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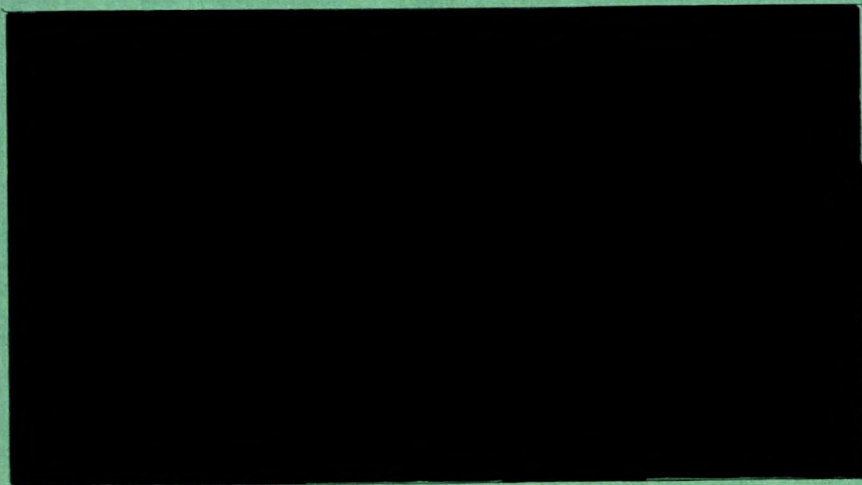
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**CANADA**

**DEPARTMENT OF ENERGY, MINES AND RESOURCES**

**OTTAWA**



*Mines Branch*

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MINES BRANCH INVESTIGATION REPORT

IR 69-27

March, 1969

DETERMINATION OF THE GRINDING CHARACTERISTICS  
OF THREE ORES SUBMITTED BY SOQUEM,  
STE. FOY, P.Q.

by

T. F. BERRY

Mineral Processing Division

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SUMMARY OF RESULTS

The following table shows the average calculated work index in kWh/short ton for the three ores tested compared to the two ores of known work index.

WORK INDEX RESULTS

	<u>Using Comparison Ore A (13.5)</u>	<u>Using Comparison Ore B (16.4)</u>
Copper ore Zone 1	11.7	10.6
Copper ore Zone 2	12.2	11.0
Zinc-Silver ore	11.5	10.4

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## INTRODUCTION

On December 16, 1968, a letter was received from Mr. Raymond Raby, Soquem, (Quebec Mining Exploration Company), 2383 Ste. Foy Road, Ste. Foy, P.Q. Mr. Raby stated that they had been unable to standardize their grindability procedure and asked the assistance of the Mines Branch in determining the work index of ores from Louvicourt, Quebec.

### Shipment

A box containing 130 lb of ore was received on January 13, 1969. The ore from Louvicourt, in the Val d'Or area of Quebec, was identified as follows:

Cu Ore 585-1	Zone 1A and 1B
Cu Ore	Zone 2
Zn-Ag Ore	

### Investigative Procedure

The method presently used at the Mines Branch to calculate the work index ( $W_i$ ) of an ore is based on comparative batch grinding tests. The ore under test and an ore, the work index of which is known, are ground under identical conditions. Particle size determinations are made of the feeds and the ground pulps. The results are plotted on log-log paper and the 80% passing sizes are recorded. From these results the work index is calculated.

## DETAILS OF INVESTIGATION

Samples weighing 2000 grams of each of the three ores submitted were ground for 15 and 20 minutes respectively. Identical grinding times and conditions were used in grinding two other ores, the work indices of which were known.

Particle-size determinations were carried out on the feeds and ground pulps of the test ores and the comparison ores.

The result of this work is recorded in the following tables.

TABLE 1

Results of Grinding Tests for  $W_i$  Calculations - Comparison Ores

Particle Size		Comparison Ore A						Comparison Ore B					
Microns	Mesh	Feed		15 min		20 min		Feed		15 min		20 min	
		% Ret	% Pass	% Ret	% Pass	% Ret	% Pass	% Ret	% Pass	% Ret	% Pass	% Ret	% Pass
1680	10	0.5	99.5					0.4	99.6				
1190	14	12.1	87.4					10.3	89.3				
840	20	14.9	72.5					15.5	73.8				
590	28	13.0	59.5					14.4	59.4				
420	35	11.3	48.2					12.8	46.6		100.0		
297	48	8.8	39.4		100.0		100.0	10.6	36.0	0.2	99.8		100.0
210	65	7.3	32.1	1.3	98.7	0.4	99.6	9.2	26.8	3.3	96.5	1.2	98.8
149	100	5.5	26.6	5.8	92.9	2.8	96.8	6.4	20.4	12.5	84.0	7.1	91.7
105	150	4.9	21.7	12.0	80.9	8.9	87.9	5.2	15.2	17.2	66.8	15.1	76.6
74	200	3.6	18.1	11.2	69.7	11.1	76.8	3.7	11.5	15.6	51.2	15.1	61.5
-74	-200	18.1						11.5		51.2		61.5	
56				5.2	64.5	4.6	72.2						
40				13.6	50.9	14.5	57.7						
28				12.3	38.6	14.0	43.7						
20				10.1	28.5	11.5	32.2						
14				7.4	21.1	8.4	23.8						
10				6.1	15.0	6.9	16.9						
-10				15.0		16.9							
Total		100.0		100.0		100.0		100.0		100.0		100.0	



Table 3 shows the 80% passing points in microns for the comparison ores and the Louvicourt ores, and Table 4 shows the work indices which were calculated from the Bond work-index formula:

$$W_i \left( \frac{10}{\sqrt{F_{80}}} - \frac{10}{\sqrt{P_{80}}} \right) = W_i \left( \frac{10}{\sqrt{P_{80}}} - \frac{10}{\sqrt{F_{80}}} \right)$$

TABLE 3

80% Passing Points

Product		Comparison Ore A	Comparison Ore B	Zone 1 Ore	Zone 2 Ore	Zn-Ag Ore
F <sub>80</sub>	Feed	1030	970	1200	1400	1300
P <sub>80</sub>	15 min grind	105	148	85	105	85
P <sub>80</sub>	20 " "	76	115	67	67	67

TABLE 4

Results of Work Index Calculations

Product	Comparison Ore A	Comparison Ore B	Zone 1 Ore	Zone 2 Ore	Zn-Ag Ore
15 min grind	(13.5)		11.3	12.6	11.1
20 " "			12.1	11.8	11.9
15 min grind		(16.4)	10.3	11.6	10.3
20 " "			10.8	10.5	10.6

### CONCLUSIONS

The grinding characteristics of these ores when compared to two ores of known work index indicate that they are medium-soft ores and should grind easily.

Generally, ores under test should be compared with ores which have similar work index. For this reason, the results obtained using the comparison ore with a work index of 13.5 kWh/short ton are a better indication of the work which will be required to grind these ores.