required for the operation is either on hand or installed in the cupola building. It may be questioned that the estimated cost of providing these facilities is low, but all concerned including operating and accounting are satisfied that the estimates are adequate. It is presently planned to use one of our own mineral jigs, which is not now in use, in the flowsheet but it would be highly desirable to purchase a new jig in the not too far distant future.

In determining operations costs, the processing rates developed are based on grinding all products. The ball mill is the bottleneck in the operation but it is believed that a number of the inventory items will not have to be ground making it possible to substantially increase the per hour output of the plant. Even assuming that milling will be required on all products, the following costs are indicated:

	Cost Per Lb. Recovered Copper*
Ashes	7.50¢
Fines	6.44¢
Brick	
Sidewalls #21 & #22	14.54¢
Arches #21 & #22	11.64¢
Bottom #21	8.65¢
Sidewall #20	14.97¢
Arch #20	11.84¢
Bottom #20	9.31¢
Screenings	21.69¢
Miscellaneous Scrap	6.73¢

*Includes sorting, yard transportation, processing, smelting and refining, stockpiling, loading, shoring, yard overhead, and freight.

Although all inventory items have been treated individually from a cost standpoint, the return from processing the ash inventory alone will make it possible to recover the entire installation cost.

X Research Activities Committe Members February 1, 1957

It is proposed that expense items be taken into the research budget and that the unit be operated under the supervision of Research personnel until processing procedures have been developed. If this method of operation is approved, a project budget summary will be prepared.

G. L. Craig

GLC/d
cc: ASK
KFF
HLC
ABL

Box 201 - Folder 21
"Slag Utilization"

W. H. Maxwell February 11, 1959

Dear Max:

In the process of smelting and refining, we generate rather substantial tonnages of slag. The slag is granulated in water and pumped into the lake. We are forwarding two representative samples separately. Although we have looked at a number of end use applications for the product, we have not as yet been able to find a home for it. Since all sizes are produced in the granulating operation, it would be possible to screen out a range of sizes below approximately 1/4" to any desired specification.

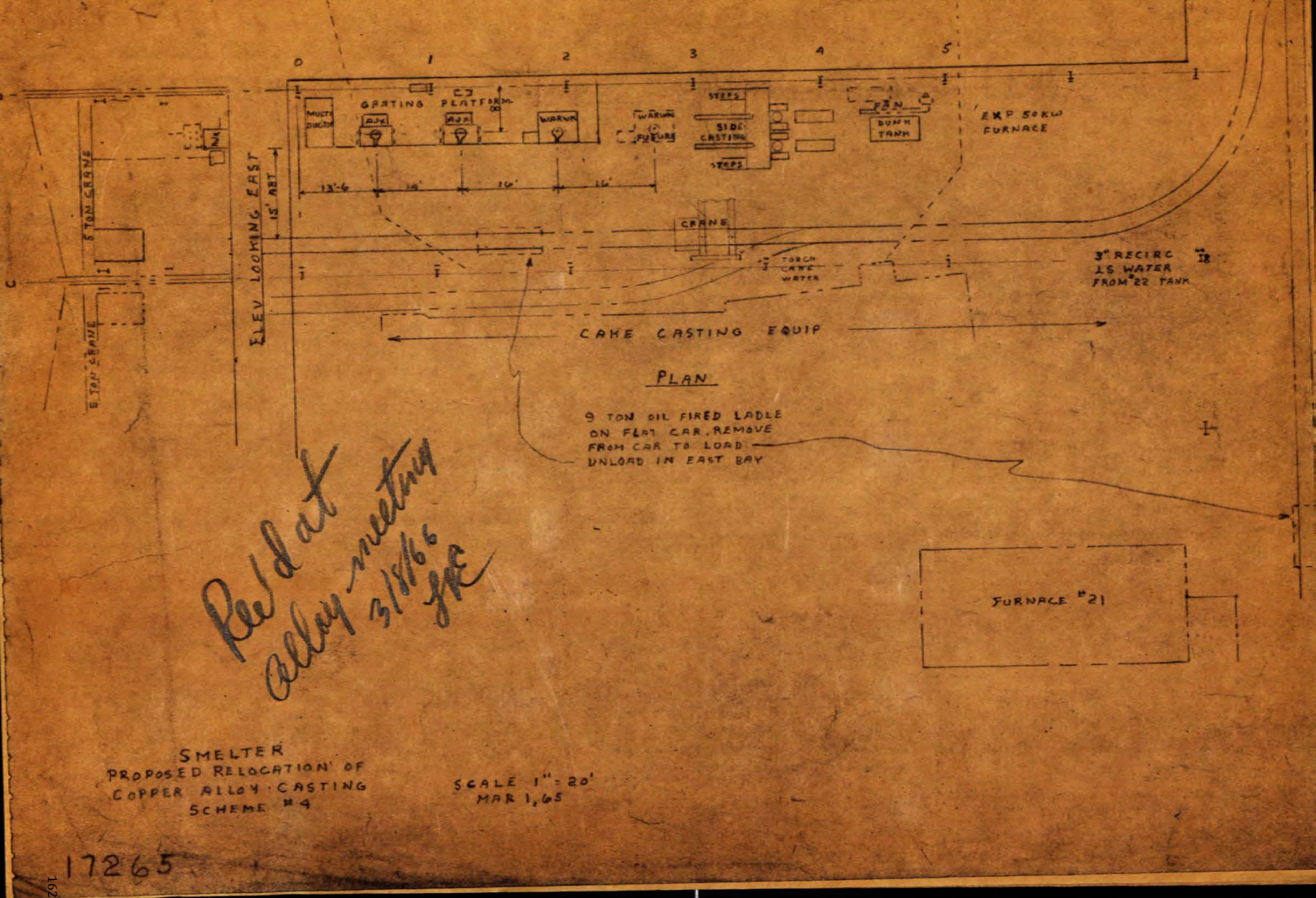
We are currently working with a company in Minneapolis that manufactures sanders for trucks and buses and there is a possibility that we may be able to market some of it in that area. However, since we do produce approximately 1500 tons a month and with an accumulation of millions of tons in Torch Lake (which could be brought back in and classified), it would certainly be nice to find an end use for the product.

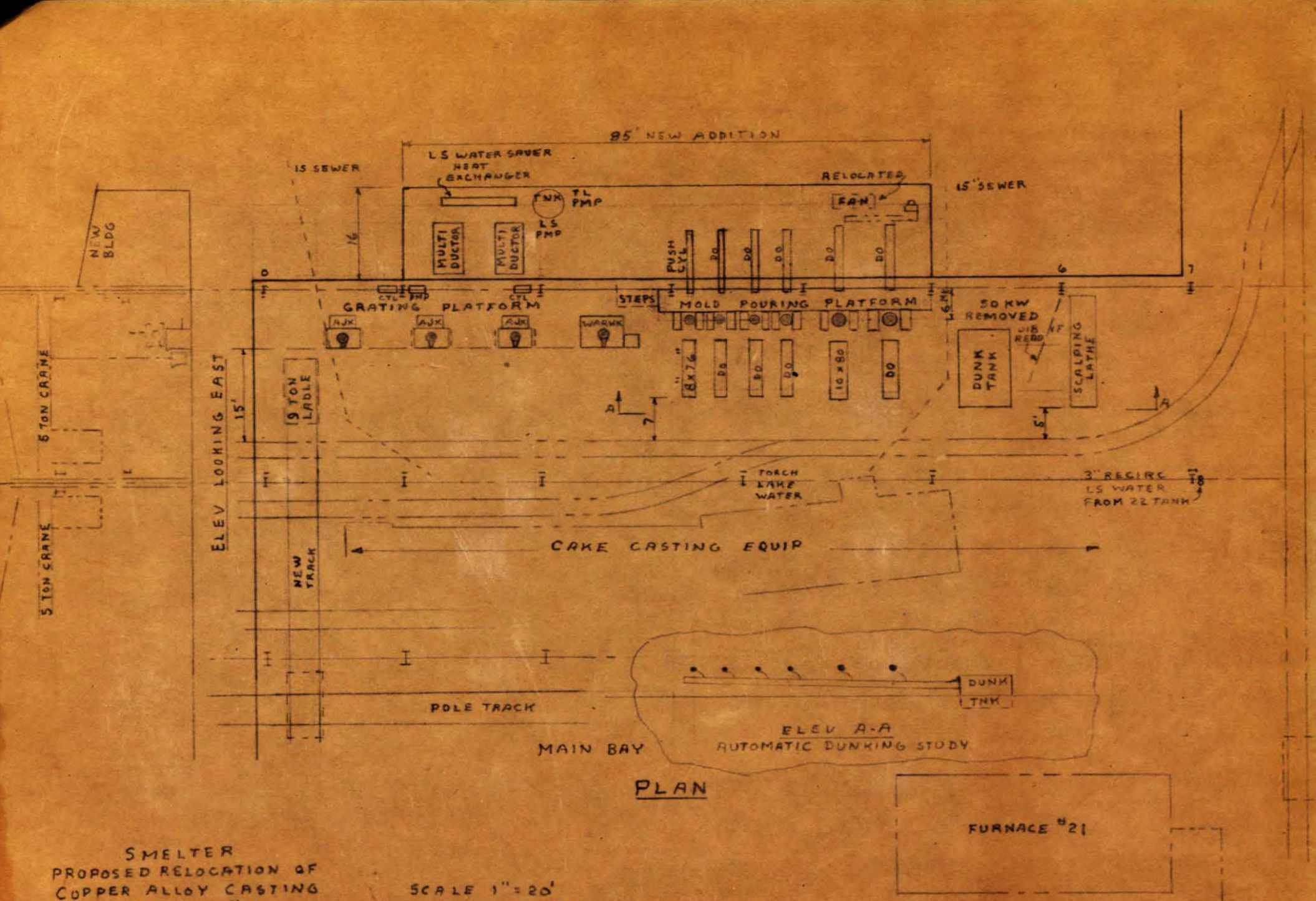
It has just been called to our attention that there is an organization that concerns itself with the utilization of slag aggregate and we are wondering if it would be possible to find out more specifically what they do, if they have any publications available for distribution, and if we might obtain some assistance from them in marketing this product. The organization is "National Slag Association, 644 Warner Building, Washington 4, D.C.".

G. L. Craig

GLC/d

P.S. I am not in any particular rush for this information as I am leaving for the East tomorrow for some major surgery and expect to be out of circulation for a few weeks. - G.L.C.

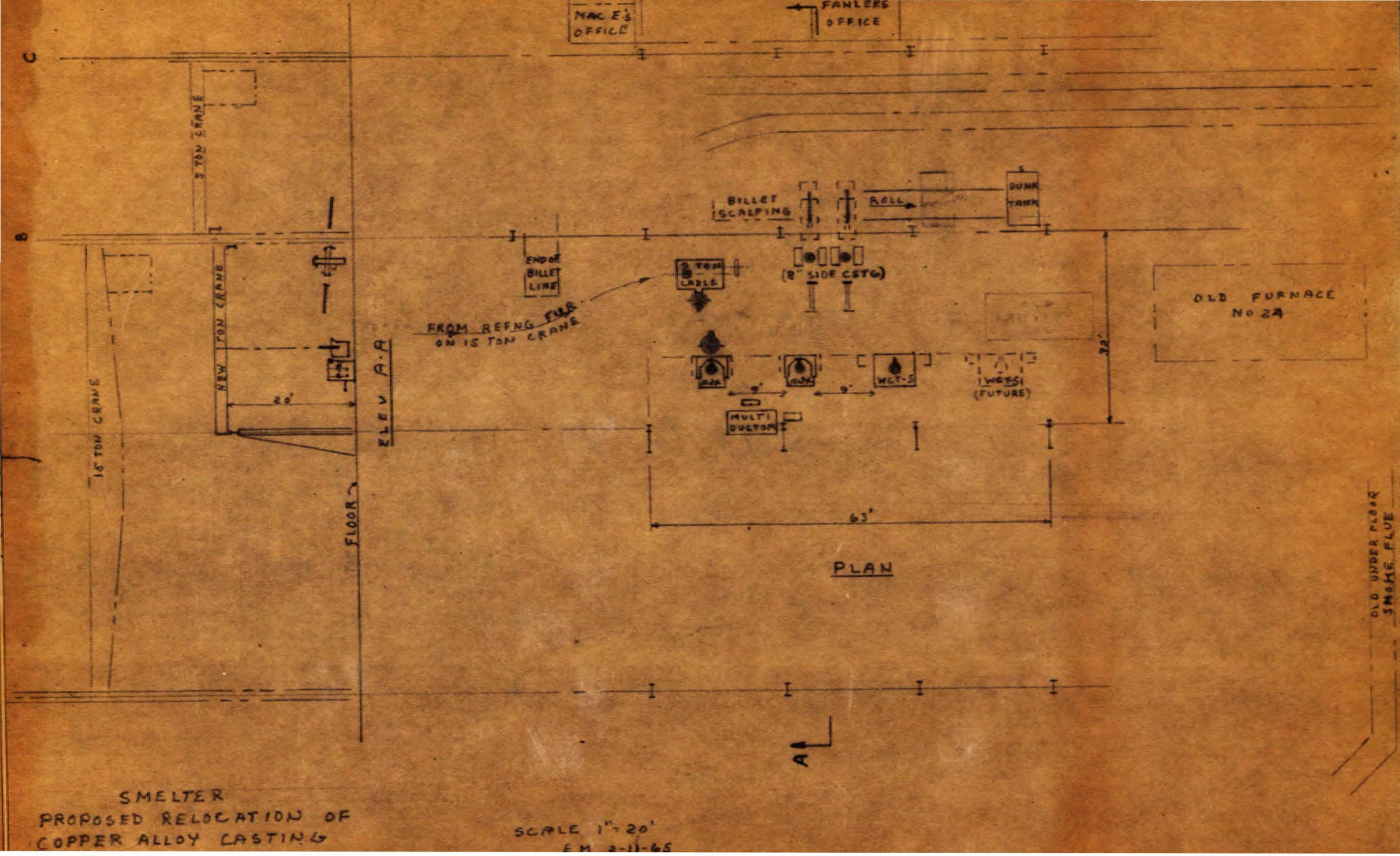

0
1
2
3
4
5
GRATING
PLATFORM
MULTI DUCTS
ADJ
ADJ
WARM
WARM
FUTURE
STEPS
SIDE CASTING
STEPS
FAN
DUNK TANK
EXP 50 KW FURNACE
13'-6
16'
16'
16'
5 TON CRANE
5 TON CRANE
ELEV LOOKING EAST
15' ABT
CRANE
TORCH CAKE WATER
3" RECIRC IS WATER FROM 22 TANK
CAKE CASTING EQUIP
PLAN
9 TON OIL FIRED LADLE ON FLAT CAR. REMOVE FROM CAR TO LOAD UNLOAD IN EAST BAY
FURNACE #21
Rev'd at alloy meeting 3/8/66 JE
SMELTER
PROPOSED RELOCATION OF COPPER ALLOY CASTING SCHEME #4
SCALE 1" = 20'
MAR 1, 65
17265



SMELTER
PROPOSED RELOCATION OF
COPPER ALLOY CASTING
SCHEME #5

SCALE 1" = 20'
MAR 3, 66 EM

17265



SMELTER
PROPOSED RELOCATION OF
COPPER ALLOY CASTING

SCALE 1" = 20'
EM 2-11-65

National Spectrographic Laboratories, Inc.

19500 SOUTH MILES ROAD • CLEVELAND, OHIO 44128 • (216) 475-8208

File 1920

INVOICE NO.

TO Calumet and Hecla, Inc.
Calumet Division
Calumet, Michigan 49913

Attn.: Mr. J. Bastian

SLAG SAMPLE
FEED

DATE	MATERIAL	YOUR ORDER NO.	REPORT NO.
4/7/69	Quantitative		CN 140786

ELEMENTS DETERMINED %	SAMPLE NO. 31469	SAMPLE NO.	SAMPLE NO.	SAMPLE NO.	SAMPLE NO.	SAMPLE NO.	SAMPLE NO.
Ti	0.68						
Cr	0.22	means less than					
Mn	-0.0002						
As	-0.0003						
Ru	-0.0003						
Pt	-0.0001						
Pd	-0.0001						
Ir	-0.0003						
Ga	-0.0001						
Mo	-0.001						
In	-0.001						
Ag	-0.0005						
Lab. No.	16546						

RECEIVED AT CALUMET DIVISION APR 9 1969 RESEARCH AND DEVELOPMENT

We certify the above analysis to be the true results on the designated samples.

NATIONAL SPECTROGRAPHIC LABORATORIES, INC.

J. D. Golland
Chief Chemist

Sworn to and subscribed before me a Notary Public in and for the County of Cuyahoga, State of Ohio, this

DAY OF , 19

MS-002
Box 164
Folder 3

DUPLICATE REPORT OF ANALYSIS

National Spectrographic Laboratories, Inc.

19500 SOUTH MILES ROAD • CLEVELAND, OHIO 44128 • (216) 475-8208

Field 1920

INVOICE NO.

TO Calumet and Hecla, Inc.
Calumet Division
Calumet, Michigan 49913

Attn.: Mr. C. J. Bastian

SEMI-QUANTITATIVE SPECTROGRAPHIC ANALYSIS

DATE	MATERIAL	YOUR ORDER NO.	REPORT NO.
4/11/69			CM 14356

RANGE OF CONCENTRATION	# 2 Slag Residue	# 4 Slag Residue
Major Greater than 10%	----	----
Near Major 5-25%	----	Ca
Minor 1-10%	Si	Si
Near Minor 0.5-5%	Al	Al
Low 0.1-1%	Ca	Cu, Mg
Near Low 0.05-0.5%	Cr, Ti, Na, K, Cu, Mg	Cr, Ti, Na, K, Mn
Very Low 0.01-0.1%	Sr, Sn, Pb	Sr, Sn, Pb
Strong Trace 0.005-0.05%	V, Ba	V, Ba
Trace Less than 0.01%	B, Zr, Mo	B, Zr, Mo
Not Detected	Mn, Ag, As, Bi, Li, Cb, Cd, Co, Ni, Sb, W, Zn, Li	Ag, As, Bi, Li, Cb, Cd, Co, Ni, Sb, W, Zn, Li
Lab. No.	17356	17357

J. D. Holland — Chief Chemist

DUPLICATE REPORT OF ANALYSIS