

APR 28 1978



I.D.B.  
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D.A.L.  
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P.O. BOX 512 • MILWAUKEE, WISCONSIN 53201  
March 22, 1978  
FILE

CC K.L.C. Grum 14K  
Bulatovic  
Carrington  
020687

MINING SYSTEMS DIVISION

Grum-grinding tests.

Noranda Mines  
c/o Lakefield Research of Canada, Ltd.  
P. O. Box 430  
Lakefield, Ontario, AOL 2H0

ATTENTION: Mr. K. Koningsmann

SUBJECT: ALLIS-CHALMERS TEST REPORT 78-033  
ON TWO (2) DRUMS OF LEAD ZINC ORE  
IDENTIFIED AS 2027 GRUM BULK SAMPLE #1  
AND 2027 GRUM BULK SAMPLE #2

Sir:

This in reference to the October 27, 1977 letter from Mr. S. Bultavosic, Project Metallurgist for Lakefield Research of Canada, Ltd. We have finally received the material and processed this order. We apologize for any delay after receipt of the material. You will find within the report are Bond work indices for both samples, both at 14 mesh for the rod mill and 200 mesh for the ball mill. It appears this material does not have an excessively high work index. The range is 13.5 to 11.5 in the rod and ball mill respectively. If you have any questions concerning the testwork, do not hesitate to contact us. If we can be of assistance concerning the application of grinding mills, certainly do not hesitate to contact us.

Along those lines, I take the liberty of forwarding one copy of this test report to Canadian Allis-Chalmers Ltd. at their main plant Lachine Office in the care of Mr. Tom Steele, the Sr. Grinding Mill Application Engineer.

I will, by copy of this letter at our office of Contract Administration direct them to submit the invoice to the following address: Kerr Addison Mines, Ltd. P. O. Box 91, Commerce Court West, Toronto, Ontario M5L1C7, ATTENTION: Mr. J. Carrington. We trust this is correct.

Regards,

C. A. Roloff  
Sr. Grinding Mill Application Engineer  
MINING SYSTEMS DIVISION

CAR/lij

cc: Mr. Tom Steele  
Canadian Allis-Chalmers Ltd.

LIS-CHALMERS  
PROCESS RESEARCH AND TEST CENTER

TEST REPORT

Test No. 78-033 Charge No. 07-6136-71533 Date Reported 3/7/78

Submitted by (customer) A/C Canada For Kerr Addison Mines Ltd.

P.O. Box 91, Commerce Court West, Toronto, Ontario, M5L 1C7

Test Requested by Mr. C. A. Rowland Div. Mining Systems

References \_\_\_\_\_

SAMPLE AS RECEIVED

Weight 267 kg (588 lb) gross Date Rec'd. 11/2/77

Description Two drums of dark Gray to Green, Lead/Zinc Ore were received from Lakefield

Research of Canada, Ltd. One drum was identified as "2027 Grum Bulk Sample #1 (1 1/2"

Material), the other as "2027 Grum Bulk Sample #2 ( 1/2" Material).

TEST PROCEDURE

Type of Test Bond Closed Circuit Grindability Test  
Rod Mill at 14 Mesh  
Ball Mill at 200 Mesh

Equipment Used 12" x 24" Bond Rod Mill  
12" x 12" Bond Ball Mill  
Beckman Model 930 Air Comparison Pycnometer

Test Results	Specific Gravity	Bond Work Index		Work Index Metric	
		Rod Mill 14 Mesh	Ball Mill 200 Mesh	Rod Mill 14 Mesh	Ball Mill 200 Mesh
(1 1/2") Grum Bulk Sample #1	3.85	12.2	10.3	13.5	11.4
( 1/2") Grum Bulk Sample #2	3.89	12.0	10.4	13.2	11.5

Note: The Rod Mill Feed Distribution of "Grum Bulk Sample #2 (1/2" Material) also is the "As Received" Screen Analysis of that sample.

Samples to be discarded unless advised.

By R. J. Mueller, E. J. Szelmeczka  
R. J. Mueller, E. J. Szelmeczka/BHB *BHB*

ALLIS-CHALMERS  
BOND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 1180 MICRO-METERS ( 14 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GR MS PER REV.
1	75.0	1481.0	1023.0	458.0	6.107
2	194.0	2155.0	460.0	1705.0	8.789
3	111.0	1691.0	673.0	1018.0	9.171
4	122.0	1785.0	525.0	1260.0	10.329
5	106.0	1653.0	555.0	1103.0	10.453
6	108.0	1616.0	517.0	1099.0	10.176

LAB MILL FEED IS 164.3 LBS PER CU.FT., PACKED (2.63 KG/LITER)  
 EQUIVALENT TO 3291 GRAMS (1250 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 1644.6 GRAMS SPECIFIC GRAVITY = 3.85  
 AVERAGE OF LAST 2 PERIODS, 100.7 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 1180 MICRO-METERS = 10.314 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	19.53	80.47	3.94	96.06	0.	100.00
3	6700	11.66	88.31	5.00	91.07	0.	100.00
4	4750	11.51	88.49	6.89	93.11	0.	100.00
6	3350	8.78	91.22	9.83	90.17	0.	100.00
8	2360	6.77	93.23	14.81	85.19	0.	100.00
10	1700	6.06	93.94	25.85	74.15	0.	100.00
14	1180	4.62	95.38	32.57	67.43	1.31	98.69
20	850	3.92	96.08	.77	.25	21.39	77.30
28	600	3.81	96.19	.04	.21	14.48	62.82
35	425	2.81	97.19	0.	*00.00	10.75	52.07
48	300	2.74	97.26	.02	.19	7.67	44.40
65	212	2.95	97.05	0.	*00.00	7.11	37.29
100	150	2.58	97.42	0.	*00.00	5.60	31.69
150	106	2.12	97.88	0.	*00.00	5.25	26.44
200	75	2.62	97.38	0.	*00.00	4.89	21.54
270	53	1.60	98.40	0.	*00.00	3.63	17.91
325	45	.96	99.04	0.	*00.00	2.67	15.24
400	38	.99	99.01	0.	*00.00	2.32	12.92
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAW	0	3.97	0.	.19	0.	12.92	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 9377.9 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 890.2 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 12.2

Fig. 1

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 1180 MICRO-METERS DATE 4 MARCH 78

100 MESH	198	6	5	4	3	2	10 MESH	198	6	5	4	3	2	198	6	5	4	3	2	1	
1/2	7																				.1
3/8	42	1																			
3	42	1																			
4	4	2	1																		
6	4	2	1																		
8	4	2	1																		
10	4			12																	
14	4			1										2							
20	4			1																	2
28	4			1																	2
35	4			1																	
48	4			1																	2
65	4			1																	
100	4			1																	
150	4			1																	
200	4			1																	
270	4			1																	
325	4			1																	
400	4			1																	
500 *																					
MESH 100	198	6	5	4	3	2	10 MESH	198	6	5	4	3	2	198	6	5	4	3	2	1	
																					.1

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 1a

**ALLIS-CHALMERS**  
**BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST**  
**AT 75 MICRO-METERS ( 200 TYLER MESH)**

**MATERIAL** LEAD/ZINC ORE - GRUN BULK SAMPLE #1 - (1 1/2" MATERIAL)  
**SUBMITTED BY** A/C CANADA FOR KERR ADDISON MINES LTD.  
P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
**TEST NO.** 78-033 **DATE** 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	375.0	657.0	181.0	475.0	1.269
2	354.0	581.0	66.0	515.0	1.455
3	314.0	534.0	58.0	476.0	1.516
4	304.0	538.0	54.0	484.0	1.592
5	290.0	512.0	54.0	458.0	1.579
6	294.0	497.0	51.0	446.0	1.517
7	307.0	533.0	50.0	483.0	1.573

LAB MILL FEED IS 160.7 LBS PER CU.FT., PACKED (2.58 KG/LITER)  
EQUIVALENT TO 1803 GRAMS ( 700 CC.) IN MILL  
**IDEAL POTENTIAL PRODUCT** = 514.9 GRAMS **SPECIFIC GRAVITY** = 3.85  
**AVERAGE OF LAST 2 PERIODS,** 250.1 PER CENT CIRCULATING LOAD  
**GRINDABILITY AT 75 MICRO-METERS** = 1.545 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	18.97	81.03	4.56	95.44	0.	100.00
10	1700	22.24	58.80	4.03	91.41	0.	100.00
14	1180	12.56	46.24	2.16	89.24	0.	100.00
20	850	8.13	38.11	1.96	87.28	0.	100.00
28	600	5.84	32.27	1.93	85.35	0.	100.00
35	425	4.73	27.54	2.13	83.22	0.	100.00
48	300	4.42	23.12	4.06	79.15	0.	100.00
65	212	3.80	19.32	6.99	72.16	0.	100.00
100	150	3.58	15.74	13.69	58.47	0.	100.00
150	106	2.08	13.66	22.11	36.36	0.	100.00
200	75	3.63	10.04	33.57	2.80	2.80	97.20
270	53	2.96	7.07	0.	*00.00	20.95	76.26
325	45	1.33	5.75	0.	*00.00	11.12	65.14
400	38	1.19	4.55	0.	*00.00	11.69	53.44
500	26	0.	*00.00	0.	*00.00	13.13	40.32
PAN	0	4.55	0.	2.80	0.	40.32	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 2329.2 MICRO METERS  
80 PCT. PASSING PRODUCT SIZE EQUALS 56.8 MICRO METERS  
WORK INDEX FROM ABOVE TEST EQUALS 10.3

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUN BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 75-033 AT 75 MICRO-METERS DATE 4 MARCH 78

100 MESH	198	6	5	4	3	2	10	198	6	5	4	3	2	198	6	5	4	3	2	1	.1	
1/2	7																					
3/8	7																					
3	7																					
4	7																					
6	7																					
8	42	1																				
10	42		1																			
14	4	2			1																	
20	4	2				1																
28	4	2					1															
35	4	2						1														
48	4	2							1													
65	4	2								1												
100	4		2								1											
150	4			2					1													
200	4									1				2								
270		4									1											
325			4									1										
400				4									1									
500 *					4																	*
MESH198	6	5	4	3	2		198	6	5	4	3	2		198	6	5	4	3	2		1	
100							10							1								.1

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 2a

**ALLIS-CHALMERS**  
**BCND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST**  
**AT 1180 MICRO-METERS ( 14 TYLER MESH)**

MATERIAL LEAD/ZINC ORE - GRUB BULK SAMPLE #2 - ( 1/2" MATERIAL  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.

P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO

TEST NO. 78-033

DATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	75.0	1976.0	1374.0	602.0	8.027
2	119.0	2107.0	781.0	1326.0	11.143
3	81.0	1747.0	833.0	914.0	11.284
4	93.0	1744.0	691.0	1053.0	11.323
5	93.0	1964.0	689.0	1275.0	13.710
6	70.0	1685.0	776.0	909.0	12.986
7	83.0	1674.0	656.0	1008.0	12.145
8	89.0	1787.0	662.0	1125.0	12.540

LAB MILL FEED IS 173.5 LBS PER CU.FT., PACKED (2.78 KG/LITER)  
 EQUIVALENT TO 3476 GRAMS (1250 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 1737.0 GRAMS SPECIFIC GRAVITY = 3.89  
 AVERAGE OF LAST 2 PERIODS, 100.9 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 1180 MICRO-METERS = 12.392 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	4.78	95.22	0.	100.00	0.	100.00
3	6700	12.70	82.52	.73	99.27	0.	100.00
4	4750	10.12	72.40	1.40	97.87	0.	100.00
6	3350	8.51	63.90	3.68	94.19	0.	100.00
8	2360	10.17	53.73	13.78	80.40	0.	100.00
10	1700	8.29	45.43	32.88	47.52	0.	100.00
14	1180	5.90	39.53	45.31	2.21	.71	99.29
20	850	5.60	33.93	1.88	.33	20.87	78.41
28	600	4.48	29.45	.05	.28	14.76	63.55
35	425	3.59	25.86	.03	.25	10.12	53.52
48	300	3.91	21.95	.05	.20	7.23	46.30
65	212	3.55	18.40	0.	*00.00	7.58	38.72
100	150	3.43	14.97	0.	*00.00	5.49	33.23
150	106	2.79	12.17	0.	*00.00	5.13	28.10
200	75	2.82	9.36	0.	*00.00	5.35	22.75
270	53	2.12	7.23	0.	*00.00	3.79	18.96
325	45	1.17	6.06	0.	*00.00	2.23	16.73
400	38	1.20	4.86	0.	*00.00	2.23	14.50
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAN	0	4.86	0.	.20	0.	14.50	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 6175.3 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 874.0 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 12.0

ALLIS-CHALMERS

MATERIAL SUBMITTED BY LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 A/C CANADA FOR KEPP ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 1180 MICRO-METERS DATE 5 MARCH 78

100	10						1						.1						
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1	
1/2 7																			
3/8 61																			
3 421																			
4 42 1																			
6 42 1																			
8 4 2 1																			
10 4 3																			
14 4 1										2									
20 4 1																2			
28 4 1																2			
35 4 1																2			
48 4 1																	2		
65 4 1																			
100 4 1																			
150 4 1																			
200 4 1																			
270 4 1																			
325 4 1																			
400 4 1																			
500 *																			
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1	
100																			
							10 WEIGHT % PASSING												

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 3a

ALLIS-CHALMERS  
BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 75 MICRO-METERS ( 200 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KEPP ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 LATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	307.0	578.0	161.0	417.0	1.358
2	328.0	509.0	53.0	456.0	1.390
3	325.0	533.0	47.0	486.0	1.495
4	301.0	511.0	49.0	462.0	1.535
5	294.0	502.0	47.0	455.0	1.548
6	292.0	505.0	46.0	459.0	1.572
7	288.0	485.0	47.0	438.0	1.521

LAB MILL FEED IS 155.5 LBS PER CU.FT., PACKED (2.49 KG/LITER)  
 EQUIVALENT TO 1745 GRAMS ( 700 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 498.2 GRAMS SPECIFIC GRAVITY = 3.89  
 AVERAGE OF LAST 3 PERIODS, 250.9 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 75 MICRO-METERS = 1.547 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENT GE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	22.13	77.87	4.75	95.25	0.	100.00
10	1700	18.19	59.68	4.92	90.33	0.	100.00
14	1180	10.82	48.86	2.45	87.87	0.	100.00
20	850	9.03	39.33	2.16	85.70	0.	100.00
28	600	6.63	33.20	1.97	83.74	0.	100.00
35	425	4.64	28.56	2.10	81.64	0.	100.00
48	300	4.39	24.17	3.80	77.84	0.	100.00
65	212	4.52	19.55	6.46	71.38	0.	100.00
100	150	4.23	15.42	12.98	58.39	0.	100.00
150	106	2.55	12.86	21.77	36.62	0.	100.00
200	75	3.62	9.24	33.28	3.34	3.94	96.06
270	53	2.44	6.79	3.15	.20	21.47	74.60
325	45	1.30	5.49	0.	*00.00	11.09	63.51
400	38	1.14	4.35	0.	*00.00	11.18	52.33
500	26	0.	*00.00	0.	*00.00	13.51	38.82
PAN	0	4.35	0.	.20	0.	38.82	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 2451.0 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 58.3 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 10.4

Fig. 4

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 75 MICRO-METERS DATE 5 MARCH 78

100						10	WEIGHT % PASSING					1	.1						
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1	.1
1/2 7																			
3/8 7																			
3 7																			
4 7																			
6 7																			
8 42 1																			
10 42 1																			
14 4 2 1																			
20 4 2 1																			
28 4 2 1																			
35 4 2 1																			
48 4 2 1																			
65 4 2 1																			
100 4 2 1																			
150 4 2 1																			
200 4 1 2																			
270 4 1 2																			
325 4 1 1																			
400 4 1 1																			
500 *																			
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1	.1
100																			

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 4a

**LIS-CHALMERS  
PROCESS RESEARCH AND TEST CENTER**

**TEST REPORT**

Test No. 78-033 Charge No. 07-6136-71533 Date Reported 3/7/78

Submitted by (customer) A/C Canada For Kerr Addison Mines Ltd.

P.O. Box 91, Commerce Court West, Toronto, Ontario, M5L 1C7

Test Requested by Mr. C. A. Rowland Div. Mining Systems

References \_\_\_\_\_

**SAMPLE AS RECEIVED**

Weight 267 kg (588 lb) gross Date Rec'd. 11/2/77

Description Two drums of dark Gray to Green, Lead/Zinc Ore were received from Lakefield Research of Canada, Ltd. One drum was identified as "2027 Grum Bulk Sample #1 (1 1/2" Material), the other as "2027 Grum Bulk Sample #2 (1/2" Material).

**TEST PROCEDURE**

Type of Test Bond Closed Circuit Grindability Test  
Rod Mill at 14 Mesh  
Ball Mill at 200 Mesh

Equipment Used 12" x 24" Bond Rod Mill  
12" x 12" Bond Ball Mill  
Beckman Model 930 Air Comparison Pycnometer

Test Results	Specific Gravity	Bond Work Index		Work Index Metric	
		Rod Mill 14 Mesh	Ball Mill 200 Mesh	Rod Mill 14 Mesh	Ball Mill 200 Mesh
(1 1/2") Grum Bulk Sample #1	3.85	12.2	10.3	13.5	11.4
(1/2") Grum Bulk Sample #2	3.89	12.0	10.4	13.2	11.5

Note: The Rod Mill Feed Distribution of "Grum Bulk Sample #2 (1/2" Material) also is the "As Received" Screen Analysis of that sample.

Samples to be discarded unless advised.

By R. J. Mueller, E. J. Szelmeczka  
R. J. Mueller, E. J. Szelmeczka/BHB *BHB*

ALLIS-CHALMERS  
BOND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 1180 MICRO-METERS ( 14 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GP MS PER REV.
1	75.0	1481.0	1023.0	458.0	6.107
2	194.0	2165.0	460.0	1705.0	8.789
3	111.0	1691.0	673.0	1018.0	9.171
4	122.0	1785.0	525.0	1260.0	10.329
5	106.0	1663.0	555.0	1108.0	10.453
6	108.0	1616.0	517.0	1099.0	10.175

LAB MILL FEED IS 164.3 LBS PER CU.FT., PACKED (2.63 KG/LITER)  
 EQUIVALENT TO 3291 GPAMS (1250 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 1644.6 GRAMS SPECIFIC GRAVITY = 3.85  
 AVERAGE OF LAST 2 PERIODS, 100.7 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 1180 MICRO-METERS = 10.314 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM NU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	19.53	80.47	3.94	96.06	0.	100.00
3	6700	11.66	68.81	5.00	91.07	0.	100.00
4	4750	11.51	57.30	6.39	84.17	0.	100.00
6	3350	8.78	48.52	9.83	74.35	0.	100.00
8	2360	6.77	41.75	14.81	59.54	0.	100.00
10	1700	6.06	35.69	25.85	33.69	0.	100.00
14	1180	4.62	31.07	32.67	1.02	1.31	98.69
20	850	3.92	27.15	.77	.25	21.39	77.30
28	600	3.81	23.34	.04	.21	14.48	62.82
35	425	2.81	20.53	0.	*00.00	10.75	52.07
48	300	2.74	17.79	.02	.19	7.67	44.40
65	212	2.95	14.84	0.	*00.00	7.11	37.29
100	150	2.58	12.26	0.	*00.00	5.60	31.69
150	106	2.12	10.15	0.	*00.00	5.25	26.44
200	75	2.62	7.52	0.	*00.00	4.89	21.54
270	53	1.60	5.92	0.	*00.00	3.63	17.91
325	45	.96	4.96	0.	*00.00	2.67	15.24
400	38	.99	3.97	0.	*00.00	2.32	12.92
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAN	0	3.97	0.	.19	0.	12.92	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 9377.9 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 890.2 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 12.2



ALLIS-CHALMERS  
BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 75 MICRO-METERS ( 200 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
TEST NO. 78-033 DATE 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	375.0	657.0	181.0	476.0	1.269
2	354.0	581.0	66.0	515.0	1.455
3	314.0	534.0	58.0	476.0	1.516
4	304.0	538.0	54.0	484.0	1.592
5	290.0	512.0	54.0	458.0	1.579
6	294.0	497.0	51.0	446.0	1.517
7	307.0	533.0	50.0	483.0	1.573

LAB MILL FEED IS 160.7 LBS PER CU.FT., PACKED (2.58 KG/LITER)  
EQUIVALENT TO 1803 GRAMS ( 700 CC.) IN MILL  
IDEAL POTENTIAL PRODUCT = 514.9 GRAMS SPECIFIC GRAVITY = 3.85  
AVERAGE OF LAST 2 PERIODS, 250.1 PER CENT CIRCULATING LOAD  
GRINDABILITY AT 75 MICRO-METERS = 1.545 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	18.97	81.03	4.56	95.44	0.	100.00
10	1700	22.24	77.76	4.03	95.97	0.	100.00
14	1180	12.56	87.44	2.16	97.84	0.	100.00
20	850	8.13	91.87	1.96	98.04	0.	100.00
28	600	5.84	94.16	1.93	98.07	0.	100.00
35	425	4.73	95.27	2.13	97.87	0.	100.00
48	300	4.42	95.58	4.06	95.94	0.	100.00
65	212	3.80	96.20	6.99	93.01	0.	100.00
100	150	3.58	96.42	13.69	86.31	0.	100.00
150	106	2.08	97.92	22.11	77.89	0.	100.00
200	75	3.63	96.37	33.57	66.43	2.80	97.20
270	53	2.96	97.04	0.	*00.00	20.95	79.05
325	45	1.33	98.67	0.	*00.00	11.12	88.88
400	38	1.19	98.81	0.	*00.00	11.69	88.31
500	26	0.	100.00	0.	*00.00	13.13	86.87
PAN	0	4.55	95.45	2.80	97.20	40.32	59.68

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 2329.2 MICRO METERS  
80 PCT. PASSING PRODUCT SIZE EQUALS 56.8 MICRO METERS  
WORK INDEX FROM ABOVE TEST EQUALS 10.3



ALLIS-CHALMERS  
BCND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 1180 MICRO-METERS ( 14 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GPM BULK SAMPLE #2 - ( 1/2" MATERIAL )  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	75.0	1976.0	1374.0	602.0	8.027
2	119.0	2107.0	781.0	1326.0	11.143
3	81.0	1747.0	833.0	914.0	11.284
4	93.0	1744.0	691.0	1053.0	11.323
5	93.0	1954.0	689.0	1275.0	13.710
6	70.0	1685.0	776.0	909.0	12.986
7	83.0	1674.0	656.0	1008.0	12.145
8	89.0	1787.0	662.0	1125.0	12.640

LAB MILL FEED IS 173.5 LBS PER CU.FT., PACKED (2.78 KG/LITER)  
 EQUIVALENT TO 3476 GRAMS (1250 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 1737.0 GRAMS SPECIFIC GRAVITY = 3.89  
 AVERAGE OF LAST 2 PERIODS, 100.9 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 1180 MICRO-METERS = 12.392 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	4.78	95.22	0.	100.00	0.	100.00
3	6700	12.70	82.52	.73	99.27	0.	100.00
4	4750	10.12	72.40	1.40	97.87	0.	100.00
6	3350	8.51	63.90	3.68	94.19	0.	100.00
8	2360	10.17	53.73	13.78	80.40	0.	100.00
10	1700	8.29	45.43	32.88	47.52	0.	100.00
14	1180	5.90	39.53	45.31	2.21	.71	99.29
20	850	5.60	33.93	1.88	.33	20.87	78.41
28	600	4.48	29.45	.05	.28	14.76	63.65
35	425	3.59	25.36	.03	.25	10.12	53.52
48	300	3.91	21.95	.05	.20	7.23	46.30
65	212	3.55	18.40	0.	*00.00	7.58	38.72
100	150	3.43	14.97	0.	*00.00	5.49	33.23
150	106	2.79	12.17	0.	*00.00	5.13	28.10
200	75	2.82	9.36	0.	*00.00	5.35	22.75
270	53	2.12	7.23	0.	*00.00	3.79	18.96
325	45	1.17	6.06	0.	*00.00	2.23	16.73
400	38	1.20	4.86	0.	*00.00	2.23	14.50
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAN	0	4.86	0.	.20	0.	14.50	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 6175.3 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 874.0 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 12.0

Fig. 3

ALLIS-CHALMERS

MATERIAL SUBMITTED BY LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 A/C CANADA FOR KEPP ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 1180 MICRO-METERS DATE 5 MARCH 78

100						10	WEIGHT % PASSING					1	.1					
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
1/2 7																		
3/8 61																		
3 421																		
4 42 1																		
6 42 1																		
8 4 2 1																		
10 4				3														
14 4				1						2								
20 4				1												2		
28 4				1													2	
35 4				1														2
48 4				1														2
65 4				1														
100 4				1														
150 4				1														
200 4				1														
270 4				1														
325 4				1														
400 4				1														
500 *																		
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
100						10						1						

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 3a

ALLIS-CHALNERS  
 BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST  
 AT 75 MICRO-METERS ( 200 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KEPP ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	307.0	578.0	161.0	417.0	1.358
2	328.0	509.0	53.0	456.0	1.390
3	325.0	533.0	47.0	486.0	1.495
4	301.0	511.0	49.0	462.0	1.535
5	294.0	502.0	47.0	455.0	1.548
6	292.0	505.0	46.0	459.0	1.572
7	288.0	485.0	47.0	438.0	1.521

LAB MILL FEED IS 155.5 LBS PER CU.FT., PACKED (2.49 KG/LITER)  
 EQUIVALENT TO 1745 GRAMS ( 700 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 498.2 GRAMS SPECIFIC GRAVITY = 3.89  
 AVERAGE OF LAST 3 PERIODS, 250.9 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 75 MICRO-METERS = 1.547 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENT GE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	22.13	77.87	4.75	95.25	0.	100.00
10	1700	18.19	59.68	4.92	90.33	0.	100.00
14	1180	10.82	48.86	2.46	87.87	0.	100.00
20	850	9.03	39.83	2.16	85.79	0.	100.00
28	600	6.63	33.20	1.97	83.74	0.	100.00
35	425	4.64	28.56	2.10	81.64	0.	100.00
48	300	4.39	24.17	3.80	77.84	0.	100.00
55	212	4.52	19.55	6.46	71.38	0.	100.00
100	150	4.23	15.42	12.98	58.39	0.	100.00
150	106	2.56	12.86	21.77	36.62	0.	100.00
200	75	3.62	9.24	33.28	3.34	3.94	96.06
270	53	2.44	6.79	3.15	.20	21.47	74.60
325	45	1.30	5.49	0.	*00.00	11.09	53.51
400	38	1.14	4.35	0.	*00.00	11.18	52.33
500	26	0.	*00.00	0.	*00.00	13.51	38.82
PAN	0	4.35	0.	.20	0.	38.82	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 2451.0 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 58.3 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 10.4

Fig. 4

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 75 MICRO-METERS DATE 5 MARCH 78

MESH	100					10					1					.1			
	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4		3	2	1
1/2 7																			
3/8 7																			
3 7																			
4 7																			
6 7																			
8 42 1																			
10 42 1																			
14 4 2 1																			
20 4 2 1																			
28 4 2 1																			
35 4 2 1																			
48 4 2 1																			
65 4 2 1																			
100 4 2 1																			
150 4 2 1																			
200 4 1 2																			
270 4 1 2																			
325 4 1 2																			
400 4 1 2																			
500 * 4																			
MESH 198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1	
100						10						1							

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+D=5 C+D=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 4a

ALLIS-CHALMERS  
PROCESS RESEARCH AND TEST CENTER

TEST REPORT

Test No. 78-033 Charge No. 07-6136-71533 Date Reported 3/7/78

Submitted by (customer) A/C Canada For Kerr Addison Mines Ltd.

P.O. Box 91, Commerce Court West, Toronto, Ontario, M5L 1C7

Test Requested by Mr. C. A. Rowland Div. Mining Systems

References \_\_\_\_\_

SAMPLE AS RECEIVED

Weight 267 kg (588 lb) gross Date Rec'd. 11/2/77

Description Two drums of dark Gray to Green, Lead/Zinc Ore were received from Lakefield

Research of Canada, Ltd. One drum was identified as "2027 Grum Bulk Sample #1 (1 1/2"

Material), the other as "2027 Grum Bulk Sample #2 ( 1/2" Material).

TEST PROCEDURE

Type of Test  Bond Closed Circuit Grindability Test  
 Rod Mill at 14 Mesh  
 Ball Mill at 200 Mesh

Equipment Used  12" x 24" Bond Rod Mill  
 12" x 12" Bond Ball Mill  
 Beckman Model 930 Air Comparison Pycnometer

Test Results	Specific Gravity	Bond Work Index		Work Index Metric	
		Rod Mill 14 Mesh	Ball Mill 200 Mesh	Rod Mill 14 Mesh	Ball Mill 200 Mesh
(1 1/2") Grum Bulk Sample #1	3.85	12.2	10.3	13.5	11.4
( 1/2") Grum Bulk Sample #2	3.89	12.0	10.4	13.2	11.5

Note: The Rod Mill Feed Distribution of "Grum Bulk Sample #2 (1/2" Material) also is the "As Received" Screen Analysis of that sample.

Samples to be discarded unless advised.

By Randy Mueller, E. J. Szelmezcza  
R. J. Mueller, E. J. Szelmezcza/BHB *BHB*

**ALLIS-CHALMERS**  
**BOND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST**  
**AT 1180 MICRO-METERS ( 14 TYLER MESH)**

**MATERIAL** LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
**SUBMITTED BY** A/C CANADA FOR KERR ADDISON MINES LTD.  
P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
**TEST NO.** 78-033 **DATE** 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GP MS PER REV.
1	75.0	1481.0	1023.0	458.0	6.107
2	194.0	2165.0	460.0	1705.0	8.789
3	111.0	1691.0	673.0	1018.0	9.171
4	122.0	1785.0	525.0	1260.0	10.329
5	106.0	1663.0	555.0	1108.0	10.453
6	108.0	1616.0	517.0	1099.0	10.175

LAB MILL FEED IS 164.3 LBS PER CU.FT., PACKED (2.63 KG/LITER)  
EQUIVALENT TO 3291 GRAMS (1250 CC.) IN MILL  
**IDEAL POTENTIAL PRODUCT** = 1644.6 GRAMS **SPECIFIC GRAVITY** = 3.85  
**AVERAGE OF LAST 2 PERIODS,** 100.7 PER CENT CIRCULATING LOAD  
**GRINDABILITY AT 1180 MICRO-METERS** = 10.314 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	19.53	80.47	3.94	96.06	0.	100.00
3	6700	11.66	68.81	5.00	91.07	0.	100.00
4	4750	11.51	57.30	6.39	84.17	0.	100.00
6	3350	8.78	48.52	9.83	74.35	0.	100.00
8	2360	6.77	41.75	14.81	59.54	0.	100.00
10	1700	6.06	35.69	25.85	33.69	0.	100.00
14	1180	4.62	31.07	32.37	1.02	1.31	98.59
20	850	3.92	27.15	.77	.25	21.39	77.30
28	600	3.81	23.34	.04	.21	14.43	62.82
35	425	2.81	20.53	0.	*00.00	10.75	52.07
48	300	2.74	17.79	.02	.19	7.67	44.40
65	212	2.95	14.84	0.	*00.00	7.11	37.29
100	150	2.58	12.26	0.	*00.00	5.60	31.69
150	106	2.12	10.15	0.	*00.00	5.25	26.44
200	75	2.62	7.52	0.	*00.00	4.89	21.54
270	53	1.60	5.92	0.	*00.00	3.63	17.91
325	45	.96	4.96	0.	*00.00	2.57	15.24
400	38	.99	3.97	0.	*00.00	2.32	12.92
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAN	0	3.97	0.	.19	0.	12.92	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 9377.9 MICRO METERS  
80 PCT. PASSING PRODUCT SIZE EQUALS 890.2 MICRO METERS  
WORK INDEX FROM ABOVE TEST EQUALS 12.2

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 1180 MICRO-METERS DATE 4 MARCH 78

100						10	WEIGHT % PASSING					1						.1	
MESH	198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
1/2	7																		*
3/8	42	1																	
	3	42	1																
	4	4	2	1															
	6	4	2	1															
	8	4	2	1															
	10	4			12														
	14	4			1							2							
	20	4			1													2	
	28	4			1													2	
	35	4			1														
	48	4			1													2	
	65	4			1														
	100	4			1														
	150	4			1														
	200	4			1														
	270	4			1														
	325	4			1														
	400	4			1														
500 *																			*
MESH	198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
100							10												.1

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 1a

ALLIS-CHALMERS  
BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 75 MICRO-METERS ( 200 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRIND BULK SAMPLE #1 - (1 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 4 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	375.0	657.0	181.0	476.0	1.269
2	354.0	581.0	66.0	515.0	1.455
3	314.0	534.0	58.0	476.0	1.516
4	304.0	538.0	54.0	484.0	1.592
5	290.0	512.0	54.0	458.0	1.579
6	294.0	497.0	51.0	446.0	1.517
7	307.0	533.0	50.0	483.0	1.573

LAB MILL FEED IS 160.7 LBS PER CU.FT., PACKED (2.58 KG/LITER)  
 EQUIVALENT TO 1803 GRAMS ( 700 CC.) IN M LL  
 IDEAL POTENTIAL PRODUCT = 514.9 GRAMS SPECIFIC GRAVITY = 3.85  
 AVERAGE OF LAST 2 PERIODS, 250.1 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 75 MICRO-METERS = 1.545 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	18.97	81.03	4.56	95.44	0.	100.00
10	1700	22.24	58.80	4.03	91.41	0.	100.00
14	1180	12.56	46.24	2.16	89.24	0.	100.00
20	850	8.13	38.11	1.96	87.28	0.	100.00
28	600	5.84	32.27	1.93	85.35	0.	100.00
35	425	4.73	27.54	2.13	83.22	0.	100.00
48	300	4.42	23.12	4.06	79.15	0.	100.00
65	212	3.80	19.32	6.99	72.16	0.	100.00
100	150	3.58	15.74	13.69	58.47	0.	100.00
150	106	2.08	13.66	22.11	36.36	0.	100.00
200	75	3.63	10.04	33.57	2.80	2.80	97.20
270	53	2.96	7.07	0.	*00.00	20.95	76.25
325	45	1.33	5.75	0.	*00.00	11.12	65.14
400	38	1.19	4.55	0.	*00.00	11.69	53.44
500	26	0.	*00.00	0.	*00.00	13.13	40.32
PAN	0	4.55	0.	2.80	0.	40.32	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 2329.2 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 56.8 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 10.3



ALLIS-CHALMERS  
BCND ROD MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 1180 MICRO-METERS ( 14 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL )  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 DATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	75.0	1976.0	1374.0	602.0	8.027
2	119.0	2107.0	781.0	1326.0	11.143
3	81.0	1747.0	833.0	914.0	11.284
4	93.0	1744.0	691.0	1053.0	11.323
5	93.0	1964.0	689.0	1275.0	13.710
6	70.0	1685.0	776.0	909.0	12.986
7	83.0	1674.0	666.0	1008.0	12.145
8	89.0	1787.0	662.0	1125.0	12.640

LAB MILL FEED IS 173.5 LBS PER CU.FT., PACKED (2.78 KG/LITER)  
 EQUIVALENT TO 3476 GRAMS (1250 CC.) IN MILL  
 IDEAL POTENTIAL PRODUCT = 1737.0 GRAMS SPECIFIC GRAVITY = 3.89  
 AVERAGE OF LAST 2 PERIODS, 100.9 PER CENT CIRCULATING LOAD  
 GRINDABILITY AT 1180 MICRO-METERS = 12.392 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T. MESH	ASTM MU-M	LAB. MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENTAGE	
		ON	PASSING	ON	PASSING	ON	PASSING
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	4.78	95.22	0.	100.00	0.	100.00
3	6700	12.70	82.52	.73	99.27	0.	100.00
4	4750	10.12	72.40	1.40	97.87	0.	100.00
6	3350	8.51	63.90	3.68	94.19	0.	100.00
8	2360	10.17	53.73	13.78	80.40	0.	100.00
10	1700	8.29	45.43	32.88	47.52	0.	100.00
14	1180	5.90	39.53	45.31	2.21	.71	99.29
20	850	5.60	33.93	1.88	.33	20.87	78.41
28	600	4.48	29.45	.05	.28	14.76	63.55
35	425	3.59	25.86	.03	.25	10.12	53.52
48	300	3.91	21.95	.05	.20	7.23	46.30
65	212	3.55	18.40	0.	*00.00	7.58	38.72
100	150	3.43	14.97	0.	*00.00	5.49	33.23
150	106	2.79	12.17	0.	*00.00	5.13	28.10
200	75	2.82	9.36	0.	*00.00	5.35	22.75
270	53	2.12	7.23	0.	*00.00	3.79	18.96
325	45	1.17	6.06	0.	*00.00	2.23	16.73
400	38	1.20	4.86	0.	*00.00	2.23	14.50
500	26	0.	*00.00	0.	*00.00	0.	*00.00
PAN	0	4.86	0.	.20	0.	14.50	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT. PASSING FEED SIZE EQUALS 6175.3 MICRO METERS  
 80 PCT. PASSING PRODUCT SIZE EQUALS 874.0 MICRO METERS  
 WORK INDEX FROM ABOVE TEST EQUALS 12.0

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUM BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 1180 MICRO-METERS DATE 5 MARCH 78

100						10	WEIGHT % PASSING					1						.1	
MESH	198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
1/2 7																			
3/8 61																			
3 421																			
4 42 1																			
6 42 1																			
8 4 2 1																			
10 4 3																			
14 4 1 2																			
20 4 1 2																			
28 4 1 2																			
35 4 1 2																			
48 4 1 2																			
65 4 1																			
100 4 1																			
150 4 1																			
200 4 1																			
270 4 1																			
325 4 1																			
400 4 1																			
500 *																			
MESH	198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
100							10												

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 3a

ALLIS-CHALNERS  
BOND BALL MILL CLOSED CIRCUIT GRINDABILITY TEST  
AT 75 MICRO-METERS ( 200 TYLER MESH)

MATERIAL LEAD/ZINC ORE - GRUB BULK SAMPLE #2 - ( 1/2" MATERIAL)  
SUBMITTED BY A/C CANADA FOR KEPT ADDISON MINES LTD.  
P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
TEST NO. 78-033 DATE 5 MARCH 78

PERIOD	REVOLUTIONS OF MILL	GRAMS OF PRODUCT	GRAMS IN FEED	NET GRAMS PRODUCED	NET GRAMS PER REV.
1	307.0	578.0	161.0	417.0	1.358
2	328.0	509.0	53.0	456.0	1.390
3	325.0	533.0	47.0	486.0	1.495
4	301.0	511.0	49.0	462.0	1.535
5	294.0	502.0	47.0	455.0	1.548
6	292.0	505.0	46.0	459.0	1.572
7	288.0	485.0	47.0	438.0	1.521

LAB MILL FEED IS 155.5 LBS PER CU.FT., PACKED (2.49 KG/LITER)  
EQUIVALENT TO 1745 GRAMS ( 700 CC.) IN MILL  
IDEAL POTENTIAL PRODUCT = 498.2 GRAMS SPECIFIC GRAVITY = 3.89  
AVERAGE OF LAST 3 PERIODS, 250.9 PER CENT CIRCULATING LOAD  
GRINDABILITY AT 75 MICRO-METERS = 1.547 NET GRAMS PER REV.

SIZE OF SIEVE EQUIV. T.MESH	ASTM MU-M	LAB.MILL FEED PERCENTAGE		CIRCULATING LOAD PERCENTAGE		LAST PER. PRODUCT PERCENT GE	
		ON	PASSING	ON	PASSING	ON	SS NG
1/2	13200	0.	100.00	0.	100.00	0.	100.00
3/8	9500	0.	100.00	0.	100.00	0.	100.00
3	6700	0.	100.00	0.	100.00	0.	100.00
4	4750	0.	100.00	0.	100.00	0.	100.00
6	3350	0.	100.00	0.	100.00	0.	100.00
8	2360	22.13	77.87	4.75	95.25	0.	100.00
10	1700	18.19	59.68	4.92	90.33	0.	100.00
14	1180	10.82	48.86	2.45	87.87	0.	100.00
20	850	9.03	39.83	2.16	85.70	0.	100.00
28	600	6.63	33.20	1.97	83.74	0.	100.00
35	425	4.64	28.56	2.10	81.64	0.	100.00
48	300	4.39	24.17	3.80	77.84	0.	100.00
65	212	4.52	19.65	6.46	71.38	0.	100.00
100	150	4.23	15.42	12.98	58.39	0.	100.00
150	106	2.56	12.86	21.77	36.62	0.	100.00
200	75	3.62	9.24	33.28	3.34	3.94	96.06
270	53	2.44	6.79	3.15	.20	21.47	74.60
325	45	1.30	5.49	0.	*00.00	11.09	63.51
400	38	1.14	4.35	0.	*00.00	11.18	52.33
500	26	0.	*00.00	0.	*00.00	13.51	38.82
PAN	0	4.35	0.	.20	0.	38.82	0.

SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

80 PCT.PASSING FEED SIZE EQUALS 2451.0 MICRO METERS  
80 PCT.PASSING PRODUCT SIZE EQUALS 58.3 MICRO METERS  
WORK INDEX FROM ABOVE TEST EQUALS 10.4

ALLIS-CHALMERS

MATERIAL LEAD/ZINC ORE - GRUB BULK SAMPLE #2 - ( 1/2" MATERIAL)  
 SUBMITTED BY A/C CANADA FOR KERR ADDISON MINES LTD.  
 P.O. BOX 91, COMMERCE COURT WEST, TORONTO, ONTARIO  
 TEST NO. 78-033 AT 75 MICRO-METERS DATE 5 MARCH 78

100						10	WEIGHT % PASSING					1	.1					
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
1/2 7																		
3/8 7																		
3 7																		
4 7																		
6 7																		
8 42 1																		
10 42 1																		
14 4 2 1																		
20 4 2 1																		
28 4 2 1																		
35 4 2 1																		
48 4 2 1																		
65 4 2 1																		
100 4 2 1																		
150 4 2 1																		
200 4 1 2																		
270 4 1 2																		
325 4 1 2																		
400 4 1 2																		
500 * 4																		*
MESH198	6	5	4	3	2	198	6	5	4	3	2	198	6	5	4	3	2	1
100						10						1						.1

FEED=1 CIRC.LD.=2 PRODUCT=4 F+C=3 F+P=5 C+P=6 ALL=7  
 SCREEN ANALYSES DO NOT REPRESENT PLANT OPERATION RESULTS

Fig. 4a