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**A/S BIDJOVACCE GRUBER**

NORGES GEOLOGISKE UNDERSØKELSE  
TRONDHEIM, NORWAY

LABORATORY REPORT NO. 1 ON THE TESTING OF  
YOUR GRAPHITIC COPPER ORE SAMPLE  
OUR LOT NO. 1636-1

January 4, 1967

2566

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### APPENDIX

FLOWSHEET  
TEST DATA SHEETS

# THE GALIGHIER COMPANY

ESTABLISHED 1901



545-585 WEST EIGHTH SOUTH STREET

P. O. BOX 209

SALT LAKE CITY, UTAH 84110

U.S.A.

CABLE ADDRESS  
GALSAL  
TELEX 038 536

TELEPHONE  
359-8731  
AREA CODE 801

January 4, 1967

Norges Geologiske Undersøkelse  
Leiv Eirickssons Vei 39  
Postboks 3006  
Trondheim, Norway

Attention: Mr. Karl Ingvaldsen  
Administrative Director

LABORATORY REPORT NO. 2 ON THE TESTING OF  
YOUR GRAPHITIC COPPER ORE SAMPLE  
OUR LOT NO. 1636-1

Gentlemen:

Pursuant to our detailed laboratory report of January 27, 1966 and our letter of November 17, 1966, we are pleased to submit this report covering the latest test results of work performed on your graphitic copper ore sample, our Lot No. 1636-1.

## I. OBJECTIVE

The objective of this investigation was to determine the maximum obtainable grade and recovery of copper minerals that could be expected from ore as represented by your sample of graphitic copper ore.

## II. FLOWSHEET RECOMMENDATION

As a result of the tests which were conducted during this phase of the investigation, it was determined that the most satisfactory method of treating ore as represented by sample 1636-1 involved carbon flotation followed with selective copper flotation. The results of Test No. 57, following this procedure, were given to you in our letter of November 17, 1966. Because these results were rather encouraging, a closed-circuit test (Test No. 58) was conducted, the detailed procedure and results of which are presented as follows:

1. A representative 1000 gram charge of ore was ground in a laboratory ball mill at 50% solids (using softened, Salt Lake City water). Reagent to the ball mill was 0.20 pound of kerosene per ton of ore. The screen analysis of the ball mill discharge was as follows:

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January 4, 1967

|       |     |      |      |      |      |      |
|-------|-----|------|------|------|------|------|
| Mesh  | +65 | +100 | +150 | +200 | +325 | +325 |
| Wt. % | 0.6 | 11.6 | 13.5 | 13.4 | 21.6 | 46.3 |

2. The ball mill discharge was diluted to 2% solids, the pH being 7.3. 0.06 pound of MIBC (methyl isobutyl carbinol) was added to the float cell and a carbon rougher concentrate was floated for three minutes. 0.06 pound of MIBC was added and the float was continued for another three minutes. 0.06 pound of MIBC was staged two more times with float intervals of two minutes after each stage addition, total rougher flotation time being ten minutes. This was a somewhat rigorous float procedure but it was found to be necessary to insure a complete removal of the carbon. The carbon that is not floated in the carbon float would report as a diluent in the copper circuit. We observed that during the carbon float, the fine carbon floats first and the coarse carbon floats toward the end of the float.
3. The carbon rougher concentrate was thickened and reground, the ball mill discharge being 89.9% minus 325 mesh.
4. To the reground concentrate, 0.03 pound of MIBC was added and the carbon was cleaned for three minutes. 0.03 pound of MIBC was staged at the end of three, six and eight minutes of the cleaner float, the total float time being nine minutes for the No. 1 cleaner.
5. The carbon cleaner concentrate was recleaned for seven minutes with 0.03 pound of MIBC being added at the beginning of the cleaner and at the end of four and six minutes of the No. 2 cleaner.
6. The carbon recleaner concentrate was cleaned again, the float time being 7.5 minutes with 0.03 pound additions of MIBC at the beginning and at the end of four and six minutes of the float.
7. The combined carbon cleaner tails were thickened and added to the thickened carbon rougher tail. This combined product was conditioned with 4.0 pounds of lime (to a pH of 11.0), 0.02 pound of NaCN and 0.08 pound of Dow Z-200 for ten minutes, after which a copper rougher was floated for five minutes. 0.04 pound of Z-200 was conditioned in for one minute and the copper rougher float was continued for another five minutes. 0.04 pound of Z-200 was conditioned in for another minute and the rougher was continued for four more minutes, total copper rougher flotation time being 14 minutes.
8. The copper rougher concentrate was thickened and reground with 4.0 pounds of lime and 0.08 pound of Z-200.
9. The reground copper concentrate was cleaned for 12 minutes, the pH being 11.0.
10. The copper cleaner concentrate was conditioned for one minute with 1.2 pounds of lime (pH of 11.3) and was recleaned for five minutes.

11. The recleaner concentrate was conditioned for one minute with 1.0 pound of lime and 0.03 pound of MIBC and was cleaned a third time for five minutes.
12. The copper cleaner tails were combined, thickened and added to the carbon rougher tail of the following test along with the carbon cleaner tails of that test thus closing the circuit.

Total reagent requirements for Test No. 58 were: 0.20 pound of kerosene, 0.57 pound of MIBC, 0.02 pound of NaCN, 10.2 pounds of lime and 0.24 pound of Z-200.

The flowsheet used and results obtained in Test No. 58 are depicted as follows:

TEST NO. 58 - CLOSED CIRCUIT

|                               | Wt.    | Wt.   | Cu    | Distribution |
|-------------------------------|--------|-------|-------|--------------|
| Product                       |        |       |       | Cu           |
| <u>Series #1</u>              |        |       |       |              |
| Carbon Cleaner Concentrate #3 | 420    | 42.0  | 0.207 | ----         |
| Copper Cleaner Concentrate #3 | 62     | 6.2   | 24.61 | ----         |
| Copper Rougher Tail           | 429    | 42.9  | 0.166 | ----         |
| Head (Less Circulating Load)  | 911    | 91.1  | 1.68  | ----         |
| <u>Series #2</u>              |        |       |       |              |
| Carbon Cleaner Concentrate #3 | 423    | 42.3  | 0.239 | 5.7          |
| Copper Cleaner Concentrate #3 | 60     | 6.0   | 26.54 | 89.0         |
| Copper Rougher Tail           | 518    | 51.7  | 0.182 | 5.3          |
| Head                          | 1001   | 100.0 | 1.79  | 100.0        |
| <u>Series #3</u>              |        |       |       |              |
| Carbon Cleaner Concentrate #3 | 419    | 43.3  | 0.220 | 4.8          |
| Copper Cleaner Concentrate #3 | 70     | 7.2   | 24.71 | 90.6         |
| Copper Rougher Tail           | 478    | 49.5  | 0.182 | 4.6          |
| Head                          | 967    | 100.0 | 1.96  | 100.0        |
| <u>Series #4</u>              |        |       |       |              |
| Carbon Cleaner Concentrate #3 | 428.0  | 42.4  | 0.252 | 5.8          |
| Copper Cleaner Concentrate #3 | 65.3   | 6.5   | 25.27 | 89.4         |
| Copper Rougher Tail           | 517.0  | 51.2  | 0.173 | 4.8          |
| Head                          | 1010.3 | 100.0 | 1.84  | 100.0        |
| Copper Cleaner Tail #3        | 19.0   |       | 3.49  |              |
| Copper Cleaner Tail #2        | 45.0   |       | 1.650 |              |
| Copper Cleaner Tail #1        | 97.0   |       | 0.396 |              |

The results of the above test allow for the following observations:

1. A copper recovery of 34.6% was obtained in a concentrate assaying 24.33% Cu in open circuit testing (Test No. 57), 6.4% of the copper being contained in the combined copper cleaner tailings. The above results show that the majority of the copper contained in this circulating load eventually appeared in the final copper concentrate in that a recovery of about 90% was obtained. It is to be noted that there was very little difference in the copper assays of the copper rougher tailings in Series 1 through 4.

2. A final copper concentrate grade of about 25% can be expected when concentrating ores as represented by the tested sample.
3. The circulating load of Series 1 was seen to be 8.9% by weight of the original ore. That of the final series was about 16%, this representing a substantial increase. However, this was not detrimental regarding final copper concentrate grade and recovery.

### III. VARIABLES INVESTIGATED

Twenty-eight tests have been conducted on the graphitic copper ore sample in this latest investigation, the complete details of which may be found on the appended data sheets (Test Nos. 31-58). The major variables which were investigated are discussed as follows:

1. The effect of carbon collector concentration at various grinds for carbon rougher flotation, relating to copper losses in the carbon concentrate and carbon recovery (Test Nos. 31 through 42). These tests indicated that, by increasing the amount of carbon collector (kerosene), copper losses increased in the carbon rougher concentrate. This was primarily due to the increased weight of carbon floating. It was more difficult to float the carbon at the coarser grinds and higher collector concentrations were required at the coarser grinds for a reasonable carbon removal. Inasmuch as complete carbon removal is required prior to copper flotation, it is our belief that a relatively fine grind (about 45% minus 325 mesh) should be used to facilitate carbon removal. It was also determined that by regrinding the carbon rougher concentrate to 90% minus 325 mesh prior to cleaning, copper losses in the final carbon concentrate would be minimized while still assuring a high carbon recovery.
2. Various collectors for copper flotation. Three different collectors were tested in the copper flotation circuit, these being Z-3, Z-6 and Z-200. Z-3 was observed to have insufficient collecting power in the environment tested in that a poor copper recovery resulted after rougher concentrate cleaning (see Test No. 44). Z-6 appeared to be too strong a collector in that the iron sulfides floated more readily than was the case with Z-200. Z-200 was the most favorable collector regarding flotation selectivity and copper recovery.
3. The effect of regrinding the copper rougher concentrate prior to cleaning. As can be seen in the tabulation of results presented below, the final copper concentrate grade and recovery are substantially increased when employing a regrind on the copper rougher concentrate prior to cleaning.

## THE GALLIGHER COMPANY

Norges Geologiske Undersøkelser

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January 4, 1967

| <u>Test No.</u> | <u>Minus 325</u> | <u>Product</u>       | <u>Wt. %</u> | <u>% Cu</u> | <u>% Dist.</u> |
|-----------------|------------------|----------------------|--------------|-------------|----------------|
| 53              | 94.8             | Cu Cl Concentrate #2 | 5.2          | 23.42       | 66.4           |
|                 |                  | Cu Cl Concentrate #1 | 8.4          | 18.3        | 83.7           |
| 56              | 95.4             | Cu Cl Concentrate #4 | 6.8          | 22.23       | 82.2           |
| 57              | 100.0            | Cu Cl Concentrate #3 | 6.3          | 24.33       | 84.6           |
|                 |                  | Cu Cl Concentrate #2 | 7.7          | 20.6        | 87.5           |
|                 |                  | Cu Cl Concentrate #1 | 9.8          | 16.5        | 89.3           |

Cursory studies were conducted involving attempts to float the copper and iron minerals together in a bulk float, followed with selective separations of the copper and the iron (Test Nos. 31, 32 and 43) but visual observations indicated inferior results. Also, two stage grinding tests were conducted (Test Nos. 45 and 46) and nothing worthy of further pursuit was developed as a result of these tests. The relatively uncomplicated flowsheet as used in Test No. 58 would seem to be the most desirable approach for treating ores as represented by Lot No. 1635-1.

We've appreciated the opportunity to conduct this investigation for you and, if you have any questions concerning the project or desire further studies, please contact us.

Sincerely yours,

THE GALLIGHER COMPANY

*John Kanthos*

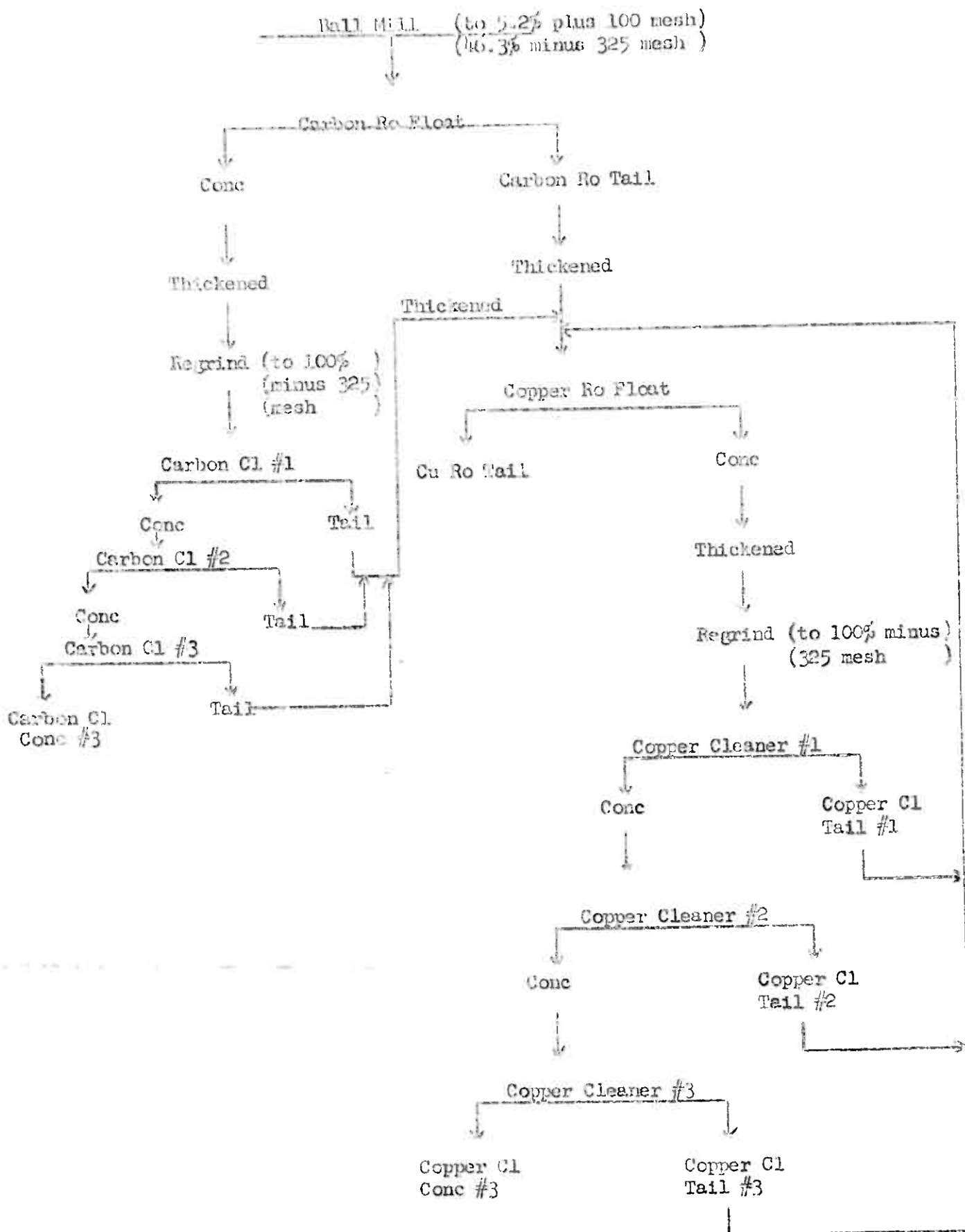
John Kanthos  
Metallurgist

JX/do

cc. GWC

THE GALICHER COMPANY

FLOWSHEET, LOT NO. 1636-1, TEST NO. 58





CABLE  
"GALGAL"

**THE GALIGHER COMPANY**

P.O. BOX 209 — 545.535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
392-8731

OUR LOT NO. 1636-1

DATE.....

BY \_\_\_\_\_

TEST NO. 31

NAME Norges Geologiske

TEST NO. 31 NAME                       
Same C-Ro as test 14 except coarser grind.

[illegible]

REMARKS:

Bulk to conc high in coarse carbon.

CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 202 — 545-535 WEST 5TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
359-8731

OUR LOT NO. 1636-1

DATE 7-27-66

BY \_\_\_\_\_ JX

TEST NO. 32-1

NAME Norges Geologiske

Same as test 14 except Cu conc cleaned further using SO2 caustic starch.

[illegible]

REMARKS:

CABLE  
"GALBAL"

**THE GALIGHIER COMPANY**

P. O. BOX 209 — 545-885 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
339-8731

OUR LOT NO. 1636-1  
DATE 7-27-66  
BY JX

TEST NO. 32-2

NAME Norges Geologiske

[illegible]

REMARKS:

CABLE  
"CALSAL"

**THE GALIGHIER COMPANY**

P. O. BOX 209 — 548.503 WEST 6TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
389-3731

CUR LOT NO. 1636-1

DATE 8-4-66

BY \_\_\_\_\_ JX

TEST NO. 33

NAME Norges Geologiske

Carbon float on -20 mesh material

[illegible]

REMARKS:

Impeller raised  $\frac{1}{8}$ ".

CABLE  
"GALSAL"

P. O. BOX 209 — 545.825 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
880-8731

OUR LOT NO. 1636-1  
DATE 8-5-66  
BY JX

NAME Norges GeologiskeREMARKS:

\* Calculated by difference

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 545-583 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
359-6731LOT NO. 1636-1  
DATE 8-5-66  
JX

TEST NO. 35

NAME Norges Geologiske

Same as test 34 except more collector in BM (0.4 ppt).

| PRODUCT                 | Weight | Percent Weight | ANALYSIS |      |      |  | DISTRIBUTION |  |  |      |
|-------------------------|--------|----------------|----------|------|------|--|--------------|--|--|------|
|                         |        |                | Cu       |      |      |  | Cu           |  |  |      |
| C cl conc               |        | 30.8           | 0.343    |      |      |  | 5.8          |  |  |      |
| C cl tail               |        | 3.9            | 0.756    |      |      |  | 3.6          |  |  |      |
| C ro tail               |        | 60.3           | 2.770*   |      |      |  | 90.6         |  |  |      |
| Head - Assay            |        | 100.0          | 1.843    |      |      |  | 100.0        |  |  |      |
| C ro conc               |        | 25.7           | 0.434    |      |      |  | 9.4          |  |  |      |
| EXTENDING PRODUCT       |        |                |          |      |      |  |              |  |  |      |
| OPERATION               | BM     | C-Ro           | C-Ro     | C Cl | C Cl |  |              |  |  | Head |
| TIME                    | 5      | 3              | 4        | 2    | 3    |  |              |  |  |      |
| REAGENTS — LBS. PER TON |        |                |          |      |      |  |              |  |  |      |
|                         |        |                |          |      |      |  |              |  |  |      |
| Kerosene                | 0.4    |                |          |      |      |  |              |  |  |      |
| MIBC                    |        | 0.06           | 0.06     |      | 0.06 |  |              |  |  |      |
|                         |        |                |          |      |      |  |              |  |  |      |
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|                         |        |                |          |      |      |  |              |  |  |      |
| MACHINE                 |        | 1000           |          | 1000 |      |  |              |  |  |      |
| R.P.M.                  |        | 1300           |          | 1000 |      |  |              |  |  |      |
| pH                      |        | 7.2            |          | 7.5  |      |  |              |  |  |      |
| % SOLIDS                | 50     | 25             |          |      |      |  |              |  |  |      |
| TEMPERATURE             |        |                |          |      |      |  |              |  |  |      |

REMARKS:

\* Calculated by difference



CABLE  
"GALSAL"

P. O. BOX 205 — 545.535 WEST 3TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
339-5731

BY \_\_\_\_\_ JX

NAME **Norges Geologiske**

Same as test 34 except more collector in DM (0.6 ppt).

REMARKS:

\* Calculated by difference

\* Calculated by difference



\* Calculated by difference

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 545-585 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
330-8731

OUR LOT NO. 1626-1

DATE 8-8-66

BY JZ

TEST NO. 39

NAME Norges Geologiske

Same as test 37 except more collector in BM (0.6 ppt)

| Same as test 37 except more collector in BM (0.6 ppt) |        |                |       |        |  |  |  |  |  |  |              |  |  |
|-------------------------------------------------------|--------|----------------|-------|--------|--|--|--|--|--|--|--------------|--|--|
| PRODUCT                                               | Weight | Percent Weight | ASSAY |        |  |  |  |  |  |  | DISTRIBUTION |  |  |
|                                                       |        |                |       | Cu     |  |  |  |  |  |  | Cu           |  |  |
| C cl conc                                             |        | 44.1           |       | 0.387  |  |  |  |  |  |  | 9.3          |  |  |
| C cl tail                                             |        | 4.9            |       | 1.675  |  |  |  |  |  |  | 4.4          |  |  |
| C ro tail                                             |        | 51.0           |       | 3.1204 |  |  |  |  |  |  | 86.3         |  |  |
| Head (Assay)                                          |        | 100.0          |       | 1.843  |  |  |  |  |  |  | 100.0        |  |  |
| C ro conc                                             |        | 49.0           |       | 0.516  |  |  |  |  |  |  | 13.7         |  |  |
|                                                       |        |                |       |        |  |  |  |  |  |  |              |  |  |
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|                                                       |        |                |       |        |  |  |  |  |  |  |              |  |  |
|                                                       |        |                |       |        |  |  |  |  |  |  |              |  |  |

OUR LOT NO. 1636-1  
DATE 8-2-66  
BY IX

TEST NO. 40 NAME Norges Geologiske  
Same as test 34 except finer grind (20')

[illegible]

REMARKS:

\* Calculated by difference

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 848-583 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
399-8731OUR LOT NO. 1636-1  
DATE 8-9-66  
BY JATEST NO. 41 NAME Morges Geolomite  
Same as test 40 except lens collector in EM (0.08 ppt).

| PRODUCT                 | Weight | Percent Weight | ASSAY  |       |       |  |  |  |  | DISTRIBUTION |                  |      |
|-------------------------|--------|----------------|--------|-------|-------|--|--|--|--|--------------|------------------|------|
|                         |        |                | Cu     |       |       |  |  |  |  | Cu           |                  |      |
| C. cl conc              |        | 30.8           | 0.280  |       |       |  |  |  |  | 4.7          |                  |      |
| C. cl tail              |        | 10.0           | 0.869  |       |       |  |  |  |  | 4.7          |                  |      |
| C. ro tail              |        | 59.2           | 2.820* |       |       |  |  |  |  | 90.6         |                  |      |
| Head (assay)            |        | 100.0          | 1.843  |       |       |  |  |  |  | 100.0        |                  |      |
| C. ro conc              |        | 40.8           | 0.424  |       |       |  |  |  |  | 0.4          |                  |      |
|                         |        |                |        |       |       |  |  |  |  |              |                  |      |
|                         |        |                |        |       |       |  |  |  |  |              |                  |      |
| OPERATION               | EM     | C-ro           | C-ro   | C. cl | C. cl |  |  |  |  |              | GRINDING PRODUCT |      |
| TIME                    | 20     | 3              | 4      | 2     | 3     |  |  |  |  |              | Head             |      |
| REAGENTS — LBS. PER TON |        |                |        |       |       |  |  |  |  |              | MESH             | %    |
|                         |        |                |        |       |       |  |  |  |  |              | +10              |      |
|                         |        |                |        |       |       |  |  |  |  |              | +14              |      |
| Kerosene                | 0.08   |                |        |       |       |  |  |  |  |              | +20              |      |
| MIBC                    |        | 0.06           | 0.06   |       | 0.06  |  |  |  |  |              | +25              |      |
|                         |        |                |        |       |       |  |  |  |  |              | +35              |      |
|                         |        |                |        |       |       |  |  |  |  |              | +45              |      |
|                         |        |                |        |       |       |  |  |  |  |              | +100             | 5.2  |
|                         |        |                |        |       |       |  |  |  |  |              | +150             |      |
|                         |        |                |        |       |       |  |  |  |  |              | +200             |      |
|                         |        |                |        |       |       |  |  |  |  |              | +325             |      |
|                         |        |                |        |       |       |  |  |  |  |              | -125             | 46.3 |
| MACHINE                 |        | 1000           |        | 1000  |       |  |  |  |  |              |                  |      |
| R.P.M.                  |        | 1000           |        | 1000  |       |  |  |  |  |              |                  |      |
| pH                      |        | 7.2            |        | 7.5   |       |  |  |  |  |              |                  |      |
| % SOLIDS                | 50     | 25             |        |       |       |  |  |  |  |              |                  |      |
| TEMPERATURE             |        |                |        |       |       |  |  |  |  |              |                  |      |

REMARKS:

Carbon cleaner sluggish.

\* Calculated by difference



CABLE  
"GALSAL"

P. O. BOX 208 — 545-585 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
392-2731

OUR LOT NO. 1636-1  
DATE 8-9-66  
BY IX

TEST NO. 42 NAME Norges Geologiske  
Same as test 40 except less collector in EM (0.04 ppt).

[illegible]

REMARKS:

\* Calculated by difference

OUR LOT NO. 1636-1  
DATE 8-23-66  
BY TY

Same as test 41 except C cleaned 4 times and Cu float this test.

[illegible]

\* Calculated by difference

CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-555 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
352-0731

OUR LOT NO. 1636-1

DATE 8-23-66

BY JY

TEST NO. 43-2

NAME Norges Geologiske[illegible]

REMARKS: All of the slime C floated in 3 minutes of the C cl #4 float. The coarse C remained in the tail which appears to be high in Cu value. The bulk cleaner float should be eliminated.



METALLURGICAL RESEARCH DEPT.

CABLE  
"CALCAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 848-883 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
387-2781

OUR LOT NO. 1636-1

DATE 8-23-66

BY \_\_\_\_\_ JΣ

TEST NO. 43-3

NAME Norges Geologiske

[illegible]

REMARKS:

Aeration conditioning provided no visual improvement as to pyrite depression in the sep cl float.

\* with small balls

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALDOL"

## THE GALIGHER COMPANY

P. O. BOX 200 — 645-585 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
389-8731OUR LOT NO. 1636-1  
DATE 8-23-66  
BY JX

TEST NO. 44-1

NAME Norges Geologiske

Same as test 42 except C cleaned 3 times. Also, Cu float this test.

| Same as test 42 except C cleaned 3 times. Also, Cu float this test. |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|---------------------------------------------------------------------|--------|----------------|-------|-------|--------|-------|--|--|----|--|--------------|-------|-----|-----|
| PRODUCT                                                             | Weight | Percent Weight | ASSAY |       |        |       |  |  |    |  | DISTRIBUTION |       |     |     |
|                                                                     |        |                |       | Cu    |        |       |  |  |    |  |              | Cu    |     |     |
| C cl conc #3                                                        |        | 26.0           |       | 0.242 |        |       |  |  |    |  |              | 3.4   |     |     |
| C cl tail #3                                                        |        | 8.5            |       | 0.308 | 30.258 | 0.298 |  |  |    |  |              | 1.4   | 4.8 | 5.8 |
| C cl tail #2                                                        |        | 1.7            |       | 1.140 |        |       |  |  |    |  |              | 1.0   |     |     |
| C cl tail #1                                                        |        | 5.8            |       | 1.590 |        |       |  |  |    |  |              | 5.0   |     |     |
| Cu cl conc #2                                                       |        | 2.2            |       |       |        |       |  |  |    |  |              |       |     |     |
| Cu cl tail #2                                                       |        | 1.1            |       | 2.830 |        |       |  |  |    |  |              | 80.2  |     |     |
| Cu cl tail #1                                                       |        | 15.6           |       |       |        |       |  |  |    |  |              |       |     |     |
| Cu ro tail                                                          |        | 39.1           |       |       |        |       |  |  |    |  |              |       |     |     |
| Head (assay)                                                        |        | 100.0          |       | 1.843 |        |       |  |  |    |  |              | 100.0 |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
| C ro conc                                                           |        | 42.0           |       | 0.476 |        |       |  |  |    |  |              | 10.8  |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
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|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
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|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
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|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
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|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  |    |  |              |       |     |     |
|                                                                     |        |                |       |       |        |       |  |  | </ |  |              |       |     |     |

## REMARKS:

C cleaners not pulled to the same end point as in test 43. 1st C Cl pulled exactly like C Cl of test 42.  
Compare Cu test with test 11.

\* calculated by difference

REMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 843-535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
322-0731OUR LOT NO. 1636-1  
DATE 8-30-66  
BY JX

TEST NO. 45-1 NAME Norgea Geologiske

C-Ro float same as test 36. Cu Ro same as test 11

| PRODUCT                 | Weight | Percent Weight | ASSAY                |      |       |       |       | DISTRIBUTION |      |              |         |      |
|-------------------------|--------|----------------|----------------------|------|-------|-------|-------|--------------|------|--------------|---------|------|
| C. cl conc #2           |        | 23.5           |                      |      |       |       |       |              |      |              |         |      |
| C. cl tail #2           |        | 4.5            |                      |      |       |       |       |              |      |              |         |      |
| C. scav. cl conc #1     |        | 11.2           | Products not assayed |      |       |       |       |              |      |              |         |      |
| C. scav. cl tail #1     |        | 7.8            |                      |      |       |       |       |              |      |              |         |      |
| Cu. cl conc #3          |        | 5.5            |                      |      |       |       |       |              |      |              |         |      |
| Cu. cl tail #3          |        | 7.2            |                      |      |       |       |       |              |      |              |         |      |
| Cu. cl tail #2          |        | 3.4            |                      |      |       |       |       |              |      |              |         |      |
| Cu. cl tail #1          |        | 2.2            |                      |      |       |       |       |              |      |              |         |      |
| Cu. scav. conc          |        | 7.9            |                      |      |       |       |       |              |      |              |         |      |
| Cu. scav. tail          |        | 75.8           |                      |      |       |       |       |              |      |              |         |      |
| Head                    |        | 100.0          |                      |      |       |       |       |              |      |              |         |      |
|                         |        |                |                      |      |       |       |       |              |      |              |         |      |
| OPERATION               | BM     | C-Ro           | C- Ro                | Cond | Cu Ro | Cu Ro | Desl. | Rearr.       | Cond | Scav ro C Cl | PRODUCT |      |
| TIME                    | 5      | 3              | 4                    | 10   | 6     | 2.5   |       | 5            | 10   | 3            | 3       | Head |
| REAGENTS — LBS. PER TON |        |                |                      |      |       |       |       |              |      |              |         |      |
|                         |        |                |                      |      |       |       |       |              |      |              |         |      |
| Kerosene                | 0.6    |                |                      |      |       |       |       |              |      |              |         |      |
| MIBC                    |        | 0.06           | 0.06                 |      | 0.03  | 0.03  |       |              | 2.0  | 0.03         |         |      |
| Lime                    |        |                |                      | 2.2  |       |       |       |              |      |              |         |      |
| NaOH                    |        |                |                      | 6.02 |       |       |       |              |      |              |         |      |
| Z-6                     |        |                |                      |      | 0.1   | 0.05  |       |              |      | 0.05         |         | 9.2  |
|                         |        |                |                      |      |       |       |       |              |      |              |         |      |
|                         |        |                |                      |      |       |       |       |              |      |              |         |      |
| MACHINE                 |        | 1000           |                      |      |       |       |       |              |      |              |         |      |
| R.P.M.                  |        | 1000           |                      |      |       |       |       |              |      |              |         |      |
| PH                      |        | 7.0            |                      | 11.0 |       |       |       |              | 1000 |              | 1000    | 27.3 |
| % SOLIDS                | 50     | 25             |                      |      |       |       |       |              | 1000 |              | 1000    |      |
| TEMPERATURE             |        |                |                      |      |       |       |       |              | 10.9 |              | 7.4     |      |

REMARKS: Cu ro tail - sand reground with 7,000 grams of large balls. Cu scav conc high in carbon and pyrite; however, a heavy streak of pyrite still visible in the Cu scav tail. The total C-Ro conc should be cleaned.

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALBAL"

**THE GALIGHIER COMPANY**

P. O. BOX 209 — 545.588 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
389-8731

OUR LOT NO. 1636-1

DATE 8-30-66

BY                      JX                     

TEST NO. 45-2

NAME Norges Geologiske[illegible]

REMARKS: Cu Ro tail--sand reground with small balls. Sulfides floating at end of C scav float--regrind not fine enough.



CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 845.803 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
352-8731

OUR LOT NO. 1636-1  
DATE 8-30-66  
BY JX

TEST NO. 45-3

NAME Norges Geologiske

[illegible]

REMARKS:



CABLE  
'GALBAL'

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545.835 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
359-6731

OUR LOT NO. 1636-1  
DATE 8-31-66  
BY JX

TEST NO. 46-1

NAME Norgea Geologiske

TEST NO. 46-1 NAME MR. J. E. ROY  
Similar to test 45 except simplified C procedure and different Cu Cl procedure

| Similar to test 45 except simplified C procedure and different Cu Cl procedure |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |
|--------------------------------------------------------------------------------|--------|----------------|-------|--------|-------|-------|-------|-------|------|---------|------------------|------|---|--|
| PRODUCT                                                                        | Weight | Percent Weight | ASSAY |        |       |       |       |       |      |         | DISTRIBUTION     |      |   |  |
|                                                                                |        |                |       | Cu     |       |       |       |       |      |         | Cu               |      |   |  |
| C cl conc #2                                                                   |        | 35.9           |       | 0.207  |       |       |       |       |      |         | 4.2              |      |   |  |
| C cl tail #2                                                                   |        | 2.0            |       | 1.000  |       |       |       |       |      |         | 1.1              |      |   |  |
| C cl tail #1                                                                   |        | 9.2            |       | 1.270  |       |       |       |       |      |         | 6.6              |      |   |  |
| Cu cl conc #2                                                                  |        | 9.0            |       | 14.640 |       |       |       |       |      |         | 74.7             |      |   |  |
| Cu cl tail #2                                                                  |        | 3.0            |       | 1.470  |       |       |       |       |      |         | 2.5              |      |   |  |
| Cu cl tail #1                                                                  |        | 3.3            |       | 0.415  |       |       |       |       |      |         | 0.8              |      |   |  |
| Cu scav conc                                                                   |        | 8.6            |       | 1.520  |       |       |       |       |      |         | 7.4              |      |   |  |
| Cu scav tail                                                                   |        | 29.0           |       | 0.166  |       |       |       |       |      |         | 2.7              |      |   |  |
| Head (Calc)                                                                    |        | 100.0          |       | 1.766  |       |       |       |       |      |         | 100.0            |      |   |  |
|                                                                                |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |
| Cu Ro                                                                          |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |
| Tail +325                                                                      |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |
| Cu                                                                             |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |
| OPERATION                                                                      | BM     | C-Ro           | C-Ro  | Cond   | Cu Ro | Cu Ro | Desl. | Regr. | Cond | Scav Ro | GRINDING PRODUCT |      |   |  |
| TIME                                                                           | 5      | 3              | 3     | 10     | 4.0   | 2.5   | 0-325 | 5     | 3    | 3       | Head             |      |   |  |
| REAGENTS—LBS. PER TON                                                          |        |                |       |        |       |       |       |       |      |         | MESH             | %    | % |  |
|                                                                                |        |                |       |        |       |       |       |       |      |         | +10              |      |   |  |
|                                                                                |        |                |       |        |       |       |       |       |      |         | +14              |      |   |  |
| Kerosene                                                                       | 0.6    |                |       |        |       |       |       |       |      |         | +20              |      |   |  |
| MIBC                                                                           |        | 0.06           | 0.06  |        | 0.03  | 0.03  |       |       |      | 0.03    | +25              |      |   |  |
| Lime                                                                           |        |                |       | 2.2    |       |       |       |       | 2.0  |         | +35              |      |   |  |
| NaCN                                                                           |        |                |       | 0.02   |       |       |       |       |      |         | +40              | 9.2  |   |  |
| Z-6                                                                            |        |                |       |        | 0.1   | 0.05  |       |       |      | 0.01    | +65              |      |   |  |
| Powell's accel                                                                 |        |                |       |        |       |       |       |       |      | 0.05    | +100             |      |   |  |
|                                                                                |        |                |       |        |       |       |       |       |      |         | +150             |      |   |  |
|                                                                                |        |                |       |        |       |       |       |       |      |         | +200             |      |   |  |
| MACHINE                                                                        |        | 1000           |       |        |       |       |       |       |      | 1000    | +325             |      |   |  |
| R.P.M.                                                                         |        | 1000           |       |        |       |       |       |       |      | 1000    | -325             | 27.3 |   |  |
| pH                                                                             |        | 6.7            |       | 11.1   |       |       |       |       |      | 11.0    |                  |      |   |  |
| % SOLIDS                                                                       | 50     | 25             |       |        |       |       |       |       |      |         |                  |      |   |  |
| TEMPERATURE                                                                    |        |                |       |        |       |       |       |       |      |         |                  |      |   |  |

REMARKS:

C-Ro conc screened over 200 mesh +200 reground for 15' with small balls. Cu rougher tail deslimed, sands reground and combined with slimes for scavenger.

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-588 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
359-8731

OUR LOT NO. 1636-1

DATE 8-31-66

BY \_\_\_\_\_ JX

TEST NO. 46-2

NAME Norges Geologiske

[illegible]

REMARKS:

OUR LOT NO. 1636-1  
DATE 8-31-66  
BY JY

NAME: Norges Geologiske

[illegible]

The Cu cl #2 float did not come to an end point, may be a middling problem.

CABLE  
"GALCAL"

**THE GALIGHER COMPANY**

P. O. BOX 202 — 848.833 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
360-6731

OUR LOT NO. 1636-1

DATE 9-1-66

BY JX

TEST NO. 47-1

NAME Norges Geologiske

Same as test 46 except finer grind, less kerosene in EM, no C or Cu scav floats.

[illegible]

REMARKS:

The coarse C comes at the end of the C-Ro. C-Ro pulled hard towards the end of float this test.

\* with small balls

BY \_\_\_\_\_ TX \_\_\_\_\_

NAME Worges Geologische[illegible]

REMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALVAL"

## THE GALIGHER COMPANY

P. O. BOX 208 — 545-555 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
359-8731

OUR LOT NO. 1636-1

DATE 9-7-66

BY JX

TEST NO. 48-1 NAME Norges Geologiske

Same as test 47 except Z-200 in place of Z-6, kerosene in the C cleaners.

| PRODUCT               | Weight | Percent Weight | ASSAY |        |       |       |       |       |       |          | DISTRIBUTION |      |      |                  |
|-----------------------|--------|----------------|-------|--------|-------|-------|-------|-------|-------|----------|--------------|------|------|------------------|
|                       |        |                |       | Cu     |       |       |       |       |       |          | Cu           |      |      |                  |
| C cl conc #2          |        | 30.7           |       | 0.229  |       |       |       |       |       |          | 3.8          |      |      |                  |
| C cl tail #2          |        | 1.8            |       |        |       |       |       |       |       |          |              |      |      |                  |
| C cl tail #1          |        | 8.5            |       |        |       |       |       |       |       |          |              |      |      |                  |
| Cu cl conc #2         |        | 5.9            |       | 23.330 |       |       |       |       |       |          | 74.6         |      |      |                  |
| Cu cl tail #2         |        | 1.6            |       |        |       |       |       |       |       |          |              |      |      |                  |
| Cu cl tail #1         |        | 12.7           |       |        |       |       |       |       |       |          |              |      |      |                  |
| Cu ro tail            |        | 38.8           |       | 0.296  |       |       |       |       |       |          | 6.2          |      |      |                  |
| Head - Assay          |        | 100.0          |       | 1.843  |       |       |       |       |       |          |              |      |      |                  |
| Cu ro conc            |        | 20.2           |       |        |       |       |       |       |       |          |              |      |      |                  |
|                       |        |                |       |        |       |       |       |       |       |          | C-Ro         |      |      |                  |
|                       |        |                |       |        |       |       | Cu    | Cu    | Cu    | conc     | +200         |      |      |                  |
| OPERATION             | RM     | C-Ro           | C-Ro  | Cond   | Cu Ro | Cu Ro | Cl #1 | Cl #1 | Cl #2 | Reslimes | Regrt        |      |      | GRINDING PRODUCT |
| TIME                  | 20     | 3              | 3     | 10     | 4.0   | 2.5   | 3-5   | 1     | 1-4   | 0-200    | 15           |      |      | Head             |
| REAGENTS—LBS. PER TON |        |                |       |        |       |       |       |       |       |          |              |      |      |                  |
|                       |        |                |       |        |       |       |       |       |       |          |              | MESH |      |                  |
|                       |        |                |       |        |       |       |       |       |       |          |              | +10  |      |                  |
|                       |        |                |       |        |       |       |       |       |       |          |              | +14  |      |                  |
| Kerosene              | 0.08   |                |       |        |       |       |       |       |       |          |              | +20  |      |                  |
| MYRC                  |        | 0.06           | 0.06  |        |       |       |       |       |       |          |              | +25  |      |                  |
| Lime                  |        |                |       | 2.6    |       |       |       |       |       |          |              | +35  |      |                  |
| NaCN                  |        |                |       | 0.02   |       |       |       |       |       |          |              | +48  |      |                  |
| Z-200                 |        |                |       |        | 0.08  | 0.04  |       | 0.002 | 0.04  |          |              | +65  |      |                  |
| S02                   |        |                |       |        |       |       | 3.5   |       | 3.5   |          |              | +100 | 5.2  |                  |
|                       |        |                |       |        |       |       |       |       |       |          |              | +150 |      |                  |
| MACHINE               |        | 1000           |       |        |       |       | 500   |       | 500   |          |              | +200 |      |                  |
| R.P.M.                |        | 1000           |       |        |       |       | 1000  |       | 1000  |          |              | +325 |      |                  |
| pH                    |        | 7.2            |       | 10.9   |       |       | 3.1   |       | 2.8   |          |              | +325 | 46.3 |                  |
| % SOLIDS              | 50     | 25             |       |        |       |       |       |       |       |          |              |      |      |                  |
| TEMPERATURE           |        |                |       |        |       |       |       |       |       |          |              |      |      |                  |

## REMARKS:

Coarse C dropped out in the Cu Cl #1, maybe locked copper--try regrind on this product.

\* with small balls



CABLE  
"GALSAL"

## THE CALIGHER COMPANY

P. O. BOX 202 — 545-803 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
359-8731

OUR LOT NO. 1636-1

DATE 9-7-66

BY \_\_\_\_\_ JX

TEST NO. 48-2

NAME Norges Geologiske

[illegible]

REMARKS:

Leave the kerosene out of the C Cl #2.

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 545-585 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
380-2721

OUR LOT NO. 1636-1

DATE 9-13-66

BY                      JX                     

TEST NO. 49-1

NAME Norges Geologiske

Same as test 20 except C1 Ro cleaned, C-Ro deslimed, coarse C reground & cleaned.

[illegible]

REMARKS:

Sulfides dropped out in the Cu cl tail #1 but not much C dropped out. C & Cu floating in the last minute of the Cu cl #2 float.

BY \_\_\_\_\_ JX

TELEPHONE  
352-6731

NAME Norges GeologiskeREMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALVAL"

## THE GALIGHER COMPANY

P. O. BOX 208 — 845-835 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
352-0731OUR LOT NO. 1636-1  
DATE 9-14-66  
BY JX

TEST NO. 50-1 NAME Norges Geologiske

Same as test 49 except longer C-Ro float.

| PRODUCT                 | Weight | Percent Weight | ASSAY  |      |      |      |       |       |       | DISTRIBUTION |       |          |      |
|-------------------------|--------|----------------|--------|------|------|------|-------|-------|-------|--------------|-------|----------|------|
|                         |        |                | Cu     |      |      |      |       |       |       | Cu           |       |          |      |
| C cl conc #2            |        | 39.5           | 0.255  |      |      |      |       |       |       | 5.4          |       |          |      |
| C cl tail #2            |        | 2.7            | 1.300  |      |      |      |       |       |       | 1.9          |       |          |      |
| C cl tail #1            |        | 10.8           | 1.820  |      |      |      |       |       |       | 10.6         |       |          |      |
| Cu cl conc #2           |        | 4.8            | 25.400 |      |      |      |       |       |       | 65.7         |       |          |      |
| Cu cl tail #2           |        | 0.9            | 1.630  |      |      |      |       |       |       | .8           |       |          |      |
| Cu cl tail #1           |        | 1.4            | 1.940  |      |      |      |       |       |       | 1.5          |       |          |      |
| Cu ro tail              |        | 39.9           | 0.655  |      |      |      |       |       |       | 14.1         |       |          |      |
| Head (Calc)             |        | 100.0          | 1.860  |      |      |      |       |       |       | 100.0        |       |          |      |
| Cu ro conc              |        | 7.1            | 17.800 |      |      |      |       |       |       | 68.0         |       |          |      |
|                         |        |                |        |      |      |      |       |       |       |              |       |          |      |
| OPERATION               | RM     | C-Ro           | C-Ro   | C-Ro | C-Ro | Cond | Cu Ro | Cu Ro | Cu    | Cu           | Cu    | GRINDING |      |
| TIME                    | 20     | 3              | 4      | 2    | 1    | 10   | 5     | 1 - 4 | Cl #1 | Cl #2        | Cl #2 | PRODUCT  |      |
| REAGENTS — LBS. PER TON |        |                |        |      |      |      |       |       | 1 - 5 | 1 - 5        | 1     | Head     |      |
|                         |        |                |        |      |      |      |       |       |       |              |       | MESH     | %    |
|                         |        |                |        |      |      |      |       |       |       |              |       | +10      |      |
|                         |        |                |        |      |      |      |       |       |       |              |       | +14      |      |
| Kerosene                | 0.20   |                |        |      |      |      |       |       |       |              |       | +20      |      |
| NTRO                    |        | 0.06           | 0.06   | 0.06 | 0.03 |      |       |       | 1.0   | 1.2          |       | +25      |      |
| Time                    |        |                |        |      |      | 4.0  |       |       |       |              |       | +35      |      |
| NaCN                    |        |                |        |      |      | 0.02 |       |       |       |              |       | +45      |      |
| Z-200                   |        |                |        |      |      | 0.04 |       | 0.04  |       |              |       | +100     | 5.2  |
| Z-6                     |        |                |        |      |      |      |       |       |       |              | 0.001 | +150     |      |
|                         |        |                |        |      |      |      |       |       |       |              |       | +200     |      |
| MACHINE                 |        | 1000           |        |      |      |      |       |       | 500   | 500          |       | +250     |      |
| R.P.M.                  |        | 1000           |        |      |      |      |       |       | 1000  | 1000         |       | +300     |      |
| pH                      |        | 6.9            |        |      |      | 11.0 |       |       | 11.0  | 10.9         |       | -125     | 46.3 |
| % SOLIDS                | 50     | 25             |        |      |      |      |       |       |       |              |       |          |      |
| TEMPERATURE             |        |                |        |      |      |      |       |       |       |              |       |          |      |

REMARKS:

The addition of Z-6 at the end of the Cu Cl #2 float floated Cu but not C.

REMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALCAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 549-888 WEST 7th SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
328-8751

OUR LOT NO. 1636-1

DATE 10-3-66

BY JX

TEST NO. 51-1

NAME Norges Geologiske

Repeat on Test 50-1

| PRODUCT                 | Weight | Percent Weight | ASSAY Per Cent |       |      |      |      |      |         | DISTRIBUTION Per Cent |          |      |
|-------------------------|--------|----------------|----------------|-------|------|------|------|------|---------|-----------------------|----------|------|
|                         |        |                | Cu             | Ox Cu |      |      |      |      |         | Cu                    |          |      |
| C cl conc #2            |        | 39.9           |                |       |      |      |      |      |         |                       |          |      |
| C cl tail #2            |        | 2.6            |                |       |      |      |      |      |         |                       |          |      |
| C cl tail #1            |        | 12.4           |                |       |      |      |      |      |         |                       |          |      |
| Cu cl conc #2           |        | 5.7            | 22.87          |       |      |      |      |      |         | 71.4                  |          |      |
| Cu cl tail #2           |        | 0.3            |                |       |      |      |      |      |         |                       |          |      |
| Cu cl tail #1           |        | 1.3            |                |       |      |      |      |      |         |                       |          |      |
| Scav conc               |        | 2.9            | 2.29           |       |      |      |      |      |         | 3.7                   |          |      |
| Ro tail - Slimes        |        | 7.3            | 0.538          | 0.075 |      |      |      |      |         | 2.1                   |          |      |
| Scav tail - Sands       |        | 27.6           | 0.226          | 0.044 |      |      |      |      |         | 3.4                   |          |      |
| Heads - Assay           |        | 100.0          | 1.846          |       |      |      |      |      |         |                       |          |      |
| Ro tails                |        | 37.8           | 0.444          |       |      |      |      |      |         | 10.2                  |          |      |
| Slimes & sands comb.    |        | 34.9           | 0.289          |       |      |      |      |      |         | 6.5                   |          |      |
| Carbon Float            |        |                |                |       |      |      |      |      |         |                       |          |      |
| OPERATION               | RM     | Ro             | Ro             | Ro    | Ro   | Cond | Ro   | Ro   | Deslime | Sand                  | GRINDING |      |
| TIME                    | 20     | 3              | 4              | 2     | 1    | 10   | 5    | 4    |         | scav                  | PRODUCT  |      |
| REAGENTS — LBS. PER TON |        |                |                |       |      |      |      |      |         | 2                     | Heads    |      |
| Kerosene                | 0.20   |                |                |       |      |      |      |      |         |                       | MESH     | %    |
| MYBC                    |        | 0.06           | 0.06           | 0.06  | 0.03 |      |      |      |         |                       | +10      |      |
| Lime                    |        |                |                |       |      | 4.0  |      |      |         |                       | +14      |      |
| NaCN                    |        |                |                |       |      | 0.02 |      |      |         |                       | +20      |      |
| Z-200                   |        |                |                |       |      | 0.04 | 0.04 | 0.04 |         |                       | +25      |      |
| Reco                    |        |                |                |       |      |      |      |      |         |                       | +35      |      |
|                         |        |                |                |       |      |      |      |      |         | 0.05                  | +40      |      |
|                         |        |                |                |       |      |      |      |      |         |                       | +45      |      |
|                         |        |                |                |       |      |      |      |      |         |                       | +100     | 5.2  |
|                         |        |                |                |       |      |      |      |      |         |                       | +150     |      |
| MACHINE                 |        | 1000           |                |       |      |      |      |      |         | 500                   | +200     |      |
| R.F.M.                  |        | 1000           |                |       |      |      |      |      |         | 1000                  | +225     |      |
| pH                      |        | 6.9            |                |       |      | 11.1 |      |      |         |                       | +325     | 46.3 |
| % SOLIDS                |        | 25             |                |       |      |      |      |      |         |                       |          |      |
| TEMPERATURE             |        |                |                |       |      |      |      |      |         |                       |          |      |

REMARKS:

Some carbon in copper float. Copper float tails decanted over 325 mesh screen. Sands floated for copper scavenger.



**CABLE**  
**"GALSAL"**

P. O. BOX 209 — 545.533 WEST 8TH SOUTH 6TH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
359-6731

OUR LOT NO. 1636-1  
DATE 10-3-66  
BY NJB

NAME Norges Geologiske

[illegible]

REMARKS:

Carbon conc deslimed on 325 mesh - sand reground

C conc sand reground with 7,000 gms small balls. Too much weight in the Cu Cl conc #2.

CABLE  
"GALBAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 543.503 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
338-2731

OUR LOT NO. 1636-1  
DATE 10-19-66  
BY JX

TEST NO. 52-2

NAME: Norges Geologiske

[illegible]

REMARKS: C Cl tails 1 & 2 filtered and circulated to the head of Cu Ro from this test forward.

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 545-555 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
353-5731OUR LOT NO 1636-1  
DATE 10-21-66  
BY JX

TEST NO. 53-1

NAME Norgas Geolozake

Same as test 52 except C-Ro and cleaners pulled harder and C cleaned one more time. Shorter Cu cleaner #2 floor

| PRODUCT                 | Weight | Percent Weight | ASSAY |        |      |      |           |     |       | DISTRIBUTION |       |  |                  |
|-------------------------|--------|----------------|-------|--------|------|------|-----------|-----|-------|--------------|-------|--|------------------|
|                         |        |                | Cu    |        |      |      |           |     |       | Cu           |       |  |                  |
| Cu cl conc #3           |        | 42.8           |       | 0.280  |      |      |           |     |       |              | 6.5   |  |                  |
| Cu cl conc #2           |        | 5.2            |       | 23.420 |      |      |           |     |       |              | 66.4  |  |                  |
| Cu cl tail #2           |        | 3.2            |       | 9.910  |      |      |           |     |       |              | 17.3  |  |                  |
| Cu cl tail #1           |        | 1.8            |       | 3.030  |      |      |           |     |       |              | 3.0   |  |                  |
| Cu scav conc            |        | 4.0            |       | 0.844  |      |      |           |     |       |              | 1.9   |  |                  |
| Cu scav tail            |        | 43.0           |       | 0.207  |      |      |           |     |       |              | 4.9   |  |                  |
| Head                    |        | 100.0          |       | 1.830  |      |      |           |     |       |              | 100.0 |  |                  |
| Cu cl conc #1           |        | 8.4            |       | 18.300 |      |      |           |     |       |              | 83.7  |  |                  |
| Cu ro conc              |        | 10.2           |       | 15.600 |      |      |           |     |       |              | 88.7  |  |                  |
| Comb ro & scav conc     |        | 14.2           |       | 11.400 |      |      |           |     |       |              |       |  |                  |
|                         |        |                |       |        |      |      | C-Ro conc |     |       |              |       |  |                  |
| OPERATION               |        |                |       |        |      |      | Sands     | C   |       |              |       |  | GRINDING PRODUCT |
| TIME                    |        | RM             | C-Ro  | C-Ro   | C-Ro | C-Ro | 0-200     | reg | C1 #1 | C1 #1        | C1 #1 |  |                  |
| REAGENTS — LBS. PER TON |        | 20             | 3     | 3      | 2    | 2    |           | 15  | 3     | 2            | 3     |  |                  |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | Head             |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | MESH             |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +10              |
| Kerosene                | 0.20   |                |       |        |      |      |           |     |       |              |       |  | +14              |
| MYBC                    |        |                | 0.06  | 0.06   | 0.06 | 0.06 |           |     | 0.03  | 0.03         | 0.03  |  | +20              |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +25              |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +40              |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +65              |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +100             |
|                         |        |                |       |        |      |      |           |     |       |              |       |  | +150             |
| MACHINE                 |        |                | 1000  |        |      |      |           |     | 1000  |              |       |  | +200             |
| R.P.M.                  |        |                | 1000  |        |      |      |           |     | 1000  |              |       |  | +325             |
| pH                      |        |                | 7.3   |        |      |      |           |     | 7.9   |              |       |  | +325             |
| % SOLIDS                | 50     |                | 25    |        |      |      |           |     |       |              |       |  | 46.3             |
| TEMPERATURE             |        |                |       |        |      |      |           |     |       |              |       |  |                  |

REMARKS:

OUR LOT NO 1635-1  
DATE 10-21-66  
BY JX

NAME Norges Geologiske

[illegible]

REMARKS:

REMARKS:



CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 200 — 543.335 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
353-6721

OUR LOT NO 1536-1  
DATE 10-24-66  
BY JX

TEST NO. 54-1

NAME Norges Geologiske

Same as test 53 except kerosene stayed in the C-Ro. No Cu Scav float this test.

[illegible]

REMARKS:

Kerosene in the C float didn't seem to provide for a faster float of the C in the cleaners.

CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
389-0731

OUR LOT NO. 1636-1

DATE 10-24-66

BY \_\_\_\_\_ JX \_\_\_\_\_

TEST NO. 54-2

NAME Norges Geologiske

[illegible]

REMARKS:

CABLE  
"GALSAL"

P. O. BOX 200 — 545.535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
585-8721

BY                      JZ                     NAME Norges GeologiskeREMARKS:

OUR LOT NO. 1636-1  
DATE 10-28-66  
BY JY

500 gram composite of products from test 54 for a magnetic separation test.

[illegible]

REMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGHER COMPANY

P. O. BOX 209 — 845-883 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
359-8731OUR LOT NO. 1636-1  
DATE 11-1-66  
BY JX

TEST NO. 56-1

NAME Norges Geologiske

Similar to test 53 except Cu Ro and Cu scav concentrates combined and reground before cleaning.

| Similar to test 53 except Cu Ro and Cu assay concentrates combined and reground before filtering. |        |                |       |       |      |      |       |      |      |       |       |       |              |                  |  |
|---------------------------------------------------------------------------------------------------|--------|----------------|-------|-------|------|------|-------|------|------|-------|-------|-------|--------------|------------------|--|
| PRODUCT                                                                                           | Weight | Percent Weight | ASSAY |       |      |      |       |      |      |       |       |       | DISTRIBUTION |                  |  |
|                                                                                                   |        |                |       | Cu    |      |      |       |      |      |       |       | Cu    |              |                  |  |
| Cu cl conc #3                                                                                     |        | 39.1           |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Cu cl conc #4                                                                                     |        | 6.8            |       | 22.23 |      |      |       |      |      |       |       | 82.2  |              |                  |  |
| Cu cl tail #4                                                                                     |        | 0.6            |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Cu cl tail #3                                                                                     |        | 1.4            |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Cu cl tail #2                                                                                     |        | 3.5            |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Cu cl tail #1                                                                                     |        | 6.8            |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Magnetic conc                                                                                     |        | 0.3            |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Cu ro tail                                                                                        |        | 41.5           |       |       |      |      |       |      |      |       |       |       |              |                  |  |
| Head (assay)                                                                                      |        | 100.0          |       | 1.84  |      |      |       |      |      |       |       |       |              |                  |  |
|                                                                                                   |        |                |       |       |      |      |       |      |      |       |       |       |              |                  |  |
|                                                                                                   |        |                |       |       |      |      | C-Ro  | Ro   |      |       |       |       |              |                  |  |
|                                                                                                   |        |                |       |       |      |      | conc  | conc | C    |       |       |       |              |                  |  |
| OPERATION                                                                                         |        |                |       |       |      |      | thick | reg  | C    | Cl #1 | Cl #1 | Cl #1 | Cl #1        | GRINDING PRODUCT |  |
| TIME                                                                                              | 20     |                | 3     | 3     | 2    | 2    |       | 5    | 3    | 2     | 3     | 1     |              | Head             |  |
| REAGENTS — LBS. PER TON                                                                           |        |                |       |       |      |      |       |      |      |       |       |       |              | MESH             |  |
|                                                                                                   |        |                |       |       |      |      |       |      |      |       |       |       |              | +10              |  |
| Kerosene                                                                                          | 0.20   |                |       |       |      |      |       |      |      |       |       |       |              | +14              |  |
| MIBC                                                                                              |        |                | 0.06  | 0.06  | 0.06 | 0.06 |       |      | 0.03 | 0.03  | 0.03  | 0.03  |              | +20              |  |
| Fluo                                                                                              |        |                |       |       |      |      |       |      |      |       |       |       |              | +25              |  |
| NaCN                                                                                              |        |                |       |       |      |      |       |      |      |       |       |       |              | +30              |  |
| Z-200                                                                                             |        |                |       |       |      |      |       |      |      |       |       |       |              | +40              |  |
| Z-6                                                                                               |        |                |       |       |      |      |       |      |      |       |       |       |              | +45              |  |
|                                                                                                   |        |                |       |       |      |      |       |      |      |       |       |       |              | +100             |  |
|                                                                                                   |        |                |       |       |      |      |       |      |      |       |       |       |              | +150             |  |
| MACHINE                                                                                           |        |                | 1000  |       |      |      |       |      | 1000 |       |       |       |              | +200             |  |
| R.P.M.                                                                                            |        |                | 1000  |       |      |      |       |      | 1000 |       |       |       |              | +225             |  |
| pH                                                                                                |        |                | 7.2   |       |      |      |       |      | 8.1  |       |       |       |              | +325             |  |
| % SOLIDS                                                                                          | 50     |                | 25    |       |      |      |       |      |      |       |       |       |              | an. 3            |  |
| TEMPERATURE                                                                                       |        |                |       |       |      |      |       |      |      |       |       |       |              |                  |  |

CABLE  
"GALDOL"

P. O. BOX 200 — 545-535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
355-8731

BY \_\_\_\_\_ JX

NAME Norges Geologiske

[illegible]

REMARKS:



Cu Cl #1 pulled quite hard. Cu Cl tail #1 high in pyrite and pyrrhotite.

CABLE  
"GALSAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-535 WEST 6TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
282-8731

CUR LOT NO. 1636-1

DATE 11-7-66

BY JF

TEST NO. 57-1

NAME Norges Geologiske

Same as Test 55 except longer C-Ro conc and Cu-Ro conc regrinds.

[illegible]

REMARKS:

CABLE  
"GALSAL"

P. O. BOX 309 — 340.535 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
322-2721

DATE 11-7-66

BY \_\_\_\_\_ JX

NAME Norges Geologiske

REMARKS:

CABLE  
"GALILEO"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-883 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
352-8731

OUR LOT NO. 1636-1

DATE 11-7-66

BY \_\_\_\_\_

TEST NO. 57-3

NAME Norooa Gooloolake

[illegible]

REMARKS:

METALLURGICAL RESEARCH DEPT.

CABLE  
"GALSAL"

## THE GALIGNER COMPANY

P. O. BOX 209 — 845-888 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.TELEPHONE  
355-8731OUR LOT NO 1636-1  
DATE 11/23/66  
BY JX

TEST NO. 58-1 NAME Norges Geologiske

Same as Test 57 except closed circuit

| PRODUCT                 | Weight | Percent Weight | ASSAY |       |      |      |           |           |         |       | DISTRIBUTION |       |  |                  |
|-------------------------|--------|----------------|-------|-------|------|------|-----------|-----------|---------|-------|--------------|-------|--|------------------|
| Series #1               |        |                |       | Cu    |      |      |           |           |         |       | Cu           |       |  |                  |
| C-Cl Conc #3            | 420    | 42.0           |       | 0.207 |      |      |           |           |         |       |              |       |  |                  |
| Cu Cl Conc #3           | 62     | 6.2            |       | 24.61 |      |      |           |           |         |       |              |       |  |                  |
| Cu Ro Tail              | 429    | 42.9           |       | 0.166 |      |      |           |           |         |       |              |       |  |                  |
| Head (less C.L. #)      | 911    | 91.1           |       | 1.68  |      |      |           |           |         |       |              |       |  |                  |
| Series #2               |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
| C-Cl Conc #3            | 423    | 42.3           |       | 0.239 |      |      |           |           |         |       | 5.7          |       |  |                  |
| Cu Cl Conc #3           | 60     | 6.0            |       | 26.54 |      |      |           |           |         |       | 89.0         |       |  |                  |
| Cu Ro Tail              | 538    | 51.7           |       | 0.182 |      |      |           |           |         |       | 5.3          |       |  |                  |
| Head (Calc)             | 1001   | 100.0          |       | 1.79  |      |      |           |           |         |       | 100.0        |       |  |                  |
| *circulating load       |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
| OPERATION               |        |                |       |       |      |      | C-Ro conc | C-Ro conc | C       |       |              |       |  | SPINDING PRODUCT |
| TIME                    | PM     |                | C-Ro  | C-Ro  | C-Ro | C-Ro | thick     | reg       | Cl #1   | Cl #1 | Cl #1        | Cl #1 |  |                  |
| REAGENTS — LBS. PER TON | 20     |                | 3     | 3     | 2    | 2    |           | 10        | 3       | 3     | 2            | 1     |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  | Head             |
| Kerosene                | 0.20   |                |       |       |      |      |           |           |         |       |              |       |  | 5.2              |
| MTBC                    |        |                | 0.06  | 0.06  | 0.06 | 0.06 |           |           | 0.03    | 0.03  | 0.03         | 0.03  |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
|                         |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |
| MACHINE                 |        |                | 1000  |       |      |      |           |           | 1000    |       |              |       |  |                  |
| R.P.M.                  |        |                | 1000  |       |      |      |           |           | 1000    |       |              |       |  |                  |
| pH                      |        |                | 7.3   |       |      |      |           |           | 8.0-8.0 |       |              |       |  |                  |
| % SOLIDS                | 50     |                | 25    |       |      |      |           |           | 8.0-8.0 |       |              |       |  |                  |
| TEMPERATURE             |        |                |       |       |      |      |           |           |         |       |              |       |  |                  |

REMARKS:

Voluminous froth in the C.Cl. floats 1, 2, and 3.

CABLE  
"GALGAL"

**THE GALIGHER COMPANY**

P. O. BOX 209 — 545-555 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
332-0731

OUR LOT NO. 1636-1  
DATE 11-21-66  
BY JX

TEST NO. 58-2

NAME Norges Geologiske

[illegible]

## REMARKS:

The Cu Ro conditioner and Ro float could possible be shortened.



CABLE  
"GALDIA"

P. O. BOX 209 — 545-538 WEST 8TH SOUTH STREET  
SALT LAKE CITY, UTAH 84110 — U.S.A.

TELEPHONE  
322-9731

OUR LOT NO. 1636-1  
DATE 11-21-66  
BY JX

NAME Norges Geologiske

[illegible]

REMARKS: