



UNIVERSITY OF MINNESOTA
TWIN CITIES

Mineral Resources Research Center
Minneapolis, Minnesota 55455

December 4, 1973

Dr. Benjamin Alvarado
Calle 64 No. 7-18 Apt. 1002
Bogota D. E., Colombia

Dear Dr. Alvarado:

Thank you very much for your letter of November 28. We are indeed interested in the project you have outlined in your letter, and there are a number of ways we could proceed. I am certain that every effort should be made to lower the phosphorus content, which should greatly improve the economics of your steel making facilities.

The ore appears to be very difficult and it is impossible for me to make a very realistic cost estimate without first running some preliminary tests. May I suggest that you consider a project in three phases. The first phase would only involve enough test work to decide whether or not beneficiation appears feasible and define the scope of the test work. The second phase would be to carry out laboratory scale tests which after evaluation might lead to a third phase which would involve laboratory scale pilot plant tests and economic evaluation. For the first phase of the work I would need about 50 pounds of a representative sample. We would make a detailed mineralogical examination and perform a few exploratory flotation and magnetic separation tests. The cost of the first phase would be approximately as follows:

Mineralogy	\$ 500.00
Beneficiation Tests	1,200.00
Chemical Analysis and Report	<u>500.00</u>
Total	\$2,200.00

As you know, the Mineral Resources Research Center is a nonprofit organization and the exact costs of the tests are calculated on the basis of our costs plus 100 percent of salaries and fringe benefits as an overhead charge. If you are interested in pursuing this investigation, we need only a letter of authorization stating that the total cost is not to exceed \$2,200.00 without prior written notice.

I was in Bogota about a year ago on a consulting project with the National Academy of Sciences. I might say that I was very favorably impressed with the mineral wealth of the country.

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Please advise me at your earliest convenience if you care to pursue this laboratory work and I would also direct your attention that I might be of some value to you as a consultant along with Arthur G. McKee & Company if you require additional economic studies. #74

For your information I am enclosing the costs of a few typical standard tests to assist you in making research test cost estimates.

Best personal regards,

J. E. Lawver

J. E. Lawver
Director

JEL:mp

MRRC COSTS FOR MINERAL BENEFICIATION TESTS

1. Davis Tube Test, single point with Fe analyses	\$ 25.00
2. Davis Tube Test, three point with Fe analyses	50.00
3. Flotation Tests	
Batch test with fixed reagent addition preceded by	
a. Crushing and grinding, including Fe analyses	65.00
b. Crushing, grinding and desliming, including Fe analyses	80.00
c. Crushing, grinding and magnetic separation, including Fe analyses	150.00
d. Crushing, grinding, magnetic separation and desliming, including Fe analyses	165.00
e. Exploratory flotation test, per sample	600.00
4. Grindability, Bond, test at 100 mesh	185.00
5. Grindability, Bond, wet screen to fine size	235.00
6. Magnetic Roast-Separation (lab scale)	
a. Single grind of product	110.00
b. Three grinds of product	210.00
7. Pellet Tests	
a. Reduction-Abrasion (Linder)	140.00
b. Reducibility under load (Burghardt)	200.00
c. Swelling (JIS-M8715-1968)	140.00
d. Reduction (JIS-M8713-1966)	140.00
e. Reduction-Swelling (MRRC)	160.00
8. Screen Analysis, 7 screens, 8 Fe analyses	60.00
9. Sink-Float test on sized products at two gravities (5 sizes) with Fe analyses	325.00
10. Table, shaking, analysis on 1000 gm sample to produce conc., midd., and tail, including Fe analyses	90.00
11. Table, shaking, analysis on 5,000 gm sample to produce conc., midd., and tail, including Fe analyses	160.00
12. Pilot Plant Tests, not including set-up time or analysis of products	
Cost per day	600.00

13. Chemical Analysis Cost

Total Fe	1.64
Ferrous Fe	2.46
Metallic Fe	4.85
Insol	5.44
SiO ₂	12.35
Mn	1.76
Al ₂ O ₃	5.73
CaO	11.52
MgO	10.64
Cu	4.58
Ni	4.65

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