	59.9	0.33	0.52
V-61	-	-	-	-	-	16.4	0.96	34.4	3.1	59.6	54.1	0.22	0.64
V-62	-	-	-	-	-	14.2	0.20	32.5	2.2	49.3	42.9	0.29	0.63
V-66	-	-	-	-	-	19.3	1.08	26.8	4.3	54.0	38.3	0.27	0.60
V-67	12.0	1.42	41.0	3.3	50.1	34.5	1.05	16.9	7.1	59.2	32.6	0.36	0.94
V-68	8.1	1.46	57.5	2.4	50.1	24.1	1.75	25.2	2.7	66.5	57.4	0.54	0.74
V-69	11.0	0.88	46.3	2.0	51.5	18.1	1.07	31.1	4.0	57.0	42.6	0.20	0.66
V-71	10.7	2.01	50.5	4.3	54.3	19.0	2.35	34.9	9.0	66.7	60.3	0.34	0.64
V-72	5.8	1.58	56.8	1.9	33.8	25.3	2.21	21.1	11.4	54.2	52.6	0.57	0.75
V-73	12.8	3.90	49.3	9.9	64.3	33.5	3.70	22.2	24.5	75.6	54.4	0.56	0.70

* Pas un nettoyage mais seulement les 2 première minutes de flottation.

(E) VARIOUS LEAD-ZINC SEPARATION PROCEDURES

The investigations of lead-zinc separation procedures were based on the attempts to reduce the amount of zinc reporting to the lead concentrate. The following procedures were tested:

- i) sequential flotation of lead and zinc
- ii) fine regrinding of rougher concentrates
- iii) de-zincing of lead concentrates
- iv) bulk flotation followed by selective flotation
- v) desorption of reagents from a bulk concentrate

The most efficient process was found to be selective flotation followed by fine regrinding (100% - 325 mesh) of the rougher concentrates and cleaner flotation. There were minor sliming problems but no work was done to resolve this.

The galena and the sphalerite were found to be finely disseminated throughout each other, and for this reason fine grinding increased the effectiveness of sequential flotation. Sliming problems could be overcome either by dispersants or by desliming.

The established de-zincing procedure for lead concentrates which consists of steam heating the lead concentrate pulp followed by flotation was also tested. The sphalerite did not float selectively from the lead and thus this method was abandoned.

Another procedure tried was the desorption of the reagents in a bulk concentrate, but this method too, was unsuccessful. This process consisted of "soaking" the bulk concentrate in a 10% sodium sulphide solution, dewatering, repulping in fresh water. A lead concentrate was then floated.

TESTS PERFORMED

- V-57 - lime replaced by soda ash
- V-58 - selective flotation
- V-74 - regrinding of zinc concentrate
- V-76 - regrinding of lead tailings and lead concentrate
- V-77 - de-zincing of lead concentrate
- V-77A - regrind of lead concentrate prior to dezincing
- V-78 - increased steam heating time during dezincing
- V-79 - finer primary grinding prior to dezincing
- V-80 - finer primary grinding and concentrate regrinding stages
- V-81 - desorption of reagents from a bulk lead-zinc concentrate followed by a lead float
- V-82 - desorption of reagents from a bulk lead-zinc concentrate
- V-83 - bulk lead-zinc, bulk cleaning, then selective lead flotation

TABLEAU DES RESULTATS
DE DIFFERENT PROCEDURES

	ε-325%	HEAD		2nd Pb Cl. Conc.				Pb Ro. Conc.					
		Assays		εWt.	Assays		% Dist.		εWt.	Assays		% Dist.	
		Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn
V-57	74.5	5.29	9.59	9.6	36.6	12.0	66.5	12.0	20.3	23.5	13.2	90.3	28.0
V-58	75.5	5.37	9.14	19.5	22.2	33.0	80.6	70.4	23.4	19.9	32.9	86.6	84.3
V-74	38.0	4.93	9.80	2.3	54.6	9.6	25.5	2.3	8.7	34.2	12.9	60.4	11.5
V-76	84.0	5.08	9.75	3.2	56.1	8.4	35.4	2.7	-	-	-	-	-
V-77	56.5	5.03	9.94	-	-	-	-	-	5.2	19.8	7.22	20.5	4.1
V-77A	-	5.03	9.94	-	-	-	-	-	3.3	12.6	4.96	8.3	1.7
V-78	77.5	4.19	9.25	2.83	42.8	2.30	28.9	0.7	17.8	19.5	13.5	82.9	25.9
V-79	76.5	5.03	9.63	1.4	47.9	6.4	3.8	0.3	7.8	40.3	12.6	62.5	10.2
V-80	78.0	5.21	9.42	3.3	60.5	8.1	38.4	2.8	16.5	26.6	14.8	84.4	25.8
V-81	72.5	4.65	8.70	1.6	37.4	15.8	12.9	2.9	6.7	29.2	21.4	42.1	16.5
V-82	68.0	4.67	9.19	-	-	-	-	-	3.8	19.1	36.9	15.5	15.3
V-83	60.0	4.77	8.89	0.8	12.4	44.8	2.1	4.0	4.0	10.4	43.0	8.7	20.2

	2nd Zn Cl. Conc.				Zn Ro. Conc.				Rejet				
	εWt.	Assays		Dist.	εWt.	Assays		Dist.	εWt.	Assays			
		Pb	Zn			Pb	Zn			Pb	Zn		
V-57	9.3	0.50	51.8	0.9	50.2	18.0	0.62	30.7	2.1	57.7	44.3	0.32	0.65
V-58	-	-	-	-	-	7.1	4.88	16.6	3.6	7.3	32.9	0.26	0.66
V-74	10.0	1.78	54.6	3.6	55.7	29.5	2.22	22.82	13.3	62.7	52.5	0.55	0.72
V-76	11.4	2.90	53.7	6.5	62.8	17.0	3.88	42.0	13.0	73.1	62.7	0.44	0.66
V-77	-	-	-	-	-	3.6	28.6	23.1	20.5	8.4	81.7	1.05	9.00
V-77A	-	-	-	-	-	6.1	27.8	19.4	33.7	11.9	81.7	1.05	9.00
V-78	11.1	1.6	48.2	4.2	57.6	16.3	2.1	38.0	8.0	66.7	60.8	0.44	0.61
V-79	12.6	2.98	47.6	7.5	62.3	19.1	3.2	37.7	12.1	74.7	59.7	0.46	0.71
V-80	8.6	1.80	56.6	3.0	51.7	27.1	2.2	24.6	11.3	70.9	58.5	0.37	0.55
V-81	-	-	-	-	-	16.5	10.96	27.2	38.9	51.5	59.3	0.18	1.08
V-82	6.2	7.64	51.2	10.1	34.5	9.6	10.2	47.8	20.8	49.9	58.8	0.20	0.87
V-83	-	-	-	-	-	8.1	9.18	44.9	15.6	40.9	75.2	1.86	1.39

(F) CYCLIC TESTS

Various cyclic tests employing different procedures were performed on several occasions throughout the testwork period. Tests V44 and V47* were exploratory tests based on the flowsheets and reagent balance developed from the "average" grade sample. These two tests were identical except for some adjustment of reagent quantities in test V47 from the results of test V44.

Test V75 was performed employing a new flowsheet. This flowsheet incorporated lead middlings regrinding in the primary grind and a separate regrind on the zinc rougher concentrate. There was found to be a circulating load of 33% in the lead roughing circuit.

Due to the very fine dissemination of the sphalerite a following cyclic test (V-84) was performed with very fine grinding. The primary grind was 80.5% passing 325 mesh and the concentrates were reground to 100% passing 325 mesh. This test was more successful than the others producing a lead concentrate of 57.2% lead and 10.27% zinc representing 79.6% of the lead. The zinc

* both were reported in Vangorda report No. 4.

This paragraph does not agree with the text report at back of this report.

3.
concentrate assayed 68.4% and 2.26% lead at a zinc recovery of 83.2%. Some sliming of concentrates was noticed.

A table of results and flowsheets appears on the following pages.

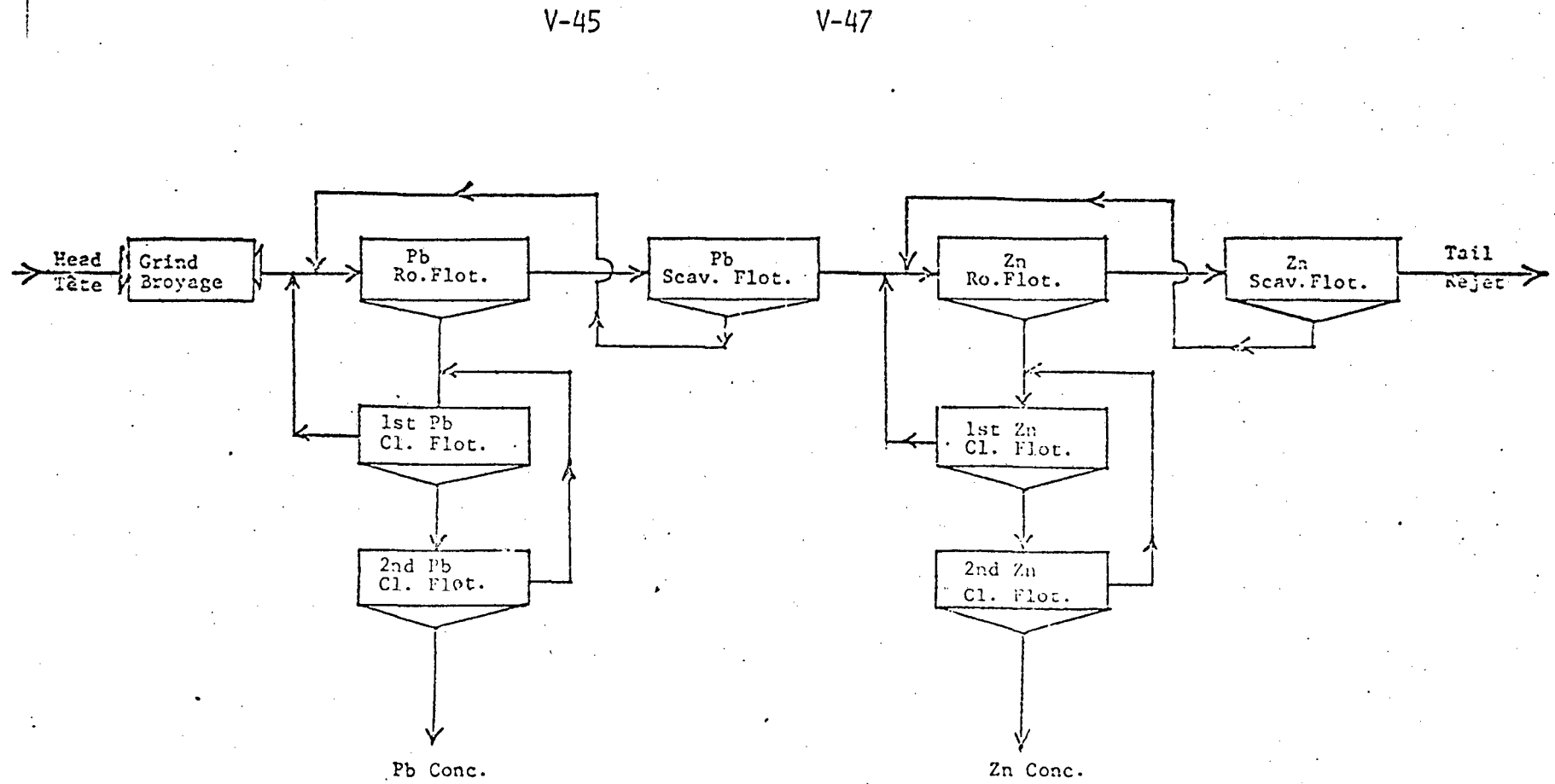
TABEAU DES RESULTATS
DES TEST CYCLIQUES

	S-325M	HEAD		2nd Pb Cl. Conc.				Pb Ro. Conc.					
		Assays		%Wt.	Assays		% Dist.		%Wt.	Assays		% Dist.	
		Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn
*V-44	66.0	4.08	8.17	9.1	37.2	13.8	83.1	15.4	18.8	22.2	12.8	69.7	22.3
*V-47	70.0	6.22	10.46	23.2	25.0	14.0	93.2	31.1	14.5	25.3	11.0	77.0	18.9
V-54	71.0	5.24	9.38	15.9	26.0	13.6	78.9	23.0	19.9	23.2	13.3	88.1	28.1
V-75	51.5	4.90	9.16	5.8	56.5	10.94	66.9	7.1	8.6	32.9	15.0	43.5	12.3
V-84	80.5	5.32	8.92	7.4	57.2	10.27	79.6	8.5	17.9	23.6	18.0	73.9	21.3

	2nd Zn Cl. Conc.					Zn Ro. Conc.				Retet			
	%Wt.	Assays		Dist.		%Wt.	Assays		Dist.		%Wt.	Assays	
		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn
V-44	8.9	2.14	52.4	4.7	57.1	8.7	.30	43.8	4.4	35.3	82.0	0.61	2.74
V-47	13.9	1.48	48.6	3.3	64.6	33.4	1.37	16.13	9.6	64.0	62.9	0.34	0.72
V-54	10.5	0.80	45.4	1.6	50.8	16.1	0.93	32.2	2.9	55.3	51.2	0.23	0.51
V-75	17.4	5.43	44.4	19.3	84.3	45.5	3.94	15.5	27.6	67.5	76.8	0.75	0.89
V-84	12.3	2.26	58.72	5.2	80.9	26.9	4.68	43.1	22.0	76.5	80.3	1.01	1.17

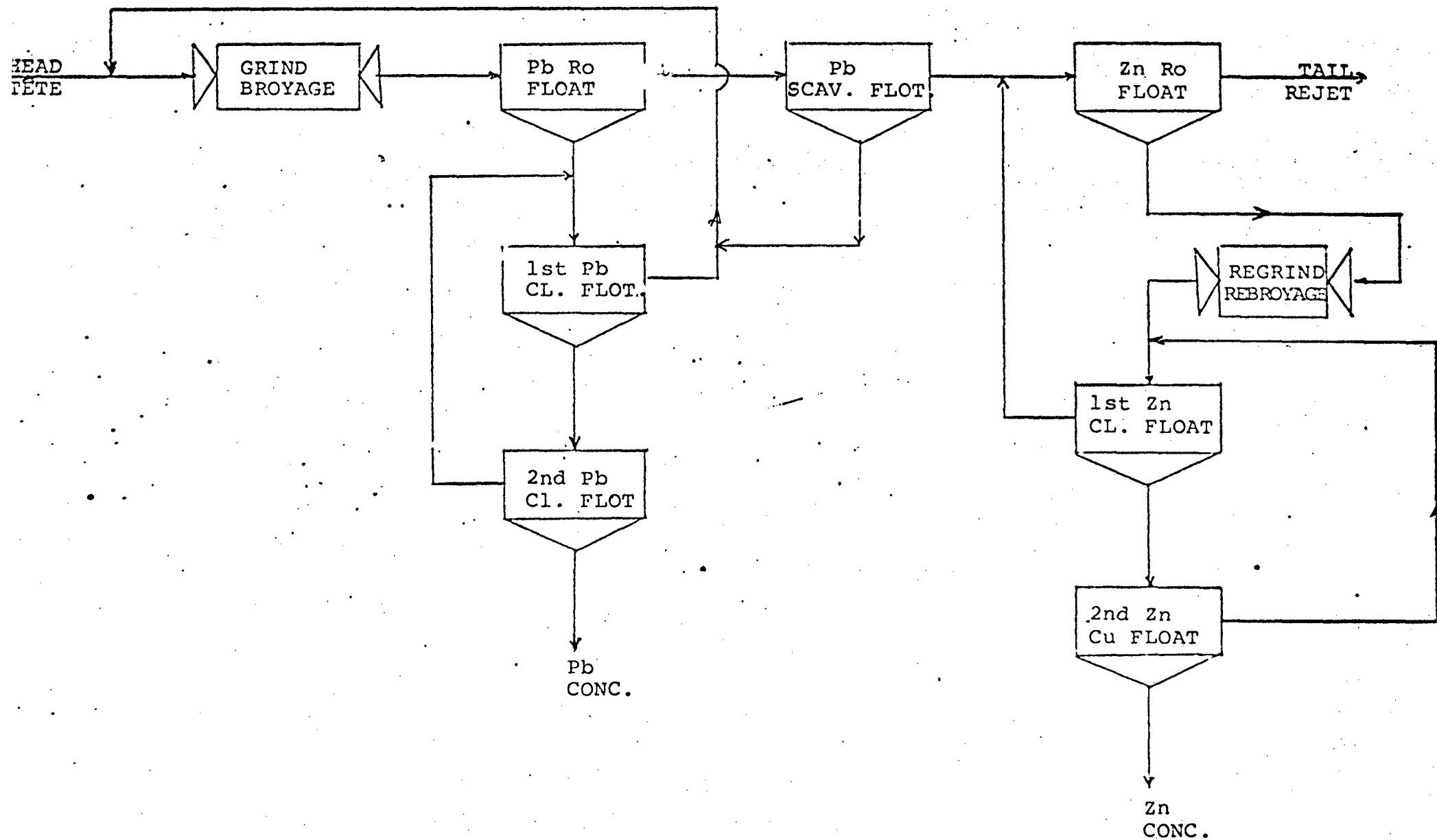
* Tests inclus dans le rapport No. 4.

PROCEDURE DES TESTS CYCLIQUE DE FLOTTATION (LOCKED TEST)



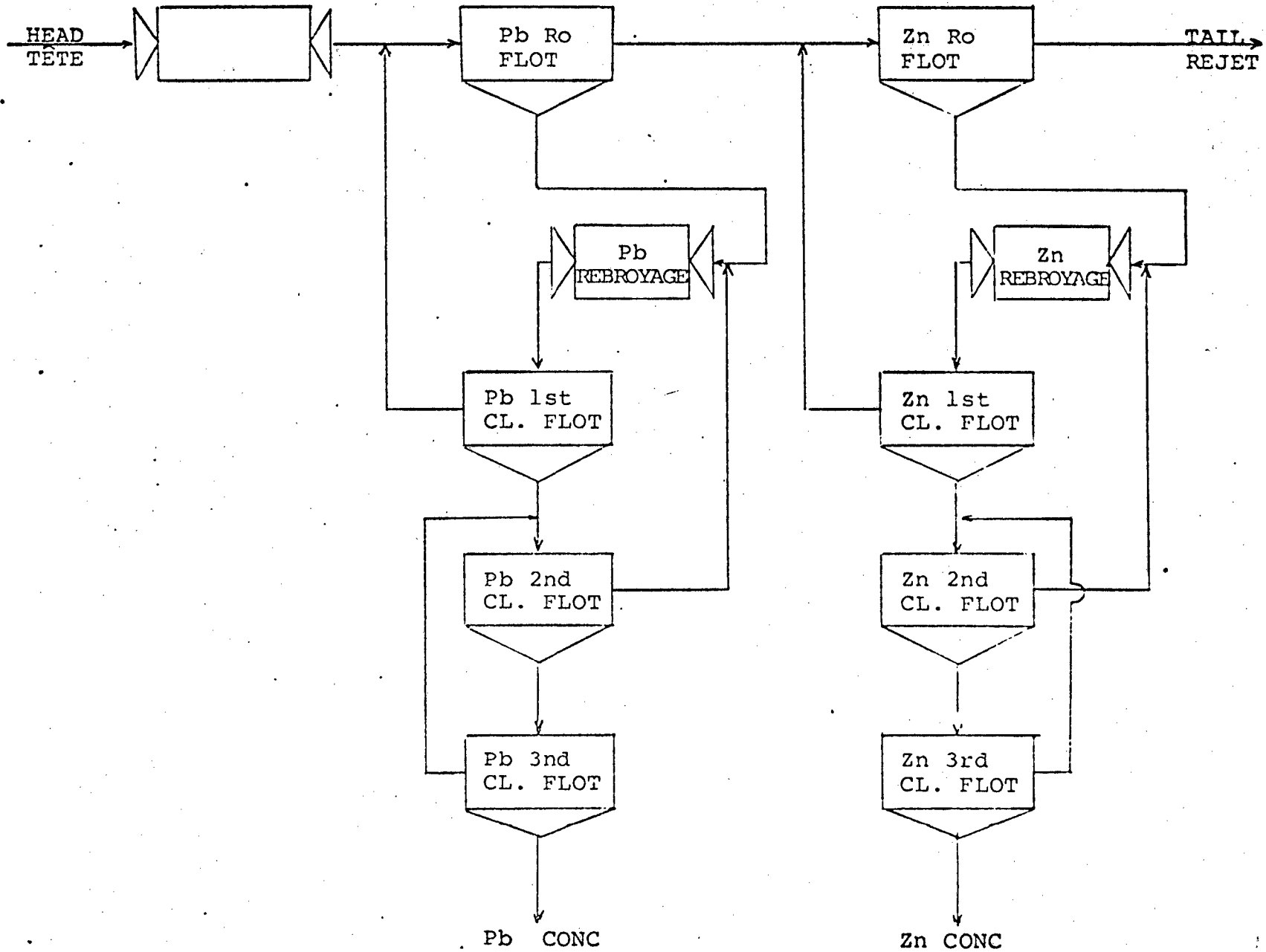
PROCEDURE DU TEST CYCLIQUE

V-75



PROCEDURE DU TEST CYCLIQUE

V-84



(G) TABLE OF COMPLETE RESULTS OF ALL TESTS DISCUSSED IN THIS REPORT

1 Dist.	2nd Zn Cl. Conc.							Zn. Res. Conc.					Pb. Res.		
	Dist.		Wt.	Assays		Dist.		Wt.	Assays		Dist.		Wt.	Assays	
	Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn	Pb	Zn		Pb	Zn
-	-	8.9	2.14	52.4	4.7	57.1	-	-	-	-	-	32.0	0.51	0.74	
-	-	13.9	1.48	48.6	3.3	64.6	-	-	-	-	-	62.9	0.34	0.72	
3	68.1	28.1	10.5	0.80	45.4	1.6	50.8	16.1	0.93	32.2	2.9	55.3	51.2	0.23	0.51
-	-	17.4	5.47	44.4	19.3	84.3	-	-	-	-	-	76.8	0.75	0.53	
7	61.0	38.7	9.0	2.92	12.08	4.8	11.2	18.2	2.34	7.6	7.8	14.3	36.1	0.26	0.64
9	82.5	20.4	-	-	-	-	-	15.1	1.28	40.2	3.6	64.8	52.4	0.23	0.62
7	82.8	21.3	8.1	0.78	50.7	7.5	59.8	16.8	1.1	30.8	3.6	54.6	51.7	0.26	0.54
9	82.5	20.4	-	-	-	-	-	15.1	1.28	40.2	3.6	64.8	53.4	0.23	0.52
5	88.8	30.3	-	-	-	-	-	20.3	0.93	24.3	3.8	50.7	41.7	0.23	0.54
5	27.3	26.4	-	-	-	-	-	22.0	0.92	22.2	4.0	54.7	35.2	0.25	0.55
6	84.1	23.0	-	-	-	-	-	14.3	1.18	39.1	3.5	61.8	53.7	0.38	0.56
8	79.7	14.7	11.1	1.32	48.8	3.1	53.9	16.7	1.53	26.8	5.5	61.1	59.9	0.33	0.53
9	87.7	25.8	-	-	-	-	-	16.4	0.95	34.4	3.1	59.6	54.1	0.28	0.54
4	86.4	27.2	-	-	-	-	-	14.2	0.80	32.5	2.2	49.3	42.9	0.23	0.55
4	83.3	22.7	-	-	-	-	-	19.3	1.05	26.8	4.3	54.0	32.3	0.27	0.53
7	78.2	20.4	12.0	1.42	41.0	3.3	50.1	34.5	1.05	16.9	7.1	59.2	33.6	0.35	0.54
1	66.0	12.2	8.1	1.46	57.5	2.4	50.1	24.1	1.75	25.2	9.7	66.5	57.4	0.54	0.74
7	80.8	15.3	11.0	0.88	46.3	2.0	51.5	18.1	1.07	31.1	4.0	57.0	42.6	0.23	0.56
4	43.2	6.5	10.7	2.01	50.5	4.3	54.3	19.0	2.35	34.9	9.0	65.7	62.3	0.34	0.54
8	65.2	22.4	5.8	1.58	56.8	1.9	33.8	25.3	2.21	21.1	11.4	54.8	52.6	0.57	0.75
4	25.6	5.6	12.8	3.90	49.3	9.9	64.3	33.5	3.70	22.2	24.5	75.6	54.4	0.55	0.73
2	90.3	26.0	9.3	0.50	51.8	0.9	50.2	18.0	0.62	30.7	2.1	57.7	44.3	0.32	0.55
9	86.6	84.3	-	-	-	-	-	7.1	4.88	16.6	3.6	7.3	32.9	0.26	0.55
9	60.4	11.5	10.0	1.78	54.6	3.6	55.7	29.5	2.22	22.22	13.3	63.7	52.5	0.55	0.72
-	-	11.4	2.90	53.7	6.5	62.8	17.0	3.88	42.0	13.0	73.1	62.7	0.44	0.65	
82	20.5	4.1	-	-	-	-	-	3.6	28.6	23.1	20.5	8.4	21.7	1.25	9.23
96	8.3	1.7	-	-	-	-	-	6.1	27.2	15.4	33.7	11.9	21.7	1.25	9.23
5	82.9	25.9	11.1	1.6	48.2	4.2	57.6	16.3	2.1	38.0	8.0	66.7	60.8	0.44	0.61
6	62.5	10.2	12.6	2.98	47.6	7.5	62.3	19.1	3.2	37.7	12.1	74.7	59.7	0.46	0.71
8	84.4	25.8	8.6	1.80	56.6	3.0	51.7	27.1	2.2	24.6	11.3	70.9	56.5	0.37	0.55
4	42.1	16.5	-	-	-	-	-	16.5	10.96	27.2	32.9	51.5	53.1	0.13	1.03
9	15.5	15.3	6.2	7.64	51.2	10.1	34.5	9.6	10.2	47.8	20.8	49.9	53.8	0.23	0.87
0	8.7	20.2	-	-	-	-	-	8.1	9.18	44.9	15.6	40.9	75.2	1.35	1.39
1	86.8	30.1	6.3	1.5	51.9	1.7	34.3	28.4	1.2	13.2	5.9	44.1	34.4	0.39	0.44
0	85.6	30.7	-	-	-	-	-	19.3	1.14	23.6	4.4	43.9	31.7	0.26	0.73
6	85.2	25.6	11.8	1.20	39.7	2.5	52.8	19.8	1.2	26.2	4.5	52.5	50.5	0.32	0.43
9	83.6	21.3	9.8	1.30	52.7	2.4	51.8	20.1	1.7	32.1	6.5	64.8	53.9	0.26	0.53
3	86.6	21.8	9.1	0.88	56.47	1.6	51.8	15.8	1.09	40.0	3.4	63.6	57.1	0.32	0.54
4	82.0	20.0	10.1	1.10	52.70	2.1	53.8	18.3	1.14	35.17	3.9	65.2	57.7	0.34	0.54
5.0	73.9	21.3	12.3	2.24	58.72	5.2	80.9	26.9	4.68	43.1	22.0	76.5	80.3	1.01	1.17

minutes de flottation

A P P E N D I X

CONDITION AND CALCULATION
DETAILS OF EACH TEST

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 17-02-75

SAMPLE NO.: High Grade TEST NO.: V-48

CHARGE GMS: 2000 gr

REMARKS: Finesse de broyage vs taux de recouvrement

Screen Analyse	Weight GMS	% Weight	% Cum	Pass
+65				
-65 + 100				
-100 + 150		.5		99.5
-150 + 200		5.0		94.5
-200 + 270		11.5		83.0
-270 + 325		15.0		68.0
- 325		68.0		
TOTAL				

*	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuCO3	Mibc	CF-98	SO2		
Grind	14	70		.30	1.0												
Pb Cond.	3	25	8.5				.94			.03							To Ph. 5.3
Pb Ro+Scav.F.	9 1/2	25	8.5							.08							
1st Pb Cl.Fl.	4	20	11.0	.08			.25			.03							
2nd Pb Cl.Fl.	3	12	11.0	.06			.06			.01							
Zn Cond.	4	24	11.0	1.6			.46				.05	1.0					
Zn Ro+Scav F.	7	24	11.0								.07						
1st Zn Cl.Fl.	3	10	11.0				.15				.015						
2nd Zn Cl.Fl.	2	8	11.0				.04				.005						

Metallurgical Balance			Assay % or Oz./Ton							%Distribution					
Product	GMS	%Wt.	Pb	Zn	Ag	Cd	Fe	Hg PPM	Pv				Pb	Zn	Ag
2nd Pb Cl Conc	83	4.2	51.0	10.7	19.67	.019	9.1	188	18.67				40.9	4.5	28.9
Pb Ro Conc.	313	15.7	28.1	13.9	13.8								83.6	21.3	76.2
O'ill Pb Conc.	425	21.3	22.2	14.5	11.1								89.8	30.6	83.1
2nd Zn Cl Conc	195	9.8	1.3	52.7	1.3	.060	9.1	420	14.16				2.4	51.8	4.6
Zn Ro Conc.	401	20.1	1.7	32.1	1.4								6.5	64.8	9.7
O'ill Zn Conc.	495	27.8	1.4	23.7	1.2								7.5	66.3	11.4
Tail	1,076	53.9	.26	.58	.29								2.7	3.2	5.5
Head	1,996		5.19	9.94	2.84								100.0	100.0	100.0

MORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA **DATE:** 17-02-75
SAMPLE NO.: High Grade **TEST NO.:** V-49
CHARGE GMS: 2000 gr
REMARKS: Finesse de broyage vs taux de recouvrement

Analyse	GMS	Weight	Cum	Pa
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.5
-200 + 270		8.5		89.0
-270 + 325		15.0		74.0
- 325		74.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CVSO4	Mibc	CF-92	SO2		
Grind	17	70		.30	1.0												
Pb Cond.	3	25	8.9				1.0				.03					-	10 Pb 5.3
Pb Ro+Scav F.	9	25	8.9								.09					-	
1st Pb Cl Fl.	4	20	11.0	.08			.21				.03					-	
2nd Pb Cl. Fl	3	12	11.1	.06			.07				.01					-	
Zn Cond.	4	24	11.0				.65					.05	1.0			-	
Zn Ro+Scav Fl	7	24	11.0				.35					.07				-	
1st Zn Cl. Fl	3	10	11.0				.10					.015				-	
2nd Zn Cl. Fl	2	8	11.0				.04					.005				-	

Metallurgical Balance			Assay % or Oz./Ton					%Distribution						
Product	GMS	%Wt.	Pb	Zn	Ag	Fe	Cd	Hg _{PPM}	Cu	Py		Pb	Zn	Ag
2nd Pb Cl Conc	129	6.5	46.2	13.7	20.9	10.2	.018		.74	18.9		58.2	8.9	47.7
Pb Ro Conc	320	16.0	28.2	13.3	13.4							86.6	21.8	76.2
ALL Pb Conc	449	22.5	21.3	13.3	10.5							92.2	30.5	83.7
2nd Zn Cl Conc	182	9.1	.88	56.5	1.3	7.4	.074	500	.02	9.08		1.6	51.8	4.1
Zn Ro Conc.	316	15.8	1.1	40.0	1.4							3.4	63.6	7.7
ALL Zn Conc	409	20.5	1.1	32.0	1.4							4.3	65.8	10.4
Zn Tail	1141	57.1	.32	.64	.29							3.6	3.7	5.9
Head	1999		5.12	9.93	2.82							100.0	100.0	100.0

MORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 18-02-75

SAMPLE NO.: High Grade TEST NO.: V-50

SCALE GMS: 2000 gr

MARKS: Finesse de broyage vs taux de recouvrement

SCREEN Analyse	GMS	Weight	Cum	Pa
+65				
-65 + 100				
-100 + 150				
-150 + 200		1.5		98.
-200 + 270		6.0		92.
-270 + 325		14.0		78.
- 325		78.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuSO4	Mibo	CF-92	SO2		
Grind	19	70		.30	1.0												
Pb Cond.	3	25	8.6				1.09			.03							to Ph 5.3.
Pb Ro+Scav F.	9	25	8.6							.09							
1st Pb Cl. Fl	4	20	11.1	.08			.21			.03							
2nd Pb Cl. FL	3	12	11.1	.06			.05			.01							
Zn Cond.	4	24	11.0				1.54				.05	1.0					
Zn Ro+Scav F.	7	24	11.0				.36				.08						
1st Zn Cl. Fl	3	10	11.0				.13				.015						
2nd Zn Cl. Fl	2	8	11.0				.05				.005						

Metallurgical Balance			Assay % or Oz./Ton							% Distribution					
Product	GMS	%Wt.	Pb	Zn	Ag	Cd	Fe	Hg PPM	Py				Pb	Zn	Ag
2nd Pb Cl. Cond	136	6.87	45.2	12.5	20.26								57.7	8.6	49.0
Pb Ro Conc	308	15.5	28.8	13.4	13.5								82.0	20.0	74.1
O'LL Pb Conc	433	21.8	22.9	13.5	10.8								91.6	28.6	82.9
2ND Zn Cl Cond	201	10.1	1.1	52.7	1.4	.059	9.1	350	12.98				2.1	53.8	5.0
Zn Ro Conc.	365	18.3	1.14	35.2	1.4								3.9	65.2	9.2
O'LL Zn Conc	468	23.5	1.12	28.5	1.34								4.9	67.6	11.2
Zn Tail	1,090	57.7	.34	.64	.29								3.7	3.7	5.9
Head	1,991		5.35	9.89	2.82								100.0	100.0	100.0

YORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 21-02-75

SAMPLE NO.: High Grade TEST NO.: V-51

WEIGHT GMS: 2000 gr

REMARKS: remplacement de sulfate de zinc par le sulfite de sodium.

Screen Analyse	GMS	Weight	Grav	Pa
+65				
-65 + 100				
-100 + 150		.5		99.5
-150 + 200		5.0		94.5
-200 + 270		13.0		81.0
-270 + 325		7.5		73.5
- 325		73.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuSO4	Mibc	CF-98	SO2		
Grind	18	70		.30		1.0											
Pb Cond.	3	25	8.8				.90				.03						To Pb 5.3
Pb Ro Flt.	5	25	8.8								.04						
Pb. Stav Flt.	4	24	8.6								.05						
Zn cond.	4	24	11.0				1.5					1.0	-				
Zn Ro Flt.	4	24	11.0								.09		-				
Zn Scav. Flt.	3	24	11.0				.40				.04		-				

Metallurgical Balance			Assay % or Oz./Ton					%Distribution					
Product	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg PPM				Pb	Zn	Ag
Pb Ro Conc.	295	14.8	30.0	12.9	13.8						82.5	20.4	63.7
D'LL Pb Conc.	428	21.5	22.2	12.6	12.2						88.6	29.0	81.4
Zn Ro conc.	301	15.1	1.28	40.2	2.4						3.6	64.8	11.2
D'LL Zn Conc.	381	19.1	2.34	32.9	2.2						8.3	67.1	12.8
Zn Tail	183	59.4	.28	.62	.31						3.1	3.9	5.7
Head	1192		5.38	9.36	3.21						100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA

DATE: 21-02-75

SAMPLE NO.: High Grade

TEST NO.: V- 52

CHARGE GMS: 2000 gr

REMARKS: Pas de stage de dioxyde de soufre, remplacé par le sulfate
de zinc et le sulfite de sodium.

Screen Analyse	GMS	Weight	Cum	Pa
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.5
-200 + 270		8.0		89.5
-270 + 325		16.0		73.5
- 325		73.5		
TOTAL				

REAGENTS lbs./ton

	Time Mins.	% Solids	pH	NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuSO4	Mibc	CF-98	SO2
Grind	18	70		.30	.5	.5									
Pb Cond.	0	25													
Pb Ro Flt.	5	25	8.9				.26			.07					
Pb Scav. Flt.	4	24	8.5							.05					
Zn Cond.	4	24	11.0				1.37					1.0			
Zn Ro Flt.	4	24	11.0								.09				
Zn Scav. Flt.	3	24	11.0				.30				.04				

Metallurgical Balance

Assay % or Oz./Ton

Units

%Distribution

Product	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg PPM				Pb	Zn	Ag
Pb Ro Conc.	381	19.4	22.8	12.5	11.2						87.3	26.4	78.3
O'LL Pb Conc.	645	32.8	14.4	11.5	7.3						93.3	41.1	85.9
Zn Ro Conc.	433	22.0	.92	22.8	1.17						4.0	54.7	9.3
O'LL Zn Conc.	629	32.0	.8	16.2	1.0						4.9	56.4	11.4
Zn Tail	693	35.2	.25	.65	.22						1.7	2.5	2.8
Head ..	1967		5.07	9.17	2.78						100.0	100.0	100.0

VANGORDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-53

CHARGE GMS: 2000 gr

REMARKS: finesse de broyage vs taux de recouvrement

Analyse	GMS	Weight	Cum	Pas
+65				
-65 + 100				
-100 + 150		1.5		98.5
-150 + 200		9.5		89.0
-200 + 270		14.0		75.0
-270 + 325		15.0		60.0
- 325		60.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuSO4	Mibc	CF-98	SO2		
Grind	11	70		.30	1.0												
Pb Cond.	3	25	9.0				1.15			.03				-		To Pb	5.3
Pb Ro+Scav. F	9	25	9.0							.08				-			
1st Pb Cl. Fl	4	20	11.0	.08			.20			.03				-			
2nd Ph Cl. Fl	3	12	11.1	.06			.06			.01				-			
Zn Cond.	4	24	11.0				1.41				.05	1.00		-			
Zn Ro+Scav F.	7	24	11.0				.42				.07			-			
1st Zn Cl. Fl.	3	10	11.0				.11				.015			-			
2nd Zn Cl. Fl	2	8	11.0				.06				.005						

Metallurgical Balance			Assay % or Oz./Ton				Units			ZDistribution		
Product	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg	ppm		Pb	Zn	Ag
2nd Pb Cl Conc	113	5.7	43.8	14.1	18.67					47.8	9.1	38.1
Pb Ro Conc.	359	18.0	24.7	12.6	11.6					85.2	25.6	75.0
O'LL Pb Conc	519	26.0	18.4	12.5	9.0					91.7	36.6	83.7
2nd Zn Cl Conc	235	11.8	1.20	39.7	1.22					2.5	52.8	5.2
Zn Ro Conc.	395	19.8	1.2	26.2	1.2					4.5	58.5	8.5
O'LL Ro Conc	470	23.5	1.2	22.6	1.2					5.2	59.8	10.0
Zn Tail	1007	50.5	.32	.63	.35					3.1	3.6	6.3
Head			5.23	8.89	2.79					100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-54

WEIGHT GMS: 2000 gr

REMARKS: Test standard du test cyclique V-47

Analyse	GMS	Weight	Assay
+65			
-65 + 100			
-100 + 150		.5	99.5
-150 + 200		4.0	95.5
-200 + 270		10.0	85.5
-270 + 325		14.5	71.0
- 325		71.0	
TOTAL			

Sample	Time Mins.	% Solids	pH	REAGENTS lbs./ton												
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-317	CuSO4	MIBC	CF-98	SO2	
Grind	15 1/2	70		.45												
Pb Cond.	3	25					.95	.035	.02		.001			-	To Ph 5.3	
Pb Ro+Scav F.	11	25	9.0								.035			-		
1st Pb Cl. Fl	6	20	11.0	.08			.20	.025						-		
2nd Pb Cl. Fl	5 1/2	12	11.0	.06			.04	.009						-		
Zn Cond	4	24	11.1				1.7				.03	1.25	-			
Zn Ro+Scav F.	11	24	11.1								.07	.10	-			
1st Zn Cl. Fl	5	10	11.0				.11				.006		-			
2nd Zn Cl. Fl	4	8	11.0				.04				.003		-			

Product	Metallurgical Balance		Assay % or Oz./Ton					Units			% Distribution		
	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg PPM				Pb	Zn	Ag
2nd Pb Cl. Conc	317	15.9	26.0	13.6	11.34						78.9	23.0	69.9
Pb Ro Conc.	396	19.9	23.2	13.3	10.2						88.1	28.1	78.7
O'LL Pb Conc.	553	27.8	17.7	13.6	8.1						94.1	40.4	87.2
2nd Zn Cl Conc	209	10.5	.80	45.4	1.01						1.6	50.8	4.1
Zn Ro Conc.	320	16.1	.93	32.2	1.0						2.9	55.3	6.2
O'LL Zn Conc.	419	21.0	1.2	33.1	1.3						3.7	56.9	7.8
Zn Tail	1020	51.2	.23	.51	.25						2.3	2.8	5.0
Head	1992		5.24	9.38	2.58						100.0	100.0	100.0

KORANDA ORE DRESSING LABORATORY

OBJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-55

WEIGHT: 2000 gr

REMARKS: Le montant de dioxyde était augmenté

Analyse	GMS	Weight	Con	P.
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97
-200 + 270		7.0		90
-270 + 325		15.0		75
- 325		75.5		
TOTAL				

	Time Mins.	Z Solid:	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CVSO4	Mibc	CF-98	SO2		
Ind	18	70		.30	1.0												
b Cond.	3	25	8.9				1.85				.03						4.6
b Ro Flt.	5	25	8.9								.04						
b Scav. Flt.	5	24	8.5								.05						
n Cond.	4	24	11.0				1.7					.05	1.0				
n Ro Flt.	4	24	11.0									.03					
n Scav. Flt.	3	24	11.0				.45					.04					

Product	Metallurgical Balance		Assay & or Oz./Ton					Units				Z Distribution		
	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg PPM				Pb	Zn	Ag	
Pb Ro Conc.	331	16.6	24.2	12.6	12.36						84.1	23.0	76.9	
ALL Pb Conc.	446	22.3	19.4	12.7	10.2						90.6	31.1	85.1	
Zn Ro Conc.	285	14.3	1.18	39.4	1.21						3.5	61.8	6.5	
ALL Zn Conc.	350	19.0	1.20	31.0	1.16						4.8	64.7	8.3	
Zn Tail	1174	58.7	.38	.66	.30						4.7	4.2	6.6	
Head ..	2000	100.0	4.78	9.11	2.67						100.0	100.0	100.0	

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-55

WARGE GMS: 2000 gr

REMARKS: Le montant de dioxyde était augmenté

Analyse	GMS	Weight	Con	Pa
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.
-200 + 270		7.0		90.
-270 + 325		15.0		75.
- 325		75.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CVSO4	Mibc	CF-92	SO2		
Grind	18	70		.30	1.0												
Pb Cond.	3	25	8.9				1.85				.03						6 Ph 4.6
Pb Ro Flt.	5	25	8.9								.04						
Pb Scav. Flt.	5	24	8.5								.05						
Zn Cond.	4	24	11.0				1.7					.05	1.0				
Zn Ro Flt.	4	24	11.0									.03					
Zn Scav. Flt.	3	24	11.0				.45					.04					

Product	Metallurgical Balance		Assay % or Oz./Ton					Units			% Distribution		
	GMS	%Wt.	Pb	Zn	Ag	Cd	Hg PPM				Pb	Zn	Ag
Pb Ro Conc.	331	16.6	24.2	12.6	12.36						84.1	23.0	76.9
O'LL Pb Conc.	446	22.3	19.4	12.7	10.2						90.6	31.1	85.1
Zn Ro Conc.	285	14.3	1.18	39.4	1.21						2.5	61.8	6.5
O'LL Zn Conc.	390	19.0	1.20	31.0	1.16						4.8	64.7	8.3
Zn Tail	1174	58.7	.38	.66	.30						4.7	4.2	6.6
Head ..	2000	100.0	4.78	9.11	2.67						100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-55

WEIGHT GMS: 2000 gr

REMARKS: Le montant de dioxyde était augmenté

Analyse	GMS	Weight	Cum	Pa
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.
-200 + 270		7.0		90.
-270 + 325		15.0		75.
- 325		75.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CVSO4	Mibc	CF-98	SO2		
Grind	18	70		.30	1.0												
Pb Cond.	3	25	8.9				1.85			.03							4.6
Pb Ro Flt.	5	25	8.9							.04							
Pb Scav. Flt.	5	24	8.5							.05							
Zn Cond.	4	24	11.0				1.7				.05	1.0					
Zn Ro Flt.	4	24	11.0								.03						
Zn Scav. Flt.	3	24	11.0				.45				.04						

Product	Metallurgical Balance		Assay % or Oz./Ton				Hg PPM	Units			% Distribution		
	GMS	%Wt.	Pb	Zn	Ag	Cd		Pb	Zn	Ag	Pb	Zn	Ag
Pb Ro Conc.	331	16.6	24.2	12.6	12.36						84.1	23.0	76.9
O'LL Pb Conc.	446	22.3	19.4	12.7	10.2						90.6	31.1	85.1
Zn Ro Conc.	285	14.3	1.18	39.4	1.21						3.5	61.8	6.5
O'LL Zn Conc.	380	19.0	1.20	31.0	1.16						4.8	64.7	8.3
Zn Tail	1174	58.7	.38	.66	.30						4.7	4.2	6.6
Head ..	2000	100.0	4.78	9.11	2.67						100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 28-02-75

SAMPLE NO.: High Grade TEST NO.: V-56

WEIGHT: 2000 gr

REMARKS: Addition des réactifs après le stage du SO₂.

ANALYSE	GMS	Weight	Cum	Pas
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.0		98.0
-200 + 270		6.5		91.5
-270 + 325		14.5		77.0
- 325		77.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R-303	R-343	CVSO ₄	Mirc	CF-92	SO ₂		
Grind	18	70															
Pb Cond.	12	25		.30	1.0		1.45										To Ph 5.3
Pb Ro Flt.	5	25	8.9								.07						
Pb Scav. Flt.	4	24	8.5								.05						
Zn Cond.	4	24	11.0				1.75					.05	1.0				
Zn Ro Flt.	4	24	11.0									.03					
Zn Scav. Flt.	3	24	11.0				.40					.04					

Metallurgical Balance				Assay % or Oz./Ton							% Distribution			
Product	Mins	GMS	%Wt.	Pb	Zn	Ag	Hg(ppm)	Cd	Fe	Py		Pb	Zn	Ag
Pb Ro Con	0.2	97	4.8	52.1	98.8	23.0	10.2	.015	6.7	13.04		53.6	4.7	42.0
Pb Ro Con	2.5	135	6.7	18.2	15.0	11.7						26.1	10.0	29.9
Pb Ro Con.	232		11.6	32.1	12.8	16.3						79.7	14.7	82.0
O'LL Pb Conc.	368		18.3	22.7	18.5	11.8						88.8	33.7	82.1
Zn Ro Conc	0.2	223	11.1	1.32	48.8	1.38	42.0	.059	7.2	10.41		3.1	53.9	5.8
Zn Ro Conc	2.4	112	5.6	1.94	13.0	1.35						2.3	7.2	2.9
Zn Ro Conc.	335		16.7	1.53	36.8	1.37						5.5	61.1	8.7
O'LL Zn Conc.	437		21.8	1.5	29.0	1.30						6.9	62.8	10.8
Zn Tail	1202		59.9	.33	.58	.31						4.2	3.5	7.1
Head	2097			4.67	10.06	2.63						100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: VANGORDA DATE: 17-03-75

SAMPLE NO.: High Grade TEST NO.: V-57

CHARGE GMS: 2000gr

REMARKS: Remplacer chaux par la soude dans une nouvelle
procédure

Screen Analyse	Weight GMS	% Weight	% Cum	Passing
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.0		98.0
-200 + 325		8.0		90.0
- 325 + 400		15.5		74.5
- 400		74.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF404	R-303	R-343	CuSO ₄	Mibc	CF-98	So ₂ 80 cc/l Ph 1.5	Soda Ash	Dithio- mete	
Grind	18	70		.30	1.2												
Pb Conc.	3	25	8.7							.03						1.9	
Pb Ro+Scav. F.	9	25	8.7		.5					.08							
1st Pb Cl Fl.	3	20	10.5	.08	.5					.015						3.0	
2nd Pb Cl. Fl.	3	12	10.5	.06	.3					.01						1.3	
Zn Cond.	4	24	11.1				2.8				.05	1.25					2.0
Zn Ro+Scav F.	7	24	11.1	.30						.07							
1st Zn Cl. Fl.	3	10	11.2				.25			.015							.2
2nd Zn Cl. Fl.	2	8	11.0				.06			.005							

Metallurgical Balance			Assay				Units				%Distribution			
Product	GMS	Wt.	Pb	Zn	Ag					Pb	Zn	Ag		
2nd Pb Cl Conc	191	9.6	36.6	11.98	13.53					66.5	12.0			
Pb Ro Conc.	405	20.3	23.5	13.2						90.3	28.0			
O'LL Ph Conc.	563	28.3	17.6	12.7						94.3	37.5			
2nd Zn Cl Conc	186	9.3	.50	51.8						0.9	50.2			
Zn Ro Conc.	358	18.0	0.62	25.6						2.1	57.7			
O'LL Zn Conc.	546	27.4	0.58	17.4						3.1	59.5			
Zn Tail	883	44.3	.32	.65						2.7	3.0			
Head	1,992		5.29	9.59						100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda

DATE: .26-03-75

SAMPLE NO.:

TEST NO.: V-59

CHARGE GMS: 2000 gr

REMARKS: Flottation a un bas Ph, pas une très bonne procédure.

Screen Analyse	Weight GMS	% Weight	% Cum	Passi
+65				
-65 + 100				
-100 + 150				
-150 + 200		3.0		97.0
-200 + 270		8.0		89.0
-270 + 325		15.5		73.5
- 325		73.5		
TOTAL				

REAGENTS lbs./ton

	Time Mins.	% Solids	pH	NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R-303	R-343	CuSO4	Mibc	CF-98	SO2
Grind	18	70		.30		1.0								-	
Pb Cond.	3	25	7.8				.5			.03				-	To Ph 5.3
Pb Ro+Scav F.	9	25	7.8							.09				-	
1st Pb Cl. Fl	4	20	8.9	.08			.05			.03				-	
2nd Pb Cl. Fl	3	12	9.0	.06						.01				-	
Zn Cond.	4	24	10.0				.70				.05	1.0		-	
Zn Ro+Scav F.	7	24	10.1				.12				.08			-	
1st Zn Cl. Fl	3	10	10.1				.05				.015			-	
2nd Zn Cl. Fl	2	8	10.1				.02				.005			-	

Metallurgical Balance

Assay

Units

% Distribution

Product	GMS	% Wt.	Pb	Zn	Ag							Pb	Zn	Ag		
2nd Pb Cl Conc	179	9.2	31.4	33.2								52.9	31.6			
Pb Ro Conc	243	12.2	27.3	30.7								61.0	38.7			
O'LL Pb Conc.	518	26.0	18.6	30.5								88.5	82.0			
2nd Zn Cl Conc	182	9.0	2.92	12.08								4.8	11.2			
Zn Ro Conc.	362	18.2	2.34	7.6								7.8	14.3			
O'LL Zn Conc.	754	37.9	1.41	4.0								9.8	15.6			
Zn Tail	718	36.1	.26	.64								1.7	2.4			
Head	1,990		5.46	9.68								100.0	100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 26-03-75

SAMPLE NO.: High grade TEST NO.: V-60

CHARGE GMS: 2000 gr

REMARKS: Flottation a un Ph élevé

Chaux en excès dans le circuit de zinc

Screen Analyse	Weight GMS	% Weight	% Cum	Passi
+65				
-65 + 100				
-100 + 150				
-150 + 200		2		98
-200 + 270		7		91
-270 + 325		14.5		76.5
- 325		76.5		
TOTAL				

	Time Mins.	% Solid	pH	REAGENTS lbs./ton														
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R-303	R-343	CuSO ₄	Mibc	CF-98	SO ₂			
Grind	18	70		.30		1.0												
Pb Cond.	3	25	9.9				.80			.03								To Ph 5.3
Pb Ro+Scav. F	9½	25	9.9							.10								
1st Pb Cl. Fl.	4	20	9.9	.08			.01			.03								
2nd Pb Cl. Fl.	3	12	10.0	.06						.01								
Zn Cond.	4	24	11.7				3.65				0.5	1.0						
Zn Ro.+Scav F	8	24	11.7				.5				.10							
1st Zn Cl. Fl.	3	10	11.7				.47				.015							
2nd Zn Cl. Fl.	2	8	11.7				.25				.005							

Metallurgical Balance			Assay			Units			% Distribution		
Product	GMS	%wt.	Pb	Zn	Ag				Pb	Zn	Ag
2nd Pb Cl Conc	227	11.4	31.6	14.5	14.5				72.6	17.4	60.2
Pb Ro Conc.	292	14.7	28.0	13.7	12.6				82.8	21.3	67.4
O'll Pb Conc	503	25.3	18.1	15.1	8.9				92.5	40.2	82.0
2nd Zn Cl. Conc	161	8.1	.78	50.7	1.05				1.3	43.4	3.1
Zn Ro Conc.	334	16.8	1.1	30.8	1.2				3.6	54.6	7.1
O'LL Zn Conc.	457	23.0	1.0	23.4	1.1				4.8	56.9	9.0
Zn Tail	1,028	51.7	.26	.54	.28				2.7	2.9	5.3
Head	1,988		4.96	9.47	2.74				100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 26-03-75

SAMPLE NO.: High Grade TEST NO.: V-61

CHARGE GMS: 2000 gr

REMARKS: Pareille à V-51, remplace la chaux par la soude dans

le circuit de Pb.

Screen Analyse	WEIGHT GMS	% Weight	% Cum	Passir
+65				
-65 + 100				
-100 + 150				
-150 + 200		2		98
-200 + 270		7		91
-270 + 325		14.5		76.5
- 325		76.5		
TOTAL				

REAGENTS lbs./ton

	Time Mins.	% Solids	pH	NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	Na ₂ CO ₃	AF404	R-303	R-317	R-343	CuSO ₄	Mibc	CF-98 SO ₂		
rind	18	70		.30		1.0											
Pb Cond.	3	25	8.8					2.0		.03						To Ph 5.3	
Pb Ro Flt.	5	25	8.8							.04							
Pb Scav. Flt.	4	24	8.4							.05							
Zn Cond.	4	24	11.0				1.75					.05	1.0				
Zn Ro Flt.	4	24	11.0									.04					
Zn Scav. Flt.	3	24	11.0				.22					.04					

Metallurgical Balance

Assay

Units

%Distribution

Product	GMS	%wt.	Pb	Zn	Ag							Pb	Zn	Ag			
Pb Ro Conc.	378	18.9	23.6	12.9	10.8							87.7	25.8	79.2			
Pb Scav. Conc.	134	6.7	4.1	12.6	2.7							5.4	8.9	7.1			
O'LL Pb Conc.	512	25.6	18.5	12.8	8.7							93.1	34.7	86.3			
Zn Ro Conc.	327	16.4	.96	34.4	1.05							3.1	59.6	6.7			
Zn Scav. Conc.	78	3.9	1.1	5.1	.92							.8	2.1	1.4			
O'LL Zn Conc.	405	20.3	.98	28.8	1.0							3.9	61.7	8.0			
Zn Tail	1,083	54.1	.28	.64	.27							3.0	3.7	5.6			
Head	2,000		5.08	9.47	2.59							100.0	100.0	100.0			

MEMORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 27-03-75
 SAMPLE NO.: High Grade TEST NO.: V-62
 CHARGE GMS: 2000 gr
 REMARKS: Na₂S avec soude, trop collecteur et de CuSO₄, trouble
 avec la mousse.

Screen Analyse	Weight GMS	Weight	Cum	Passi
+65				
-65 + 100				
-100 + 150				
-150 + 200		3		97.0
-200 + 270		8		89.0
-270 + 325		15.5		73.5
- 325		73.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	Na ₂ CO ₃	AF404	R-303	R-317	R-343	CuSO ₄	Mibc	CF-98	Na ₂ S	
Grind	18	70		.30		1.0		1.6									.5
Pb Cond.	3	25	9.8								.03						
Pb Ro Flt.	5	25	9.8								.04						
Pb Scav/ flt	6	24	9.4								.07						
Zn Cond.	4	24	11.0				1.34					.05	1.5				
Zn Ro. Flt.	4	24	11.0									.04					
Zn Scav. Flt.	3	24	11.0				.24					.04					

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	Wt.	Pb	Zn	Ag							Pb	Zn	Ag	
Pb Ro Conc.	379	19.0	23.4	13.4	10.6							86.4	27.2	74.6	
Pb Scav Conc	203	10.2	3.78	16.5	3.2							7.5	18.0	11.9	
Pb O'LL Conc	582	29.2	16.5	14.5	8.0							93.9	45.2	86.5	
Zn Ro Conc.	282	14.2	.80	32.5	1.1							2.2	49.3	5.9	
Zn Scav Conc	274	13.7	.54	1.74	.59							1.4	2.5	3.0	
O'll Zn Conc	556	27.9	.67	17.4	.86							3.7	51.9	8.9	
Zn Tail	855	42.9	.29	.65	.29							2.4	3.0	4.6	
Head	1,993		5.14	9.36	2.69							100.0	100.0	100.0	

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 27-03-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-65

CHARGE GMS: 2000 gr

REMARKS: Broyage versus taux de recouvrement.

Screen Analyse	Weight GMS	Weight	Cum	Pass
+65				
-65 + 100				
-100 + 150		4		96
-150 + 200		17		79
-200 + 270		15.5		63.
-270 + 325		12.5		51.
- 325		51.0		
TOTAL				

	Time Mins.	% Solid	pH	REAGENTS lbs./ton													
				NaCN	ZnSO	Na ₂ SO ₃	Lime	AF242	AF404	R303	R317	R343	CuSO ₄	Mibc	CF98	SO ₂	
Grind	10	70		.30	1.0												
Pb Conc.		25	9.1				.75										75 ^{cc} pi 1.5
Pb Ro Flt.	5	25	9.1							.07							
Pb Scav.Flt.	4	24	8.6							.04							
Zn Cond.	3	24	11.0				1.0						1.0				
Zn Ro Flt.	4	24	11.0										.09				
Zn Scav.Flt.	4	24	11.0				.25						.05				

Metallurgical Balance			Assay			Units			%Distribution		
Product	GMS	Wt.	Pb	Zn	Ag				Pb	Zn	Ag
Pb Ro.Conc.	449	22.6	19.6	12.98	8.98				85.6	30.7	76.3
O'll Pb Conc.	751	37.7	12.8	11.2	6.1				92.9	44.3	86.6
Zn Ro. Conc.	395	19.8	1.14	23.6	1.05				4.1	48.9	7.8
O'll Zn Conc.	608	30.5	0.93	16.62	0.91				5.5	53.3	10.4
Zn Tail	631	31.7	0.26	0.73	0.25				1.6	2.4	3.0
Head	1990	100.0	5.18	9.55	2.66				100.0	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 27-03-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-66

CHARGE GMS: 2000 gr

REMARKS: Na₂S avec chaux

Screen Analyse	Weight GMS	% Weight	% Cum	Pass
+65				
-65 + 100				
-100 + 150				
-150 + 200		3		97.0
-200 + 270		9		88.0
-270 + 325		15.5		72.5
- 325		72.5		
TOTAL				

	Time Mins.	% Solid	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R317	R343	CuSO ₄	Mibc	CF98	Na ₂ S	
Grind	18	70		.30		1.0											.5
Pb Cond.	2	25	9.8				.23										
Pb Ro Flt.	5	25	9.8							.07							
Pb Scav.Flt.	4	24	9.2							.05							
Zn Cond.	3	24	11.0				1.0						1.0				
Zn Ro Flt.	4	24	11.0									.09					
Zn Scav.Flt.	3	24	11.0				0.30					.04					

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	%Wt.	Pb	Zn	Ag							Pb	Zn	Ag	
Pb Ro Conc.	322	16.2	25.1	13.43	11.95							83.5	22.7	72.1	
O'll Pb Conc.	517	25.9	17.25	15.17	8.62							91.7	41.0	83.2	
Zn Ro Zn Conc.	385	19.3	1.08	26.8	1.17							4.3	54.0	8.4	
O'll Zn Conc.	713	35.8	0.84	15.1	0.98							6.1	56.6	13.1	
Zn Tail	763	38.3	0.27	0.60	0.26							2.1	2.4	3.7	
Head	1993	100.0	4.87	9.58	2.68							100.0	100.0	100.0	

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 16-04-75
 SAMPLE NO.: HIGH GRADE TEST NO.: V-67
 CHARGE GMS: 2000 gr
 REMARKS: Rebroyage sur le concentré de zinc avec augmentation de sulfate de zinc

Screen Analyse	Weight GMS	% Weight	% Cum	Pass
+65				
-65 + 100		.5		99.5
-100 + 150		4.5		95.0
-150 + 200		20.0		75.0
-200 + 270		15.5		59.5
-270 + 325		12.5		47.0
- 325		47.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton												Dichromate	
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF88	SO ₂		
Grind	10	70															
Pb Cond.	8	25	9.0	.30	2.5	.60										5.3	
Pb Ro Scav.F.	7	25	9.0							.10							
1st Pb Cl.Flt.	3.5	20	11.4	.08	0.5	.55				.025							
2nd Pb Cl. Flt.	3	12	10.7	.06	0.30	.08				.01							
Zn Cond.	3	24	11.0			2.0						1.0					2.0
Zn Ro Scav.F.	9	24	11.0								.17	0.25					
1st Zn Cl.Flt.	2	10	11.0			0.25					.02	0.5					
2nd Zn Cl.Flt.	2	8	11.0			0.04					.005						

Metallurgical Balance			Assay				Units				%Distribution			
Product	GMS	%wt.	Pb	Zn	Ag					Pb	Zn	Ag		
2nd Pb Cl.Cond.	191	9.7	30.12	12.9						56.7	12.7			
Pb Ro Conc.	291	14.7	27.4	13.7						78.2	20.4			
O'Il Conc.	533	26.9	17.28	13.5						90.2	37.1			
2nd Zn Cl.C.	238	12.0	1.42	40.99						3.3	50.1			
Zn Ro Conc.	684	34.2	1.05	16.86						7.1	59.2			
Zn Tail ...	766	38.6	0.36	0.94						2.7	3.7			
HEAD	1983	100.0	5.15	9.83						100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 16-04-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-68

CHARGE GMS: 2000 gr

REMARKS: Augmentation de sulfide de sodium

Screen Analyse	Weight GMS	Weight	% Cum	Pass
+65				
-65 + 100				
-100 + 150		3.5		96.5
-150 + 200		18.0		78.5
-200 + 270		15.0		63.5
-270 + 325		13.0		50.5
- 325		50.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton														
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF98	Dich.	SO ₂		
Grind	10	70																
Pb Cond.	8	25	9.0	.30		2.5	.65											to pH 5.3
Pb Ro Scav.Fl.	7	25	8.9								.10							
1st Pb Cl.Flt.	4	20	10.9	.08		0.50	.20											
2nd Pb Cl.Flt.	3	12	11.1	.08		0.30	.05			.01								
Zn Cond.	5	24	11.0				1.7					1.0				2.0		
Zn Ro	8	24	11.0								.15							
1st Zn Cl.Flt.	2	10	11.0				0.21				.02	0.5						
2nd Zn Cl.Flt.	2	8	11.0				0.05				.005							

Metallurgical Balance			Assay								%Distribution					
Product	GMS	Wt.	Pb	Zn	Ag	Hg (ppm)	Cd	Fe	Py			Pb	Zn	Ag		
2nd Pb Cl.Conc.	64	3.1	50.4	15.1								32.2	5.1			
Pb Ro Conc.	176	8.5	37.7	13.1								66.0	12.2			
O'Il Pb Conc.	382	18.5	22.3	14.3								84.9	28.9			
2nd Zn Cl.Conc.	167	8.1	1.46	57.5		356	.06	6.4	7.51			2.4	50.1			
Zn Ro Conc.	496	24.1	1.75	25.2								8.7	66.5			
Zn Tail	1185	57.4	0.54	0.74								6.4	4.6			
HEAD	2063	100.0	4.85	9.14								100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda

DATE: 16-04-75

SAMPLE NO.: HIGH GRADE

TEST NO.: V-69

CHARGE GMS: 2000 cr

REMARKS: Standard a V-66, excepter l'emploi du sulfate de zinc
à la place du sulfite de sodium

Screen Analyse	Weight GMS	% Weight	% Cum	Pass:
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.5
-200 + 270		8.0		89.5
-270 + 325		17.0		72.5
- 325		72.5		
TOTAL				

	Time Mins.	% Solid	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF98	Na ₂ S	Dich.	
Grind	18	70		.30	1.0											.5	
Pb Cond.	8	25	9.1														
Pb Ro Scav.F.	8	25	9.1				.30			.11							
1st Pb Cl.Flt.	3	20	10.5	.08	0.3		.20			.02							
2nd Pb Cl.Flt.	3	12	10.9	.06	0.1		.07										
Zn Cond.	3	24	11.0				1.5					1.0					
Zn Ro Scav.Fl.	7	24	11.0				0.25				0.13						
1st Zn Cl.Flt.	2	10	11.0				.10				.02						
2nd Zn Cl.Flt.	2	8	11.0				.02				.005						

Metallurgical Balance			Assay					Units				%Distribution			
Product	GMS	Wt.	Pb	Zn	Hg	Cd	Fe	Py				Pb	Zn	Ag	
2nd Pb Cl.C.	145	7.3	43.4	12.0	114	.021	13.4					66.6	8.9		
Pb Ro Conc.	219	11.0	35.2	13.7								80.8	15.3		
O'11 Pb Conc.	516	25.9	16.57	14.6								91.6	38.2		
2nd Zn Cl.C.	218	11.0	0.88	46.28	380	.049	12.9	21.35				2.0	51.5		
Zn Ro Conc.	360	18.1	1.07	31.14								4.0	57.0		
O'11 Zn Conc.	626	31.5	0.88	18.5								5.8	59.0		
Zn Tail	848	42.6	0.29	0.66								2.6	2.8		
HEAD	1990	100.0	4.79	9.88								100.0	100.0		

VANGORDA: HIGH GRADE
 Test No. V-70

Contrôle du temps de flottation

Tableau des résultats

	Wt.	%Wt.	ASSAY (%)		% DISTRIBUTION	
			Pb	Zn	Pb	Zn
Pb Ro Cond. 1.5	121	6.1	43.77	11.42	52.4	7.0
1½ - 3 min.	95	4.8	21.69	16.1	23.2	7.7
Pb Ro Conc.	216	10.9	35.37	13.48	75.6	14.7
Pb Conc. 3 - 4½ mins.	119	6.0	8.03	16.8	9.5	10.1
4½ - 6 mins.	77	3.9	4.42	20.1	3.4	7.8
Pb Scav. Conc.	196	9.9	6.60	18.1	12.8	17.9
6 - ½ mins.	95	4.8	2.41	23.1	2.3	11.1
7½ - 9 mins.	74	3.7	1.0	36.2	0.7	13.4
0'11 Pb Conc.	581	29.3	15.91	19.48	91.4	57.0
Pb Tail	1,403	70.7	0.62	6.09	8.6	43.0
Zn Ro Conc. 0-1½ mins.	195	9.8	1.94	33.79	3.7	33.1
1½-3 mins.	94	4.7	0.92	10.01	0.8	4.7
Zn Ro Conc. 0'11	289	14.5	1.60	26.08	4.6	37.8
3-4½ mins.	121	6.1	0.60	2.65	0.7	1.6
4½-6 mins.	162	8.2	0.48	0.91	0.8	0.8
Zn Scav. Conc.	283	14.3	0.53	1.66	1.5	2.4
6-7½ mins.	142	7.2	0.44	0.61	0.6	0.4
0'11 Zn Conc.	714	36.0	0.95	11.29	6.7	40.6
Zn Tail	689	34.7	0.28	0.70	1.9	2.4
HEAD	1,984	100.0	5.10	10.02	100.0	100.0

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 17-04-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-71

CHARGE GMS: 2000 gr

REMARKS: Addition des reactifs après le broyage

Screen Analyse	Weight GMS	% Weight	% Cum	Pass
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.5
-200 + 270		7.0		90.5
-270 + 325		15.0		75.5
- 325		75.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton															
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF98	SO ₂	Na ₂ S			
Grind	18	70	5.5																
Pb Cond.	5	25		.50		1.0													
Pb Ro Scav.F.	8	25	8.9				.05				.11								
1st Pb Cl.Fl.	4.5	20	10.5	.08		0.3	.09				.03								
2nd Pb Cl.Fl.	3	12	10.5	.06		0.1	.02				.01								
Zn Cond.	3	24	11.0				1.3					1.0							
Zn Ro Scav.Fl.	7	24	11.0				0.4					.13							
1st Zn Cl.Flt.	2	10	11.0				0.1					.02							
2nd Zn Cl.Flt.	2	8	11.1				0.05					.005							

Metallurgical Balance		Assay % or oz/ton							%Distribution									
Product	GMS	%Wt.	Pb	Zn	Ag	Hg PPM	Cd	Fe	Py				Pb	Zn	Ag			
2nd Pb Cl.C.	41	2.1	61.24	8.98		106	.018	4.5	9.98				26.0	1.9				
Pb Ro Conc.	103	5.2	41.13	12.4									43.2	6.5				
O'11 Pb Conc.	317	16.0	24.3	17.0									85.1	27.3				
2nd Zn Cl.Conc.	212	10.7	2.01	50.5		340	.062	9.9	14.71				4.3	54.3				
Zn Ro Conc.	378	19.0	2.35	54.9									9.0	66.7				
O'11 Zn Conc.	471	25.7	2.24	28.89									10.7	68.8				
Zn Tail	196	60.3	0.34	0.64									4.2	3.9				
HEAD	1984	100.0	4.95	9.95									100.0	100.0				

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda

DATE: 25-04-75

SAMPLE NO.: HIGH GRADE

TEST NO.: V-72

CHARGE GMS: 2000 gr

REMARKS: L'emploi du sulfure de sodium avec le sulfite de sodium.

Screen Analyse	Weight GMS	% Weight	% Cum	Pass:
+65				
-65 + 100				
-100 + 150		4.5		95.5
-150 + 200		11.5		84.0
-200 + 270		25.5		58.5
-270 + 325		19.5		39.0
- 325		39.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO4	Na2SO3	Lime	AF242	AF404	R303	R343	CuSO4	Mibc	CF98	Na2S	Dich.	
Grind	10	70														.5	
Pb Cond.	4	25	8.7	.30		1.0											
Pb Ro Scav.F.	6	25	8.7			1.0	.1				.11						
1st Pb Cl.Fl.	4	20	10.7	.08	.3		.3				.02						
2nd Pb Cl.F.	2	12	10.5	.06	.2		.1				.01						
2nd Pb Cl Fl.	2	12	9.3								.005						
Zn Cond.		24					2.13					1.0					2.0
Zn Ro	8	24	10.2									.15					
1st Zn Cl.Fl.	3	10	11.0				.4					.02					
2nd Zn Cl.Fl.	3	8	11.0				.09					.005	0.5				

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	%Wt.	Pb	Zn	Ag							Pb	Zn		
2nd Pb Cl.C.	96	4.8	39.6	13.1								38.8	6.7		
Pb Ro Conc.	234	11.6	27.5	18.8								65.2	22.4		
O'11 Pb Conc.	444	22.1	18.3	18.1								82.5	11.1		
2nd Zn Cl.Conc.	116	5.8	1.58	56.83								1.9	33.8		
Zn Ro Conc.	509	25.3	2.21	21.13								11.4	54.8		
Zn Tail	1056	52.6	0.57	0.75								6.1	4.1		
HEAD	2009	100.0	4.90	9.75								100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 25-04-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-73

CHARGE GMS: 2000 gr

REMARKS: Stage du dioxyde de soufre (SO₂) était supprimé avec un conditionnement du plonch

Screen Analyse	Weight GMS	% Weight	% Cum	% Passi
+65				
-65 + 100				
-100 + 150		4.5		95.5
-150 + 200		11.5		84.0
-200 + 270		23.5		58.5
-270 + 325		19.5		39.0
- 325		39.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CE98	SO ₂ to pH 5.3	Na ₂ S	Dich
Grind	10	70															
Pb Cond.	4	25	8.9	.30		1.0	.15								-		.5
Pb Ro+Scav.Fl.	6	25	8.9			1.0	.15		.11						-		
1st Pb Cl.Fl.	5	20	10.9	.08	.15		.20		.07						-		
2nd Pb Cl.Fl.	2	12	11.0	.06	.20		.10		.01						-		
Zn Cond.		24	11.0				2.0					1.0	-				2.0
En Ro	8	24	11.0								.15		-				
1st Zn Cl.Fl.	2	10	11.0				.45				.02	.5	-				
2nd Zn Cl.Fl.	2	8	11.0				.08				.005		-				

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	%Wt.	Pb	Zn								Pb	Zn		
2nd Pb Cl.C.	15	.8	54.94	9.12								8.7	.7		
Pb Ro Conc.	76	3.8	34.1	14.4								25.6	5.6		
O'11 Pb Conc.	241	12.1	29.1	16.6								69.5	20.5		
2nd Zn Cl.Conc.	256	12.8	3.90	49.27								9.9	64.3		
Zn Ro Conc.	668	33.5	5.70	22.2								24.5	75.6		
Zn Tail	1084	54.4	0.56	0.70								6.0	3.9		
HEAD	1993	100.0	5.06	9.81								100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 25-04-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-74

CHARGE GMS: 2000 gr

REMARKS: Tous les réactifs était additionné dans le broyage primaire.

Screen Analyse	Weight GMS	% Weight	% Cum	% Pass
+65				
-65 + 100				
-100 + 150		4.5		95.5
-150 + 200		11.5		84.0
-200 + 270		25.5		58.5
-270 + 325		19.5		39.0
- 325		39.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF98	Na ₂ S	Dich.	
Grind	10	70		.30		1.0										.5	
Pb Cond.	3	25	9.2				.18										
Pb Ro Scav.F.	6	25	9.2			1.0				.09							
1st Pb Cl.Fl.	4	20	11.0	.08	.1		.35			.02							
2nd Pb Cl.Fl.	3	12	11.0	.06	.1		.14			.03							
Zn Cond.	3	24	11.0				2.0				1.0						2.0
Zn Ro	8	24	11.0								.15						
1st Zn Cl.Fl.	2	10	11.0				.46				.02	.5					
2nd Zn Cl.Fl.	2	8	11.0				.10				.005						

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	%Wt.	Pb	Zn								Pb	Zn		
2nd Pb Cl.C.	45	2.3	54.63	9.60								25.5	2.3		
Pb Ro Conc.	174	8.7	34.2	12.91								60.4	11.5		
O'll Pb Conc.	359	18.0	22.1	15.0								80.8	27.5		
2nd Zn Cl.C.	200	10.0	1.78	54.57								3.6	55.7		
Zn Ro Conc.	587	29.5	2.22	22.82								13.3	68.7		
Zn Tail	1045	52.5	0.55	0.72								5.9	3.8		
HEAD	1991	100.0	4.93	9.80								100.0	100.0		

MORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda

DATE: 9-05-75

SAMPLE NO.: HIGH GRADE

TEST NO.: V-75

CHARGE GMS: 2000 gr

REMARKS: Quintuple test cyclique

Screen Analyse	Weight GMS	% Weight	% Cum	Pass %
+65				
-65 + 100		.5		99.5
-100 + 150		4.5		95.0
-150 + 200		19.0		76.0
-200 + 270		12.0		64.0
-270 + 325		12.5		51.5
- 325		51.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton														
				NaCN	ZnSO ₄	Na ₂ SO ₃	Lime	AF242	AF404	R303	R343	CuSO ₄	Mibc	CF98	Na ₂ S			
Grind	10	70		.30		1.0										.5		
Pb Cond.		25																
Pb Ro Scav.Fl.	7.5	25	9.1			1.0	.18				.105							
1st Pb Cl.Fl.	4	20	11.0	.08	.15		.40				.025							
2nd Pb Cl.Fl.	2.5	12	10.9	.06	.10		.09				.01							
En Cond.		24	11.0				.69					1.0						
Zn Ro Scav.Fl.	8	24	11.0				.35				.15	.25						
1st Zn Cl.Fl.	2	10	11.0				.45				.02	.5						
2nd Zn Cl.Fl.	2	8	11.0				.07				.005							

Metallurgical Balance du cycle 4 & 5		Assay % or oz/ton						%Distribution										
Product	GMS	%Wt.	Pb	Zn	Ag	Hg (ppm)	Cd	Py	Fe				Pb	Zn	Ag			
2nd Pb Cl.C.	236	6.7	56.84	10.7	24.7								74.2	8.2	72.4			
2nd Zn Cl.C.	567	15.9	4.88	45.7	2.5	3.92	.06	14.5	9.1				15.2	84.0	17.6			
En Tail	2751	77.4	0.69	0.87	0.29								10.6	7.8	10.0			
HEAD	3554	100.0	5.09	8.64	2.27								100.0	100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 30-05-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-76

CHARGE GMS: 2000 gr

REMARKS: Rebroyage sur les rejets du circuit de plomb et rebroyage sur les mixtes de plomb.

Screen Analyse	Weight CMS	% Weight	% Cum	% Passing
+65				
-65 + 100				
-100 + 150				
-150 + 200		1.0		99.0
-200 + 270		3.5		95.5
-270 + 325		11.5		84.0
- 325		84.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				Na ₂ S	NaCN	Na ₂ SO ₃	Chaux	R303	ZnSO ₄	R-343	Dich.	CuSO ₄					
Grind	12	70.0	9.0	.5	.30	1.0											
1st Ro Scav. Flt.	7.5	25.0	9.0			1.0	.34	.105									
1st Cl.	5	20.0	11.0		.08		.34	.03	.15								
2nd Pb Cl.	2.5	12.0	11.0		.06			.01	.10								
Ret. sur le mixte	3	20.0					.35			.02	1.0	.25					
Rebroyage	10	60.0	11.0				1.55					1.0					
2nd Ro Scav.	8	24.0	11.0				.52			.13							
1st Zn Cl.F.	2	10.0	11.0				.35			.02							
2nd Zn Cl.F.	2	8.0	11.0				.10			.005							

Product	Metallurgical Balance		Assay				Units				% Distribution			
	GMS	Wt.	Pb	Zn						Pb	Zn			
2nd Pb Cl.C.	64	3.2	56.1	8.4						35.4	2.7			
1st Pb Conc.	151	7.5	35.2	6.8						52.0	5.3			
1st Ro Conc.	253	12.6	31.1	13.5						71.3	17.5			
2nd Zn Cl.C.	223	11.4	2.90	53.7						6.5	62.8			
2nd Ro Conc.	341	17.0	3.88	42.0						13.0	73.1			
1st Zn Conc.	493	24.6	3.57	51.03						17.2	78.3			
2nd Tail	1255	62.7	0.44	0.66						5.4	4.2			
TAD	2001	100.0	5.08	9.75						100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 6-06-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-77

CHARGE GMS: 2000 gr

REMARKS: L'extraction du zinc, a partir du concentré de plomb, effet du rebroyage circuit "B". (De Zincing)

Screen Analyse	Weight GMS	% Weight	% Cum	Pass
+65				
-65 + 100				
-100 + 150				
-150 + 200				
-200 + 270		43.5		56.5
-270 + 325		56.5		
- 325				
TOTAL				

	Time Mins.	% Solid	pH	REAGENTS lbs./ton													
				Na ₂ S	NaCN	Na ₂ SO ₃	Chaux	R303	Z200	Vapeu	T°C	Dich.	CuSO ₄				
Grind	12	70		.5	.30	1.0											
Pb Ro Conc.	10	25	9.0			1.0	.32	.12				26°					
Aeration "A"	60	40									oui	98°					
Pb ret. "A"	5	8	10.6				.20			.06			.25	.15			
Rebroyage "B"	5																
Aeration "B"	60	40									oui	98°					
Pb Ret. "B"	5		10.9							.03			.25	.10			

Metallurgical Balance			Assay				Units				%Distribution				
Product	GMS	%Wt.	Pb	Zn								Pb	Zn		
PB RO CONC	1829	81.7	27.8	18.15								82.9	26.8		
Zn Ret. Conc "A"	72	3.6	28.6	23.1								20.5	8.4		
Pb Ret. Conc. A	104	5.2	19.8	7.82								20.5	4.1		
O'11 Head "A"	176	8.8	23.4	14.08								41.0	12.5		
Zn Ret. C. "B"	122	6.1	27.8	19.4								33.7	11.9		
Pb Ret. C. "B"	66	3.3	12.6	4.96								8.3	1.7		
O'11 Head "B"	188	9.4	22.5	14.32								42.0	13.6		
O'11 HEAD	1993		5.03	9.94								100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 13-06-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-78

CHARGE GMS: 2000 gr

REMARKS: "de zinging"

Screen Analyse	Weight GMS	% Weight	% Cum.	Pass
+65				
-65 + 100				
-100 + 150				
-150 + 200		2		98.0
-200 + 270		5		93.0
-270 + 325		15.5		77.5
- 325		77.5		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				Na2S	NaCN	Na2SO3	Chaux	R303	R343	Vapeur	ZnSO4	Dich.	CuSO4				
Grind	12	70		.5	.30	1.0											
Pb Ro Flt.	9	25	9.1			1.0	.26	.12									
1st Pb Cl. C.	5	20	11.0		.08		.52	.05				.15					
Pb Ret. Cond.	180	40								oui							
Pb Ret. Flt.	3	15	11.0				.2		.003			.5	.15				
Zn rebroyage	7	65	11.0				1.5										
Zn Ro- Scav.	8	24	11.0				.97		.14				1.0				
1st Zn Cl. Flt.	2	10	11.1				.30		.02								
2nd Zn Cl. Flt.	2	8	11.0				.15		.005								

Metallurgical Balance			Assay				Units				% Distribution				
Product	GMS	%Wt.	Pb	Zn								Pb	Zn		
Zn Ret. C. (3 m)	125	6.31	22.98	23.0								34.6	15.0		
Pb Ret. Conc.	56	2.83	42.8	2.3								28.9	0.7		
Pb Ro. Conc.	352	17.6	19.5	13.5								82.9	25.9		
2nd Zn Cl. C.	219	11.1	1.6	48.2								4.2	57.6		
Zn Ro Conc.	322	16.3	2.1	38.0								8.0	66.7		
Zn O'll Conc.	424	21.4	2.08	30.3								10.7	70.1		
Zn Tail	1205	60.8	0.44	0.61								6.4	4.0		
HEAD	1981	100.0	4.19	9.25								100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 4-07-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-80 (Pb Circuit)

CHARGE GMS: 6000 gr

REMARKS: Broyage fin et reboyage sur le concentré de plomb.

Screen Analyse	Weight GMS	% Weight	% Cum	Pass:
+65				
-65 + 100				
-100 + 150				
-150 + 200		2.5		97.5
-200 + 270		6.0		91.5
-270 + 325		13.5		78.0
- 325		78.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				Na ₂ S	Na ₂ SO ₃	NaCN	Chaux	R303	ZnSO ₄	Mibc							
Grind	19	70		.5	1.0	.30											
Pb Ro Flt.	6	25	9.0				.30	.08									
Pb Rebroyage	10	60	11.0			.08	.5										
Pb 1st Cl Flt.	6	45	11.0					.017	.30								
Pb 2nd Cl Flt.	5.5	20	11.0			.07	.17	.007	.23								
Pb 3rd Cl Flt.	4	23	11.0			.05	.08	.003	.17								
Pb 4th Cl Flt.	3	14	11.1			.03	.10	.003	.14								
Pb 5th Cl Flt.	4	8	11.0			.03	.07	.01	.11								

Metallurgical Balance			Assay				Units				ZDistribution			
Product	GMS	%wt.	Pb	Zn	Cu	Fe					Pb	Zn	Cu	Fe
5th Pb Cl.C.	31	0.5	66.8	5.12	0.22	3.5					6.4	0.3	0.7	
4th Pb Cl.C.	50	0.8	61.9	6.0	0.25						9.5	0.5	1.3	
3rd Pb Cl.C.	141	2.3	64.3	6.9	0.26						28.3	1.7	4.0	
2nd Pb Cl.C.	201	3.3	60.5	8.1	0.33						38.4	2.8	7.3	
2nd Pb Cl T.	185	3.1	56.2	14.8	0.78	11.5					21.6	4.9	15.9	
1st Pb Cl.C.	386	6.4	48.7	11.3	0.55						59.9	7.7	25.2	
1st Pb Cl T.	606	10.1	12.62	16.9	0.76	22.9					24.5	13.1	34.5	
Pb Ro Conc.	992	16.5	26.63	14.75	0.68						84.4	25.8	74.2	
Pb Tail	6038	835	0.97	8.36	0.05						15.6	74.2	25.8	

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 7-07-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-81

CHARGE GMS: 2000 gr

REMARKS: Séparation de Pb - Zinc par la désorption

Screen Analyse	Weight GMS	% Cum	Pass
+65			
-65 + 100			
-100 + 150	.5		99.5
-150 + 200	4.0		95.5
-200 + 270	7.5		88.0
-270 + 325	15.5		72.0
- 325	72.5		
TOTAL			

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				NaCN	Chaux	R343	CuSO ₄	Na ₂ SO ₃	R303	ZnSO ₄	10	12					
Grind	18	70		.05													
Bulk Float	14	25	9.0		.55	.18	1.0										
1st Bulk Cl.	3.5	20	10.0	.10	.50												
2nd Bulk Cl.	3	15	11.0	.08	.70												
Bulk rebroyage	8	50															
Bulk Cond.	5	30	9.5	.20				1.0									
Pb Float	4	30	9.5						.025								
Pb 1st Cl.Flt.	3	20	11.4	.08	1.0					1.0							

Metallurgical Balance			Assay %				Units				Distribution			
Product	GMS	%Wt.	Pb	Zn	Cu					Pb	Zn	Cu		
2nd Pb Ret.Cl.	31	1.6	37.4	15.8	1.16					12.9	2.9	13.0		
Pb Ret.Conc.	134	6.7	29.2	21.4	0.87					42.1	16.5	39.7		
Zn Ret.Conc.	329	16.5	10.96	27.2	0.40					38.9	51.5	45.2		
2nd Bulk Cl.C.	463	23.2	16.2	25.5	0.53					81.0	68.1	84.9		
1st Bulk Cl.C.	599	30.0	13.5	23.3	0.45					87.5	80.5	92.5		
Bulk Ro Conc.	812	40.7	10.7	19.81	0.36					93.9	92.6	100.0		
Ro Tail	185	59.3	0.48	1.08	tr					6.1	7.4			
HEAD	1995	100.0	4.65	8.70	0.15					100.0	100.0			

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 8-07-75
 SAMPLE NO.: HIGH GRADE TEST NO.: V-82
 CHARGE GMS: 2000 gr
 REMARKS: Séparation Pb-Zn par désorption flottation du zinc.

Screen Analyse	Weight GMS	% Weight	% Cum	Pass %
+65				
-65 + 100				
-100 + 150		.5		99.
-150 + 200		5.0		94.
-200 + 270		10.5		84.
-270 + 325		16.0		68.
- 325		68.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton												
				NaCN	CuSO4	R343	Chaux	Dich.	610 Cyan.	SO2	1012					
Grind	18	70		.05												
Bulk Cond.	3	25	8.0		1.0											
Bulk Float.	11	25	8.0			.15										
Bulk 1st Cl.	6	20	10.5				.5									
Bulk 2nd Cl.	4	18	11.0			.01	.55									
Bulk rebroyage	8	50	11.0													
Bulk Cond.	5	20	11.0		0.8		1.3	3.0	0.3	50cc						
Zn Ret.Flt.	7	20	11.0			.10										
Zn Cl.Ret.Flt.	3	15	12.0				1.72									

Metallurgical Balance			Assay %				Units				% Distribution					
Product	GMS	%Wt.	Pb	Zn	Cu							Pb	Zn	Cu		
2nd Zn Ret.Cl.C.	124	6.2	7.64	51.2	0.64							10.1	34.5	18.5		
Zn Ret.Conc.	191	9.6	10.2	47.8	0.70							20.8	49.9	31.0		
Pb Ret.Conc.	75	3.8	19.1	36.9	0.84							15.5	15.3	14.8		
2nd Bulk Cl.C.	266	13.4	12.7	44.7	0.74							36.4	65.1	45.8		
1st Bulk Cl.C.	307	15.5	14.9	40.0	0.76							49.3	67.5	54.2		
Bulk Ro Conc.	816	41.2	11.1	21.1	0.47							97.5	94.4	88.0		
Ro Tail	1166	58.8	0.20	0.87	0.04							2.5	5.6	11.6		
HEAD	1982		4.67	9.19	0.22							100.0	100.0	100.0		

NORANDA ORE DRESSING LABORATORY

PROJECT: Vangorda DATE: 9-07-75

SAMPLE NO.: HIGH GRADE TEST NO.: V-83

CHARGE GMS: 2000 gr

REMARKS: Procédure d'une concentrateur en production (Pb-Zn separation)

Screen Analyse	Weight GMS	% Weight	% Cum	Passi
+65				
-65 + 100				
-100 + 150				
-150 + 200		5.0		95.0
-200 + 270		9.0		86.0
-270 + 325		17.0		69.0
- 325		69.0		
TOTAL				

	Time Mins.	% Solids	pH	REAGENTS lbs./ton													
				CuSO ₄	Chaux	Mit.	R325	NaCN	ZnSO ₄	Mibc							
Grind	18	70			1.5												
Bulk Conc.	3	25	9.8	1.0	0.40	0.66											
Bulk Flt.	8	25	9.8				.065										
Bulk 1st Cl.	4.5	20	10.8		0.10												
Bulk 2nd Cl.	3	15	11.0		0.35												
Bulk Rebroy.		50	12.2		1.5			.30	1.0								
Pb Ret.Flt.	3	18	12.2				.02										
Pb Cl.Ret.Flt.	3	15	11.1		.15		.01	.18									

Metallurgical Balance			Assay %				Units				% Distribution			
Product	GMS	%wt.	Pb	Zn	Cu					Pb	Zn	Cu		
Pb Ret.Cl.C.	15	0.8	12.4	44.8	0.52					2.1	4.0	2.0		
Pb Ret.Conc.	80	4.0	10.4	45.0	0.50					8.7	20.2	10.1		
Zn Ret.Conc.	161	8.1	9.18	44.9	0.44					15.6	40.9	18.2		
2nd Bulk Cl.C.	241	12.2	9.50	44.6	0.46					24.5	61.2	28.5		
1st Bulk Cl.C.	370	18.7	12.9	38.8	0.57					50.6	81.0	34.0		
Bulk Ro Conc.	493	24.9	13.5	31.5	0.55					70.7	88.2	69.7		
Ro Tail	1489	75.2	1.86	1.39	0.08					29.3	11.8	50.5		
HEAD	1981	100.0	4.77	8.89	0.20					100.0	100.0	100.0		