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NORANDA MINES LIMITED

NORANDA, QUEBEC

VANGORDA (GRUM) PROJECT

(Translation)

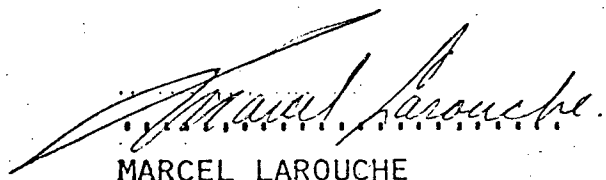
REPORT NO. 6

INVESTIGATION OF THE

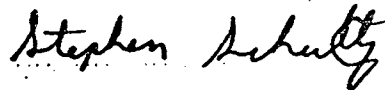
HIGH GRADE NO. 2 SAMPLE

NORANDA ORE DRESSING LABORATORY

MARCH 1, 1976



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## INTRODUCTION

On August 26, 1975, four new samples from the Grum deposit in the Yukon arrived at the Noranda Laboratory. They were designated as: "low", "medium", "high" and "very high" grade.

The "high" and "very high" grade samples were mixed and crushed to 92.4% minus four mesh. This sample was named "high grade No. 2". It contained 5.12% Pb and 9.68% Zn. A more detailed analysis can be found in Appendix 1.

The following work was performed on this sample:

1. Two cyclic tests using the optimum flotation procedure devised in previous testwork.
2. Tests using the following collectors for lead flotation:
  - a) R-325
  - b) AF-242 and 404
  - c) R-325, AF-242 and 404

and the following collectors for zinc flotation:

- a) R-343
- b) Z-200
- c) R-343 and Z-200

3. An investigation into the influence of fineness of grind using a procedure developed by "Lakefield Research".
4. Tests to compare the best procedures developed by Noranda and "Lakefield Research".

### SUMMARY

Two locked cycle tests were performed using a procedure similar to test V-84 which is described in report # 5. A flowsheet as well as a more detailed description of the tests can be found on page 12 of the section entitled "Testwork Results". A balance of the last three cycles of the best test is as follows:

#### Test # V-87

Product	Assays (%)				% Distribution			
	Pb	Zn	Cu	Fe	Pb	Zn	Cu	Fe
2nd Pb Cl Conc	40.38	12.3	.37	11.0	86.4	14.3	30.5	5.9
1st Zn Cl Conc	1.14	54.8	.28	7.2	3.1	80.9	29.8	4.8
Zn Tail	0.71	0.59	.07	25.2	10.5	4.8	39.7	89.3
Head	5.10	9.35	.13	20.43	100.0	100.0	100.0	100.0

Grind 79% - 325 mesh.

Several tests were done to compare collectors. In the lead circuit, it was found that a mixture of the collectors 242 and 404 proved to be superior to either R-325 or a mixture of 242, 404 and R-325. In the zinc circuit, R-343 proved to be better than Z-200.

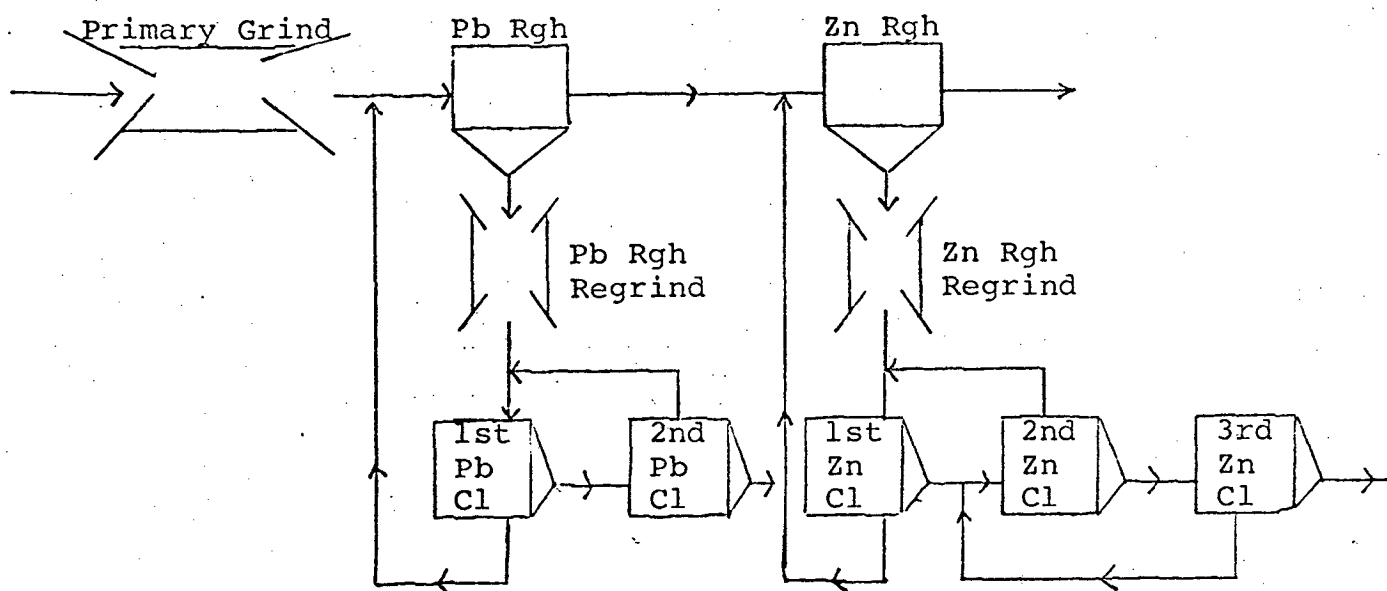
"Lakefield Research" has developed a technique by which the lead concentrate was reground before each of several cleaning stages. This procedure was tried by Noranda using the same reagents and also slightly different reagents.

In the test identical to Lakefield's, the fourth lead cleaner concentrate assayed 45.8% Pb and 11.5% Zn at a recovery of 66.3% Pb. The fourth cleaner concentrate of the modified procedure assayed 51.8% Pb and 11.5% Zn at a recovery of 42.8% Pb.

TESTWORK RESULTS

# 1. CYCLIC TESTS

One 5 cycle locked test was performed on the "high grade No. 2" sample using a procedure similar to that of test V-84 described in report No. 5. Following is a flowsheet of the test:



The collector R-303 was substituted for the previously used R-325. A metallurgical balance of the last 3 cycles is as follows:

Product	WT(gr)	%W.t.	Assays (%)		Distr. (%)	
			Pb	Zn	Pb	Zn
3rd Pb Cl Conc	157	4.46	49.4	9.09	71.2	7.9
3rd Zn Cl Conc	218	6.20	1.2	58.1	2.4	70.2
Zn Tail	3146	89.34	0.91	1.26	26.4	21.9
Head	3521	100.0	3.10	5.14	100.0	100.0

These results did not compare favourably to many of the other previous tests. Both the lead and zinc tailings were high: (lead tailings 0.91% Pb, zinc tailings 1.26% Zn). It was also found that the test had not stabilized by the last cycle.

A second locked test was therefore performed but with the following alterations:

- a) The rougher flotation time was extended.
- b) A finer regrind was used prior to the cleaning of the lead and zinc rougher concentrate.
- c) Two cleaning stages were carried out on the lead.
- d) Only one cleaning stage was carried out on the zinc.

The average metallurgical results of the three last 3 cycles of this test are as follows:

Product	Wt	%WT	Assays (%)				% Distribution			
			Pb	Zn	Cu	Fe	Pb	Zn	Cu	Fe
2nd Pb Cl Conc	434.0	10.9	40.38	12.3	.37	11.0	86.4	14.3	30.5	5.9
1st Zn Cl Conc	553.0	13.8	1.14	54.8	.28	7.2	3.1	30.9	29.8	4.8
Zn Tail	2991.0	75.3	0.71	0.59	.07	25.2	10.5	4.8	39.7	89.3
Head	3978.0	100.0	5.10	9.35	.13	20.43	100.0	100.0	100.0	100.0

The ore was ground to 79% minus 325 mesh in the primary grind.

## 2. COLLECTORS

### - Lead Circuit

Three flotation tests were performed with the following lead collectors:

Test V-88 - Sodium ethyl Xanthate (R-325)

Test V-89 - Aerofloat 242 with Aeropromoter 404

Test V-90 - A mixture of R-325, AF-242 and AP-404

Graphs 1, 2 and 3 on pages 9, 10 and 11 show both the lead and zinc recovery versus flotation time for the respective tests. Graph 4, page 12 shows the lead grade versus recovery for each test. The mixture of 242 and 404 gave the best results. The results of the test done with R-325 were however very similar to the 242-404 results.

### - Zinc Circuit

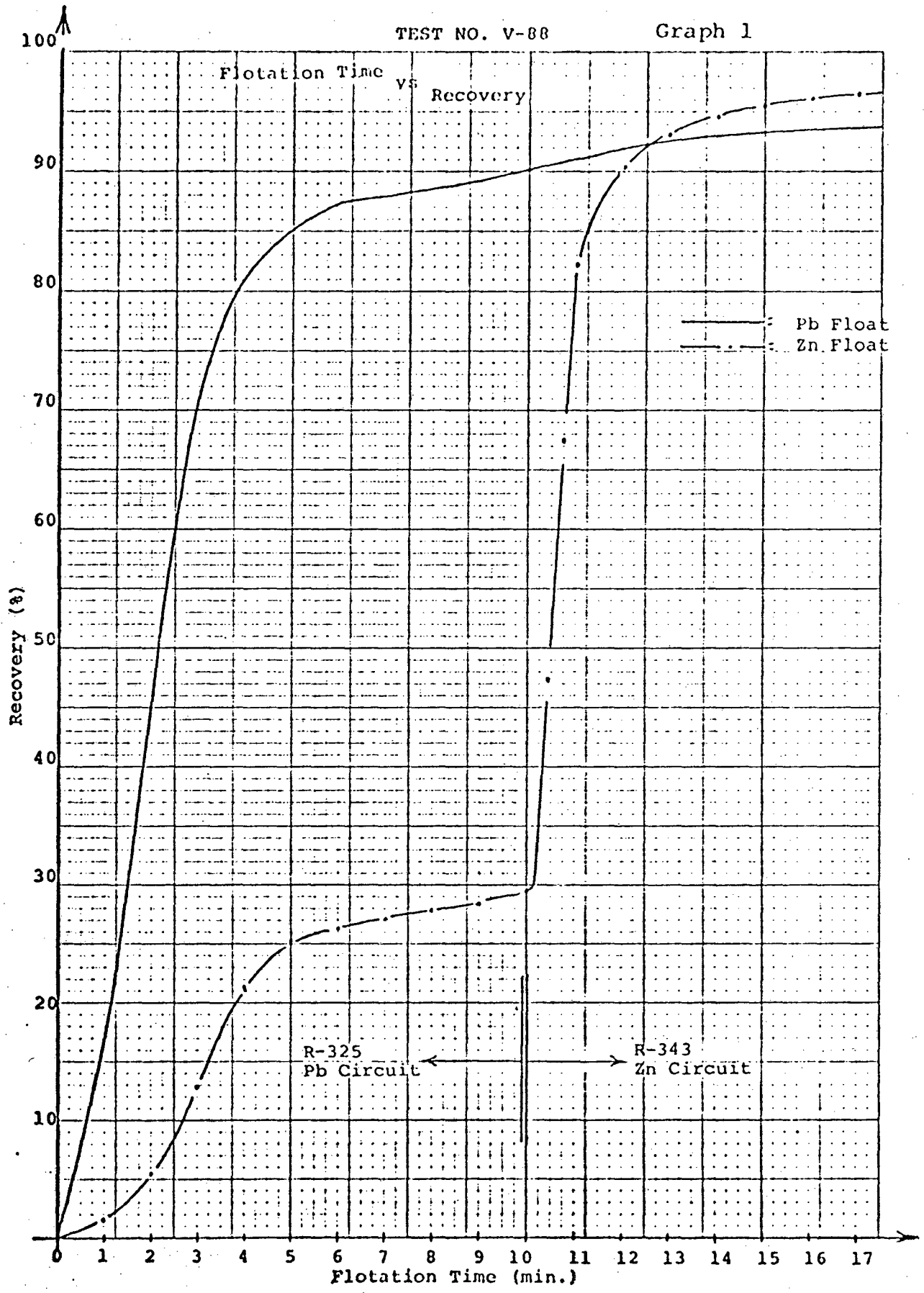
The following collectors were used in the zinc circuits of the above described tests:

Test V-88 - Sodium Isopropyl Xanthate (R-343)

Test V-89 - Z-200

Test V-90 - R-343 and Z-200

Graph 5, page 12 is a comparison of the zinc grade recovery curves for the three tests. R-343 alone, appears to have given the best results.



Graph 2

TEST V-89

Flotation Time vs Recovery

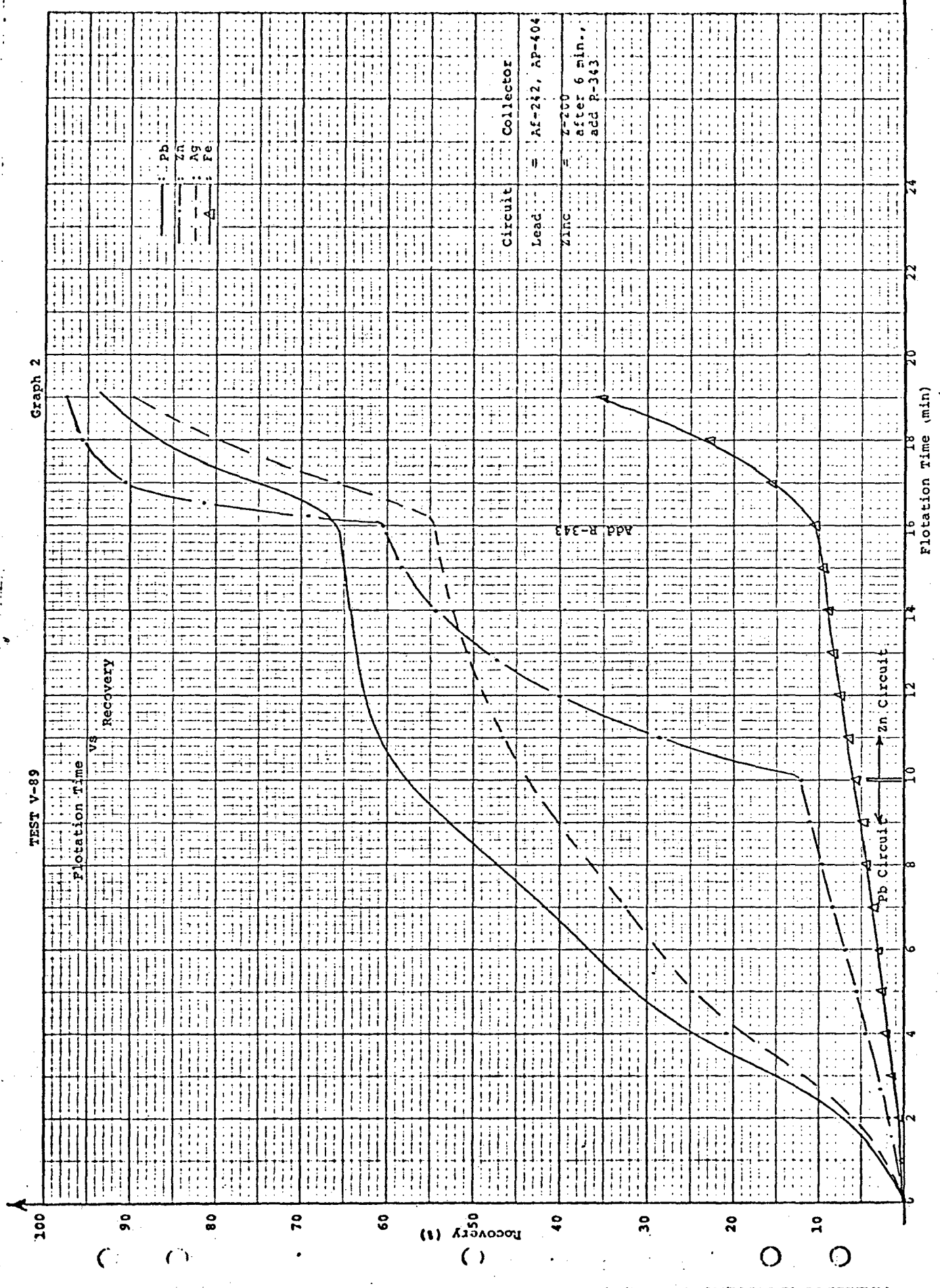
Pb  
Zn  
Ag  
Fe

Circuit Collector

Lead = AF-242, AP-404

Zinc = Z-200

After 6 min., add P-343

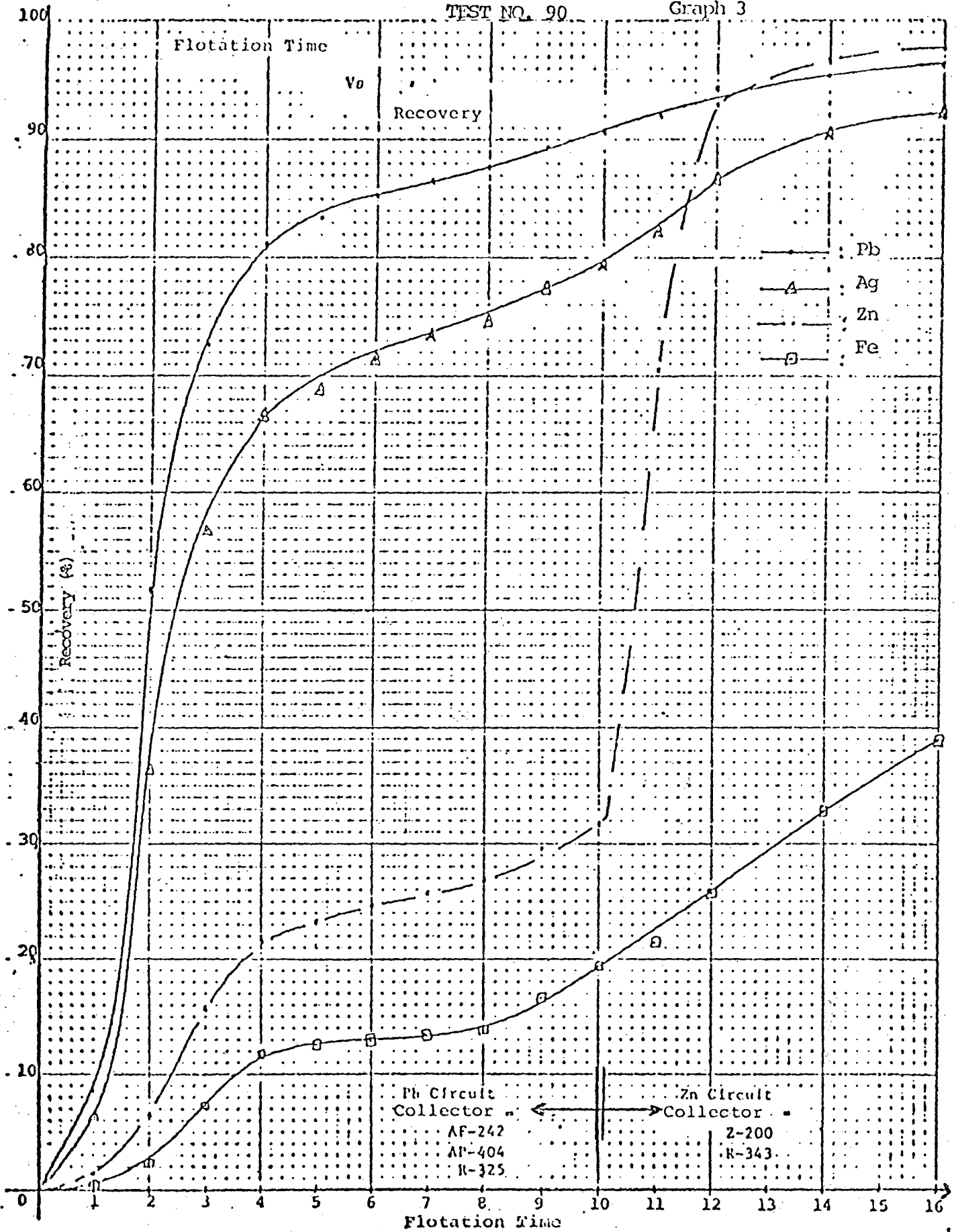


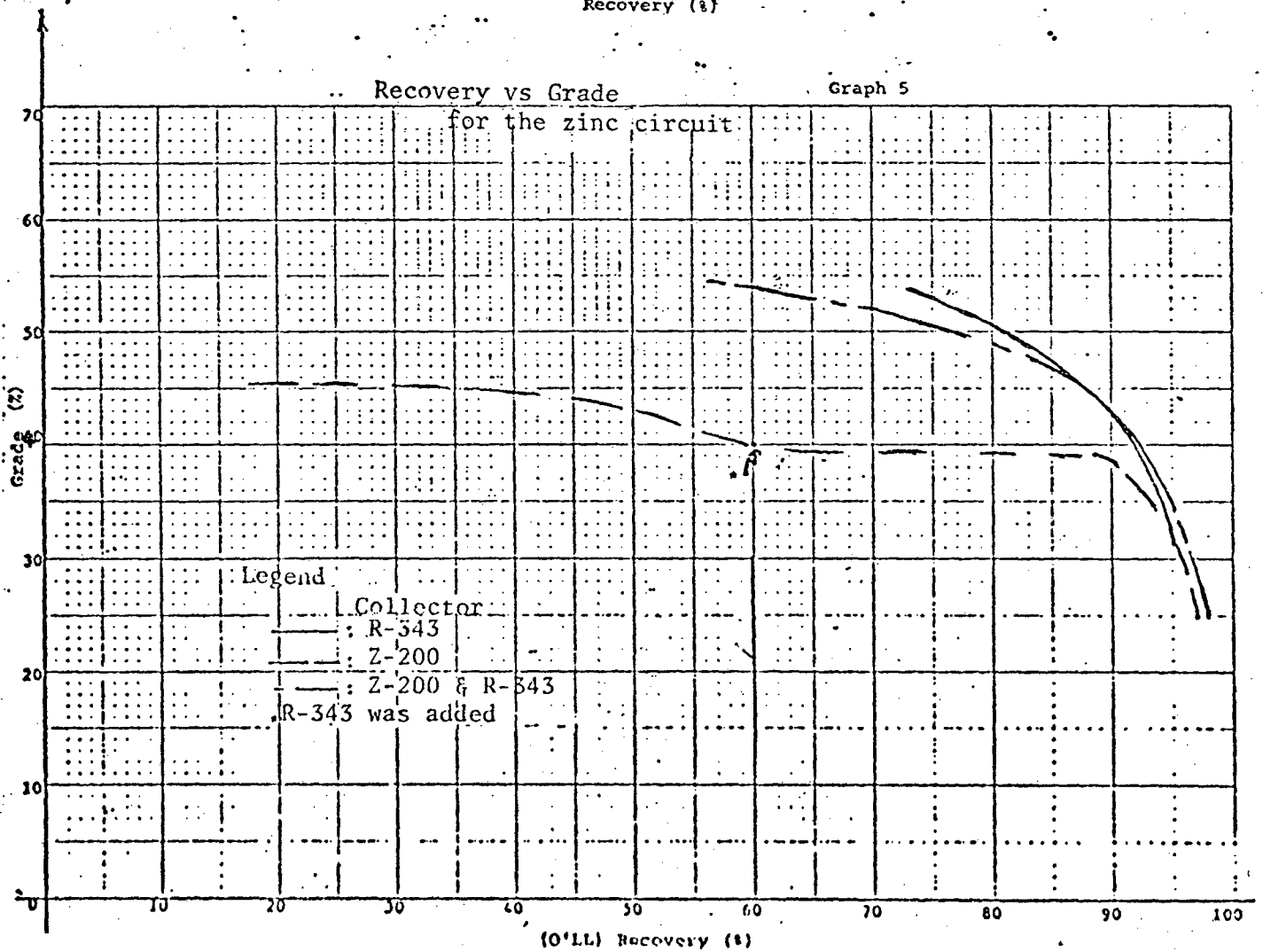
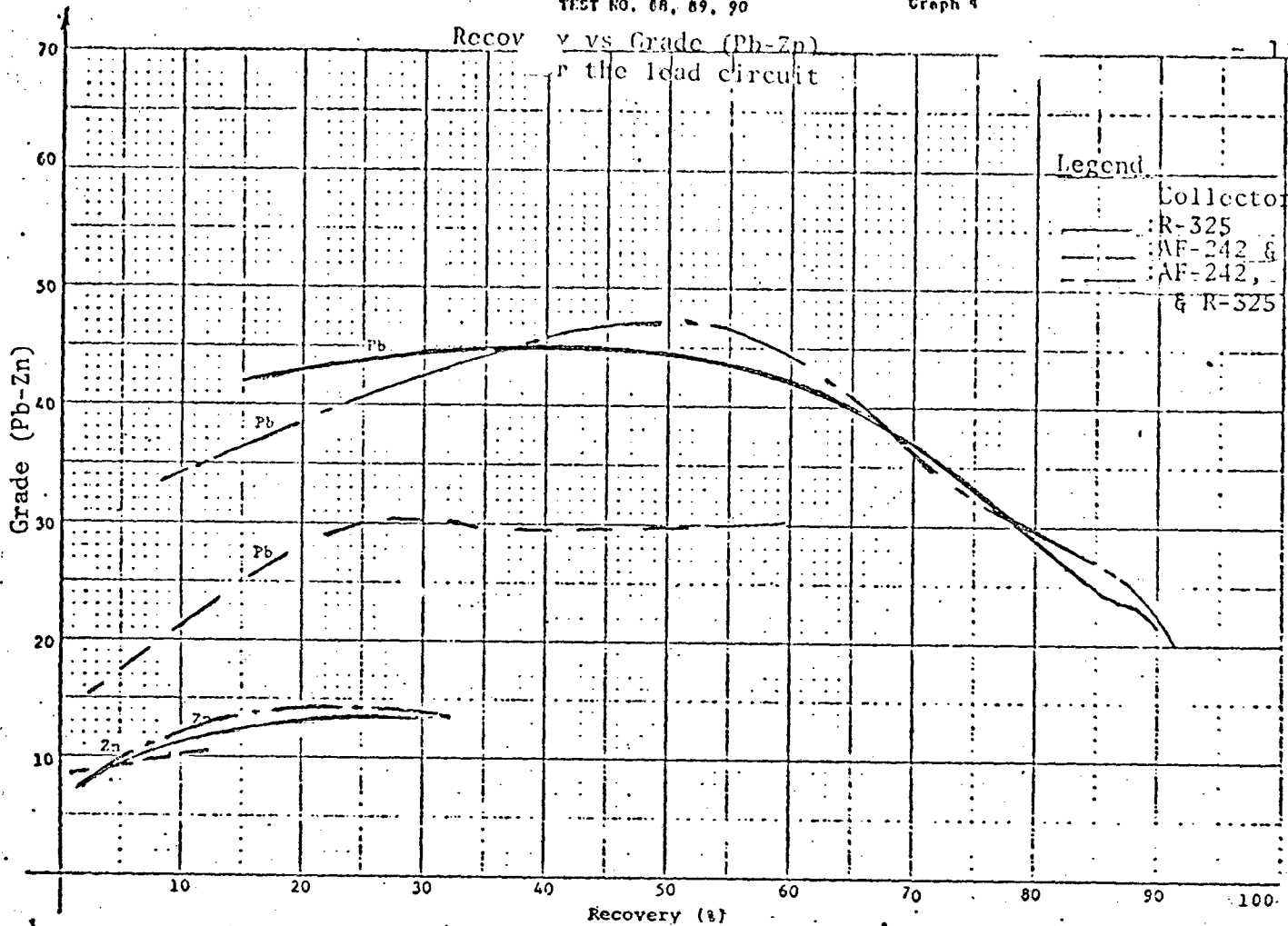
Flotation Time (min)

Recovery (%)

TEST NO. 90

Graph 3





### 3. INFLUENCE OF GRINDING

Three lead rougher concentrates were floated using a method similar to the best procedure developed by "Lakefield Research" (see Appendix 2). For each test, the following changes were made.

Test V-92 - The rougher was floated for 5 minutes instead of 9 minutes.

Test V-93 - The primary grind was 97% - 325 mesh instead of 87% - 325 mesh,

- Flotation time was also five minutes.

Test V-94 - Collector was added to a conditioning stage just before flotation instead of in the grind.

- Flotation time was eight minutes.

A table of the results are as follows:

Test	% -325M	Head		Pb Concentrate (Rougher)				
		% Pb	% Zn	% WT	Assay (%)		% Distr.	
					Pb	Zn	Pb	Zn
V-92	87.0	4.99	9.12	14.7	30.0	13.3	88.4	21.6
V-93	97.0	5.09	9.27	12.1	37.3	12.66	88.6	16.5
V-94	89.0	5.02	9.24	15.2	29.4	13.4	89.0	22.0

It was found that the fine grind had a tendency to improve selectivity.

4. TESTS TO COMPARE THE BEST PROCEDURES DEVELOPED BY LAKEFIELD AND NORANDA.

Two tests were done in order to compare the best flotation procedures developed by "Noranda" and by "Lakefield Research". The two methods are similar except that the reagents used differed.

A flowsheet of the tests can be found in Appendix 2.

Following is a table showing the reagents used for each test.

- TEST -

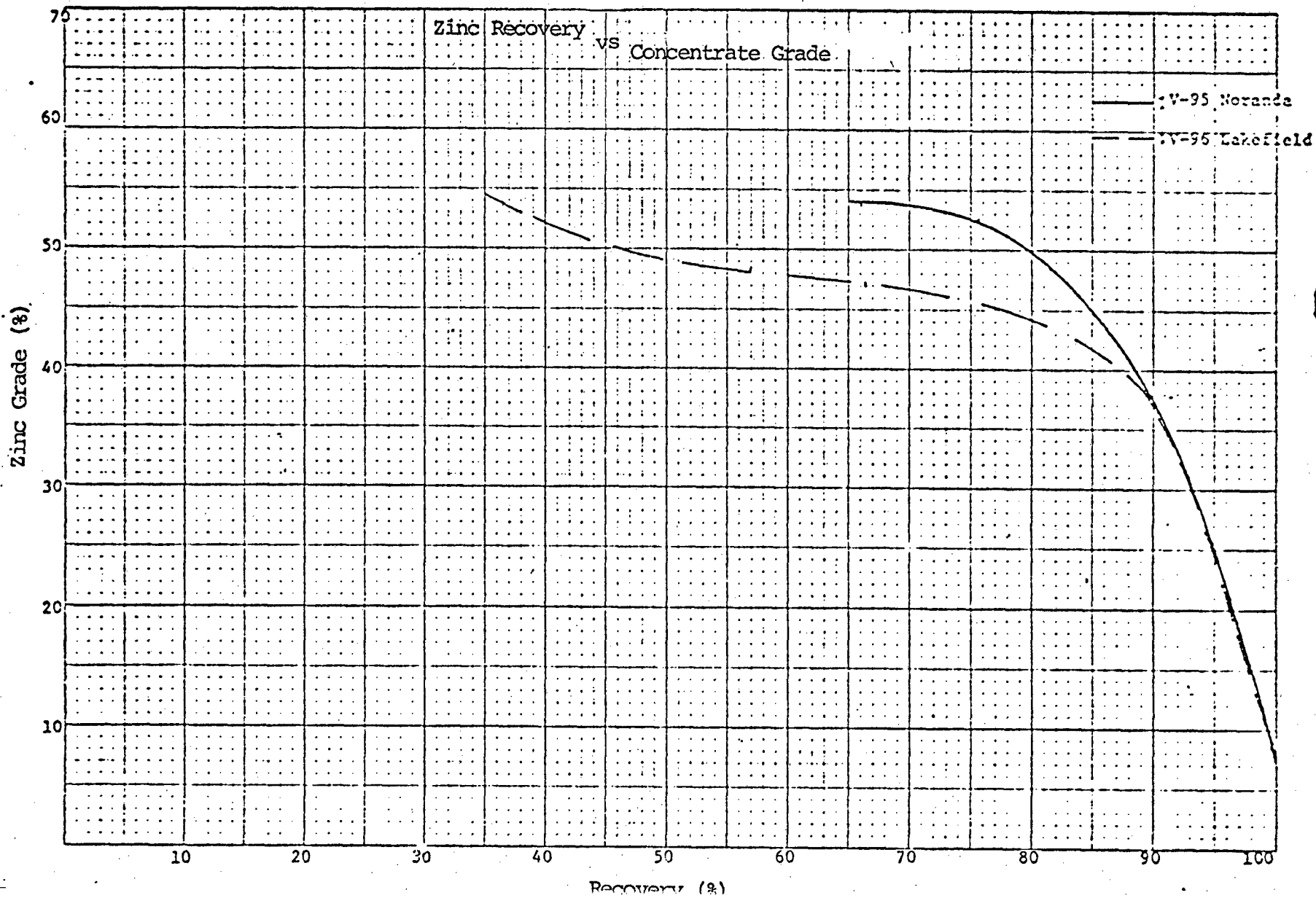
	<u>V-95 (Noranda)</u>	<u>V-96 (Lakefield)</u>
<u>Lead Circuit</u>		
Zn Depressant	Na <sub>2</sub> SO <sub>3</sub>	Zn SO <sub>4</sub>
pH Regulator	Ca(OH) <sub>2</sub>	Na <sub>2</sub> CO <sub>3</sub>
Collector	R-325	AF-242, AP-404
<u>Zinc Circuit</u>		
Pb Depressant	Dichromate	----
pH Regulator	Ca(OH) <sub>2</sub>	Ca(OH) <sub>2</sub>
Zn Activator	Cu SO <sub>4</sub>	Cu SO <sub>4</sub>
Collector	R-343	Z-200

The grind of each test was 87.5% -325 mesh. The test results can be found on the following tables and graphs. It appears that the Lakefield procedure was best for the lead circuit whereas the Noranda procedure (using R-343) gave the best results in the zinc circuit.

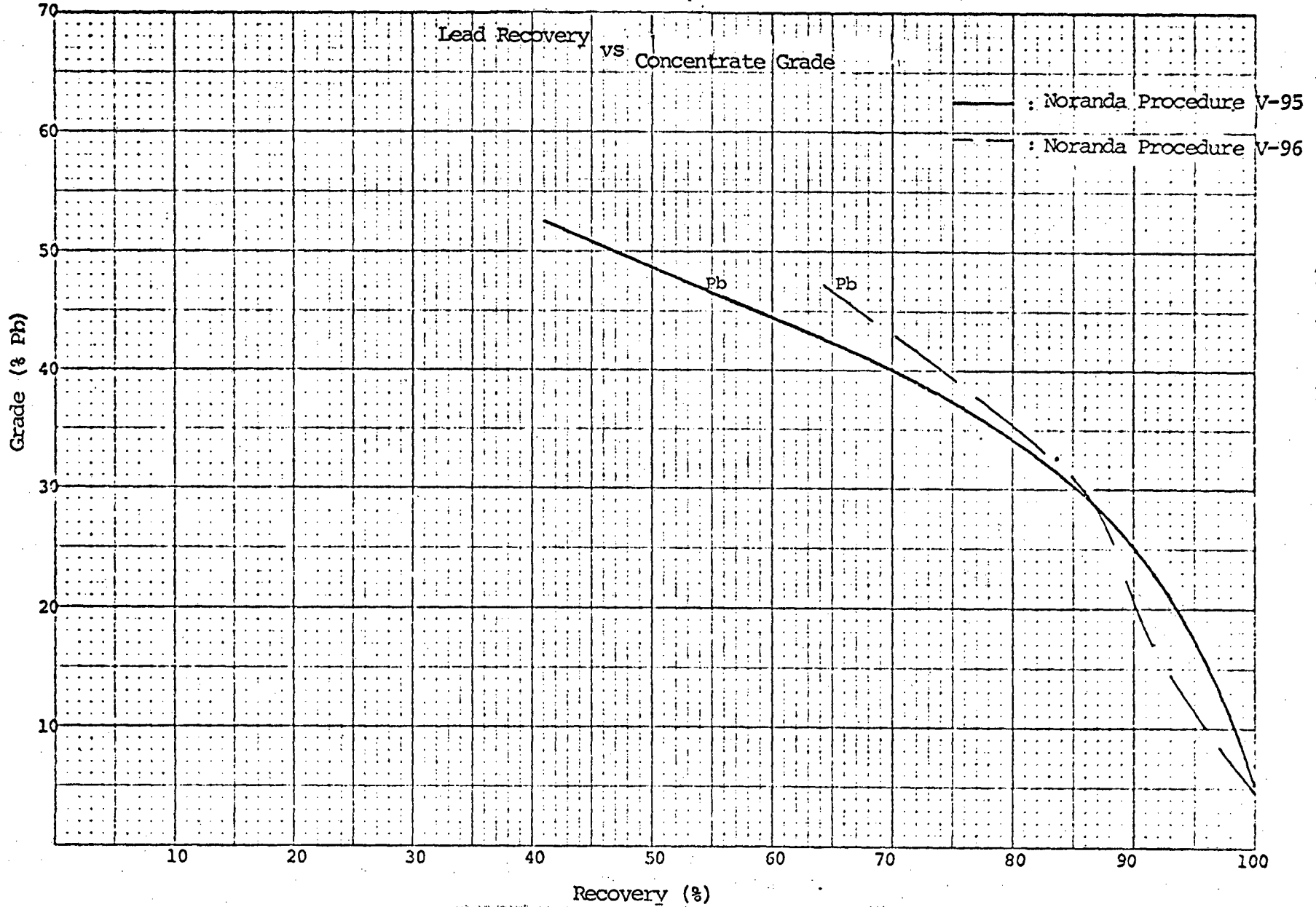
TABLE COMPARING TESTS V-95 AND V-96

	Noranda Procedure (V-95)					Lakefield Procedure (V-96)				
	Assays			% Distr.		Assays			% Distr.	
	%Wt	Pb	Zn	Pb	Zn	%Wt	Pb	Zn	Pb	Zn
4th Pb Cl Conc	4.20	51.80	11.50	42.8	5.1	7.15	45.80	11.50	66.3	9.0
4th Pb Cl Tail	1.45	34.10	13.80	9.7	2.1	1.50	21.60	14.90	6.6	2.5
3rd Pb Bl Conc	5.65	47.62	12.09	52.5	7.2	8.65	41.61	12.09	72.9	11.5
3rd Pb Cl Tail	2.90	28.20	15.40	16.1	4.8	1.45	13.60	15.30	4.0	2.4
2nd Pb Cl Conc	8.55	40.80	13.20	68.6	12.0	10.10	37.58	12.55	76.9	13.9
2nd Pb Cl Tail	3.20	17.20	15.30	10.8	5.2	4.10	11.30	15.20	9.4	6.8
1st Pb Cl Conc	11.75	34.37	13.79	79.4	17.2	14.20	29.99	14.02	86.3	21.8
1st Pb Cl Tail	10.54	6.54	15.00	13.5	16.8	9.25	2.16	12.40	4.0	12.6
Pb Ro Conc	22.29	21.21	14.36	92.9	34.0	23.45	19.02	13.38	90.3	34.4
Pb Ro Tail	77.71	0.47	7.98	7.1	66.0	76.55	0.62	7.83	9.7	65.6
3rd Zn Cl Conc	7.60	0.86	53.90	1.3	43.6	4.10	1.38	53.90	1.2	24.2
3rd Zn Cl Tail	1.35	1.62	44.5	0.4	6.4	1.80	1.34	40.60	0.5	8.0
2nd Zn Cl Conc	8.95	0.97	52.5	1.7	50.0	5.90	1.37	49.85	1.7	32.2
2nd Zn Cl Tail	1.55	1.86	23.0	0.6	3.8	2.55	1.40	41.00	0.7	11.4
1st Zn Cl Conc	10.50	1.11	48.13	2.3	53.8	8.45	1.39	47.18	2.4	43.6
1st Zn Cl Tail	4.70	1.24	11.40	1.1	5.7	5.40	0.86	25.3	0.9	15.0
Zn Ro Conc	15.20	1.15	36.78	3.4	59.5	13.85	1.18	38.65	3.3	58.6
Zn Ro Tail	62.51	0.30	0.98	3.7	6.5	62.70	0.50	1.02	6.4	7.0
Head	100.00	5.09	9.40	100.0	100.0	100.00	4.94	9.13	100.0	100.0

TESTS V-95 & V-96



TESTS V-95 & V-96



APPENDIX 1

HEAD ANALYSIS AND SAMPLE PREPARATION

Head Screen Analysis of High Grade No. 2 Sample

Mesh	% Weight	% Passing
4	7.4	92.6
6	23.1	69.5
8	16.6	52.9
10	11.3	41.6
14	6.6	35.0
20	5.4	29.6
-20	29.6	--

Sample Preparation:

The sample was crushed and mixed by the method of coning and quartering. It was then placed in 2,000 gm bags which were used for test purposes.

Head Assay of High Grade No. 2 Sample

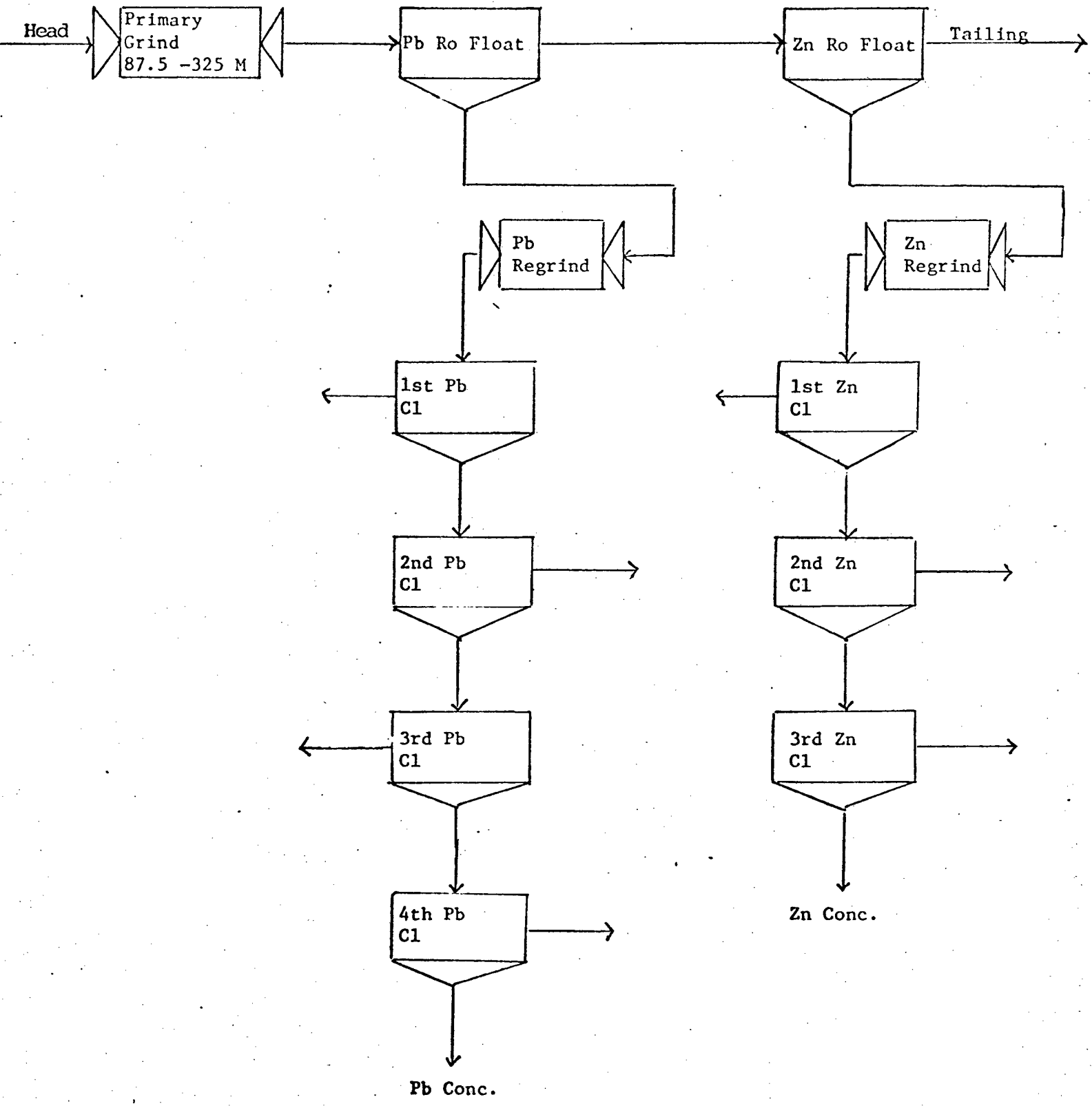
Pb (%)	=	5.12
Pb Ox (%)	=	0.62
Zn (%)	=	9.68
Zn Ox (%)	=	0.27
Cu (%)	=	0.14
Cu Ox (%)	=	0.002
Au (oz/ton)	=	0.038
Ag (oz/ton)	=	2.44
Cd (%)	=	0.017
As (%)	=	0.24
Po (%)	=	3.22
Py (%)	=	38.68
SiO <sub>2</sub> (%)	=	27.4
Al <sub>2</sub> O <sub>3</sub> (%)	=	1.33
MgO (%)	=	1.05
CaO (%)	=	1.82
Fe (%)	=	21.00
S (%)	=	28.7
Insol (%)	=	28.3
Hg (PPM)	=	112.0

Specific Gravity: 3.8

APPENDIX 2

TESTWORK DETAILS

FLWSHEET OF TESTS V-95 AND V-96  
(Lakefield & Noranda Test Comparison)



# NORANDA ORE DRESSING LABORATORY

REMARKS: \* In the fourth cleaner, we have had trouble with froth in starting.

PROJECT: Vangorda

DATE: 5-11-75

SAMPLE NO.: High Grade No. 2

TEST NO.: V-95

CHARGE GMS: 2000 gr

PURPOSE: Duplicate test No. V-87 with cleaner stage.

Product	Time Mins.	% Solids	pH	REAGENTS lbs./ton														
				Na <sub>2</sub> CO <sub>3</sub>	Ca(OH) <sub>2</sub>	Na <sub>2</sub> S	Na <sub>2</sub> SO <sub>3</sub>	ZnSO <sub>4</sub>	NaCN	CuSO <sub>4</sub>	Mibc	D-250	Dichromate	R-325	Af-242	Ad-404	Z-200	Z-34
Primary Grind	24	70	-	-	-	0.5	1.0	-	.30	-	-	-	-	-	-	-	-	-
Pb Rougher	4	25	9.9	-	.25	-	-	-	-	-	.04	-	-	0.05	-	-	-	-
	8	25	9.4	-	-	-	1.0	-	-	-	.02	-	-	0.08	-	-	-	-
Pb Conc <sup>Regrind</sup>	5	64	-	-	.50	-	-	0.5	.08	-	-	-	-	-	-	-	-	-
Pb 1st Cleaner	7	18	10.9	-	-	-	-	0.3	-	-	-	-	-	0.05	-	-	-	-
Pb 2nd Cleaner	6	10	11.0	-	.25	-	-	0.25	.06	-	-	-	-	0.04	-	-	-	-
Pb 3rd Cleaner	3	14	11.1	-	.15	-	-	0.20	.05	-	-	-	-	0.005	-	-	-	-
Pb 4th Cleaner	3	9	11.0	-	.11	-	-	0.15	-	-	-	-	-	0.002	-	-	-	-
Zn Circuit																		
Zn Cond	5	21	11.0	-	1.8	-	-	-	-	1.0	-	-	1.0	-	-	-	-	.05
Zn Rougher	8	21	11.0	-	-	-	-	-	-	-	.06	.02	-	-	-	-	-	.07
Zn Conc <sup>Regrind</sup>	6	60	-	-	.75	-	-	-	-	-	-	-	.25	-	-	-	-	-
Zn 1st Cleaner	6	12	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.03
Zn 2nd Cleaner	5	9	11.0	-	.15	-	-	-	-	-	-	-	-	-	-	-	-	.02
Zn 3rd Cleaner	2	14	11.0	-	.10	-	-	-	-	-	-	-	-	-	-	-	-	-

