4062 B-13

47-8 385

B-137

R. L.

Date August 25, 1947

Subject Rala Production

By C. E. Winters

To P. Sandidge

File

Those Eligible To Read The Attached

Copy # 2

P. Sandidge

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date
L M E			
E J Witkowski	9/2/47		

This document has been approved for release to the public by:

Donald R. Harmon 3/9/95
Technical Information Officer, ORNL Site — Date

INV. 65

UNITED STATES
ATOMIC ENERGY COMMISSION

AECX-2

09289

Oak Ridge, Tennessee
August 25, 1947

Classification Cancelled
Or Changed To
By Authority Of
By
Date

Monsanto Chemical Company
Clinton Laboratories
Oak Ridge, Tennessee

Attention: Mr. Prescott Sandidge

Gentlemen:

Subject: RALA PRODUCTION

We have received information that the customer for Rala will continue to require regular shipments for an extended period of time. You will receive a new schedule of the requirements as soon as they become available.

In discussions with Mr. Emlet, ideas were developed that reductions could be made in operating costs and uranium consumption with some additional capital expenditure. We shall appreciate the initiation of studies to see what can be accomplished in this direction. It is anticipated that the reduction of operating expense will be considered on the basis of pay-out time. The value of the reduction of uranium consumption, above its replacement cost, must be on an intangible basis and should be similarly considered.

We shall appreciate being kept informed as to the progress of the studies and will give prompt consideration to your recommendations.

Very truly yours,

C. E. Winters, Chief
Research & Development Branch
Clinton Laboratories Division

CLASSIFICATION CANCELLED
Ted Davis 1/10/95
ADD signature Date
Single rereview of CORP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

B-E

9/3/47

To: L.R.E.
From: E.J.W.

Re: Memo of 8/25/47 from Mr. C. E. Winters to Mr. Prescott Sandidge on "Rala Production"

A program for the improvement of the process equipment to decrease operating expenses and to improve the safety of operation had actually been started last February and is continuing at present. To date the following improvements have been accomplished:

(1) All but three of the Tygon transfer lines in the main cell have been replaced with metal lines to eliminate frequent decontamination of the main cell to replace the damaged Tygon lines. The remaining three lines will be replaced sometime in the future when the cell is decontaminated to repair other equipment. It is estimated that this improvement will save at least $10,000 per year on decontamination alone and will eliminate some delays in shipments which were experienced in the past. It will also eliminate a great deal of exposure of personnel to radiation

(2) The Tygon transfer lines in the

lead cubicles are, at present being altered in such a manner so as to decrease the necessity for their replacement from once every three runs to once every six runs. Although this project will save no more than $1,000 per year, it will aid us immeasurably in eliminating exposure of personnel to radiation.

(3) The project for the replacement of the black iron cell duct with one of concrete construction which was completed several weeks ago has eliminated an above tolerance radiation hazard along one half of the east wall of the building although no actual saving in money has been accomplished.

(4) A standby stainless steel blower for the vessel off-gas line which has been on order since last February may not actually decrease operating cost when installed but it will eliminate the possibility of a delayed shipment due to a breakdown of the existing blower.

(5) About one week ago, studies were initiated to determine the possibility of decreasing the operating costs by using Hanford slugs to replace the X-slugs used at present. Preliminary results of this study should be completed by October 15, 1947.

[redacted]

Classification Cancelled or Changed to [illegible] D. E. Arthur
By Authority of
AEC AUG 25 1971
Name Title Date

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-9 28

To: W. H. Ray

From: T. H. J. Burnett

August 27, 1947

Subject: Preliminary Calibration of Constant Air Monitors, 706-D.

Description of Equipment

There are two constant air monitors in Building 706-D, one on the 2nd. level over the "hot" laboratories, the other in the center of the 3rd. level area. Each basically consists of a GM tube mounted concentric (supposedly) with a 1-3/8" I.D. brass tube in which are 12 slots 1/4" wide and about which is fastened filter paper. Air is drawn through the filter paper and the airborne activity collected is counted by the GM tube which sends pulses to a ratemeter circuit (Q-364-A) in turn sending a signal to a standard D.A. milliammeter.

Purpose of Calibration

It is desired to establish the response of the indicating meter to various amounts of activity so that lines of the proper slope may be drawn on its glass face to indicate tolerance, mask and evacuation levels of air contamination.

Methods Used

Delay in the issuance of this report was occasioned by the belief that determination of the counting geometry of the GM tube assembly was a prerequisite. The method used, however, is found to be independent of, or rather, to compensate for the geometry factor. Sources of activity of known amounts are placed in lieu of the filter paper on the brass tube and the response recorded. As the sources consist of active material solutions added to bits of filter paper, self-absorption is provided for and any effects of backscatter, are as present as in actual use.

Date Obtained

Tests were made on the C.A.M. on the 3rd. level, 706-D from 2 P.M. to 5 P.M., June 30, 1947 which was then using GM tube #C1363 at 975 volts. This was in the lower third of the plateau region.

#1326

[redacted] contains information affecting the national defense of the U.S. within [redacted] 32. [redacted] revelation of its contents in any manner to an unauthorized person is prohibited by law.

This document has been approved for release to the public by:

David C. Hamilton 1/30/95
Technical Information Officer, ORNL Sit. Date

CLASSIFICATION CANCELLED
Ted Davis 1/10/95
ADD signature Date

Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

TABLE I

Source Used	Slot Position	Activity x 10^{-6} mc.	Chart Reading	Divisions per uc
1- I^{131}	center	3.2	0.050	15.8
2- I^{131}	center	6.3	0.080	12.7
3- I^{131}	center	9.5	0.115	12.2
3- I^{131}	top	9.5	0.065	
3- I^{131}	bottom	9.5	0.110	
4- I^{131}	center	16.0	0.170	10.6
1- P^{32}	center	16.7	0.515	30.8
1- P^{32}	top	16.7	0.410	24.6
1- P^{32}	bottom	16.7	0.510	
2- P^{32}	top	33.4	0.690	26.6
3- P^{32}	top	50.1	0.895	22.8
			Value used	8.0

It is seen above that the sensitive region of the GM tube was not prpperly centered with the length of the slot since readings at the top and bottom of the slot are not equally less than the center. Likewise the energy response is seen to be different for the P^{32} 1.69 Mev β^- as compared to the I^{131} 0.6 Mev β^- by an average of a factor of 2.

Similar tests were made July 1, 1947, from 9 A.M. to 12 N. on the C.A.M. on the 2nd. level, 706-D which was then using GM tube G-1335 at 1200 volts, in the lower third of the plateau.

[redacted] information affecting the national defense of the U.S. within the [redacted] 32. Its [redacted] or the revelation of [redacted] in any manner [redacted] person is prohibited by law.

[redacted]D

TABLE II

Source Used	Slot Position	Activity x 10^{-6} mc.	Chart Reading	Divisions per uc
1- I^{131}	center	3.0	0.060	20.0
2- I^{131}	center	6.0	0.100	16.6
3- I^{131}	center	9.0	0.125	13.9
3- I^{131}	top	9.0	0.112	12.5
3- I^{131}	bottom	9.0	0.120	13.4
4- I^{131}	center	14.0	0.170	12.1
1- P^{32}	center	16.0	0.590	36.9
2- P^{32}	center	32.0	0.935	29.2
			Value used	11.0

Again it is seen that the GM tube was a little farther down in the brass tube than for optimum results. Likewise the energy response is similar to that for the 3rd. level C.A.M.

Computations

The air flow assumed for the constant air monitors is 5 cfm. or 1.4×10^5 cc/min. A work order has been placed for orifice assemblies to use with each C.A.M. so that the airflow may be known individually. Upon completion, they are scheduled to be calibrated and installed. Pending this, a "safety factor" will be introduced to cover variation in airflow and also non-linearity of response throughout the chart range as well as to partly average the energy response variation.

For the 3rd. level, taking a value of 24 divisions per uc as an approximate average response and introducing a factor of 3 for the variables above there results:

(1) Deflection/uc x uc/min collected = Deflection/min.

With the evacuation level = 10^{-8} uc/cc and assuming 100% collection of activity the rate of collection becomes:

(2) uc/min = 10^{-8} uc/cc x 1.4×10^5 cc/min = 1.4×10^{-3} uc/min.

(3) Evacuation slope = defl/hr = 8 div/uc x 1.4×10^{-3} uc/min x 60 = 0.67 div/hr.

(4) Mask tolerance slope = 10^{-9} x 1.4 x 10^{5} x 8 x 60 = 0.07 div/hr.

For the 2nd. level, using a value of approximately 33 div/μc and a factor of 3 again the values result:

(5) Evacuation slope = 10^{-8} x 1.4 x 10^{5} x 11 x 60 = 0.92 div/hr.

(6) Mask tolerance slope = 10^{-9} x 1.4 x 10^{5} x 11 x 60 = 0.09 div/hr.

On both above charts 1.0 divisions is full scale.

Comments

The "safety factor" of 3 should not be regarded in the customary light of a true safety factor, rather as an arbitrary constant introduced as explained. When the chart reading increases at a rate equal or greater than the slopes computed above, it should not be felt that any leeway remains before appropriate action except for the adequate safety factor present in the establishment of the respective permissible contamination levels of 10^{-8} and 10^{-9} μc/cc used in this building.

Consideration is likewise due such factors as the occurrence of types of airborne contamination for which the collecting efficiency is not 100% and the possibility of airborne alpha contamination which will not count when collected.

Upon subsequent establishment of improved values for any of the quantities used, supplementary calibration values will be issued.

T. H. J. Burnett

THJB:ejp

cc: W. H. Ray (3)
K. Z. Morgan (2)
F. Western
R. H. Firminhac
O. D. Teague
D. E. Arthur
I. B. Whitney
T. H. J. Burnett (2)
C. File
R. File

This document contains information affecting the national defense of the [redacted] within the meaning of the Espionage Act, U.S. C. 50, 31, and 32. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

[redacted]

B-13

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-9 123

B-137

Date September 3, 1947

File

Subject Re: RaLa Shipment No. 29

Those Eligible To Read The Attached

By J. A. Leary

Copy # 1A

To E. J. Witkowski

E. J. Witkowski

Before reading this document, sign and date below:

Name	Date	Name	Date
EJW	9/11/47		
JAL	9/11/47		

This document has been approved for release to the public by:

David R Hamrin 2/3/95
Technical Information Officer Date
ORNL Site

[redacted]

NO. 1 OF 4 COPIES, SERIES 4

LOS ALAMOS SCIENTIFIC LABORATORY

P. O. Box 1663

LOS ALAMOS, NEW MEXICO

CENTRAL FILES NUMBER

47-8 125

IN REPLY REFER TO: LAB-CMR-4

September 3rd, 1947

Mr. E.J. Witkowski
Monsanto Chemical Company
Clinton Laboratories
P.O. Box W
Oak Ridge, Tennessee

Dear Mr. Witkowski:

Due to changes in our work schedule we would prefer that you deliver RaLa Shipment No. 29 to the A.E.C. representative at Oak Ridge on October 7th, 1947 instead of September 30th as agreed in the telephone conversation between Dr. R.W. Spence and your representative. In the event that this new date cannot be met by you, we would prefer that the shipment be delivered one week later rather than on September 30th.

To date we have had only one "milking" of Shipment No. 28, but it appears to be of very good quality. The activity was 2300 "curies" at 1000 on August 26th. We suspect this measurement to be about 8% higher than previous measurements due to changes in equipment.

Very truly yours,

Joseph A. Leary

Joseph A. Leary

JAL:AZ

CLASSIFICATION CANCELLED
DATE SEP 14 1947
PSE

CLASSIFICATION CANCELLED
Ted Lamm 2/3/95
ADO signature
Single ref... documents was ...
Declassification ...

[redacted]

[redacted]

Classification Cancelled ~~or Changed~~
TO
By Authority of
ATG
Name Title Date

47-9-125

Date: September 3, 1947

Classification: [redacted]

Subject: Re: RaLa Shipment No. 29

To: E. J. Witkowski

From: J. A. Leary

1 copy, series A

Distribution:

1. E. J. Witkowski

A-4

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-10 59

C.7.

E. J. Witkowski

B-137

Date October 3, 1947

File

Subject 706-D Special Slug Carrier

Those Eligible To Read The Attached

By W. S. Farmer

Copy # 1

To E. J. Witkowski

Before reading this document, sign and date below:

Name	Date	Name	Date
EJW	10/7/47		

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

#1325

MONSANTO CHEMICAL COMPANY
CLINTON LABORATORIES

DATE October 3, 1947

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-10 59

TO E. J. Witkowski

FROM W. S. Farmer

IN RE: 706-D Special Slug Carrier

Summary

Employing the slug carrier proposed by E. J. Witkowski the radiation to plant personnel handling the slug carrier will amount to approximately 500 mr/hr. If this carrier is transported by plane and the pilot is located 10 feet away he will receive 4 mr or 3% of tolerance. The above design employes 10 inches of lead shielding for 30 Hanford slugs.

Calculation

The present W power level is ~300,000 KW when fully loaded with 200 tons of uranium. This is equivalent to 0.75 KW per lb. of uranium. The Hanford slugs are 1-3/8" in diameter and 8" long. Therefore there is 7.65 lbs. of uranium per slug. An average lb. of uranium is therefore radiating 4.68×10^{15} mev/sec. in the pile. It is estimated that a 12 hour time lapse will occur between the discharge of the slugs from the pile and insertion in the carrier. The Borst-Wheeler decay curves indicate a power level reduction by a factor of 4.5×10^{-3}. The radiation from a single slug is therefore 16.0×10^{13} mev./sec. We will concern ourselves with shielding against only the hard γ ray component since the remainder of the radiation (soft γ rays and β particles) will be stopped by the lead shield thus specified. Of the total radiation only 35% is hard γ. The probability of escape from a slug is 30%. Therefore a single slug represents a source of 1.7×10^{19} ev./sec. of hard γ radiation.

The amount of lead shielding can be computed by the point source formula

$$I = \frac{\mu S_p}{4\pi a^2} e^{-\sigma t} \times 43.2 \times 10^{-8}$$

where I is r./8 hr. day, μ is 3.5×10^{-5} cm.$^{-1}$, S_p is the source strength in ev./sec., a is the shield thickness, as is also t, and σ is the absorption coefficient for 2 mev γ rays in lead.

The 706-D carrier has 30 slugs arranged in 14" diameter circle and an outer 10" lead covering. A person handling the carrier received 500 mr./8 hr. day by the point source calculation. If a person is 10 feet away from the carrier the dosage is reduced 160 fold or becomes 3 mr./8 hr. day.

W. S. Farmer
W. S. Farmer

WSF:sml
E. J. Witkowski (2)
W. S. Farmer (2)
Central Files

Penland, J. D.
158 Indian Lane, Oak Ridge — 703-A

Peterson, M. D.
509 Delaware Ave., Oak Ridge — 706-A

Pierce, E. E.
104 W. Newkirk Lane, Oak Ridge — 704-A

Pippin, Eleanor G.
308 12th St., Knoxville — 703-A

Poston, M. R.
133 Nesper Rd., Oak Ridge — 706-A

Powell, R. H.
217 Vermont Ave., Oak Ridge — 706-D

-R-

Ratliff, J. C.
118 E. Bryn Mawr Circle, Oak Ridge — 807

Reid, D. G.
118 Kentucky Ave., Oak Ridge — 704-A

M-194

To Dick

Date 9/30 Time 10:15

WHILE YOU WERE OUT

M Stringfield

Of

Phone 6333

Telephoned		Please phone him	✓
Called to see you		Will call again	
Wants to see you		RUSH	

MESSAGE

c 1.437 × 8.659

Cutting one copy = 1540 cu yds. = 6.32 Mbf
by cutting #2 canary — 10,153
1,214
8,859 Mbf Walnut

10,153 Mbf Walnut
3 cu yds #2
20 cu yds #3
75 Mbf Walnut

12 cu yds #2
50 cu yds #3
200 cu yds
Mbf Walnut

Shield

$\pi \times 25^2 \times 44.5 - \pi \times 7^2 \times 8.5$

87,600 − 1,310 = 86,290 cu in

1.36°
8.001

or 50 cu ft.

50 × 710 = 35,600 lb lead.

12" shield

$\pi \times 19^2 \times 32.5 = 1,310$

36,800 − 1,310 = 35,490 cu in

or 20.5 cu ft.

14,555 lb lead

10" shield

$\pi \times 17^2 \times 28.5 = 1,310$

24,000 − 1,310 = 24,690 cu in

or 14.3 cu ft

10,153 lb lead.

Cutting one edge = 1540 cu in cut off = 632 lb

by cutting off 2 corners — 10,153
1,264
8,889 lb total wt.

Wt. = 15 lbs after 12 hr cooling

B-137

TD Cons 8/25/71

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-10 234

INV. 77

Date October 15, 1947

File

Subject **Use of Hanford Material for Rala Production**

Those Eligible To Read The Attached

By **L. B. Emlet**

Copy # 9
Central files

To **J. C. Stewart**

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date

INV. 65

#1326

This document consists of 5 pages and 0 figures. No. 9 of 9 copies. Series A.

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-10 234

[redacted]

Classification Cancelled
Or Changed To
By Authority Of ERDA
By WTB Date SEP 12 1977

Contract W35-058-eng-71
MONSANTO CHEMICAL COMPANY
Clinton Laboratories
P. O. Box W
Oak Ridge, Tennessee

October 15, 1947 M. Day

CLASSIFICATION CANCELLED
ADD signature 1/18/95 Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

Atomic Energy Commission
P. O. Box W
Oak Ridge, Tennessee

Attention: Mr. James C. Stewart

Subj : USE OF HANFORD MATERIAL FOR RALA PRODUCTION

Ref : (1) Yearly Cost of RaLa Production, J. C. Stewart to W. J. Williams, July, 1947.

(2) RaLa Production, C. E. Winters to Prescott Sandidge, August 25, 1947.

Gentlemen:

A calculated savings of approximately $23,000.00/batch or an annual savings of at least $156,000.00 (six batches/year) is possible if Hanford irradiated material is used in place of Clinton slugs for the preparation of RaLa. An initial expenditure of approximately $10,000.00 would be necessary to prepare for handling the Hanford material.

At the present time 900 Clinton-exposed "X" slugs (2,250 pounds of uranium) are processed to produce approximately 2,500 curies of RaLa. The process time for this procedure averages about nine days/batch. In your letter to Mr. W. J. Williams, an annual cost of $498,480.00 was estimated for the production of six batches of RaLa by this process, or adjusting for continuing expenses, a cost of $57,500.00/batch.

[redacted]

Ltr to J. C. Stewart from L. B. Emlet, 10/15/47; subj: Use of Hanford Material for RaLa Production.

Under the proposed method, thirty Hanford-irradiated "W" slugs (240 pounds of uranium) would be processed to produce about 2,500 curies of RaLa. The processing time would be reduced to approximately four days. On essentially the same cost basis as above, this would be an annual cost of $341,700.00 (a savings of $156,000.00/year) for six batches; or, adjusted for continuing expenses would amount to a cost of approximately $34,550.00/batch (a savings of $23,000.00/batch).

The use of Hanford-irradiated slugs requires that two 9,000-pound, lead shields be fabricated at a cost of $2,500.00 each. The exposed slugs would be transported from Hanford to Knoxville by an airplane at an estimated cost of $6,250.00 per trip. The empty shield would be returned to Hanford by freight at a cost of $500.00. Two five-ton hoists would have to be installed in the 706-D Building in place of the present three-ton lifts. This cost is estimated to be about $5,000.00. Total cost for preparation work is, therefore, about $10,000.00.

A more detailed cost comparison of the two methods of producing RaLa is indicated in the attached table.

The container used for the transportation of "W" slugs to Clinton Laboratories would be thirty-six inches in diameter and about thirty inches high with a wall thickness of ten inches of lead. Thirty exposed slugs can be shipped in a container of this design resulting in a radiation of 65 mr/hr on the surface (memo from W. S. Farmer to E. J. Witkowski, October 3, 1947 - 706-D Special Slug Container). This degree of radiation should not be a hazard to the personnel handling the container, as long as proper precautions are taken.

It is estimated that the present Tank Farm has sufficient free space for the metal waste of approximately eighteen 2,500-curie batches of RaLa made from Clinton exposed uranium. If Hanford material is used for RaLa production, the Tank Farm would provide waste metal storage for an indefinite period.

[redacted]

Ltr to J. C. Stewart from L. B. Emlet, 10/15/47; subj: Use of Hanford Material for RaLa Production.

Preliminary inquiries indicate that the transportation of a four-and-a-half-ton shield from Hanford to Knoxville by air is feasible. The Clinton Laboratories Transportation Department cannot foresee any difficulty in delivering the shield from the Knoxville Airport to the 706-D Building. The people at Hanford feel that the packing of the container and the loading into the plane can be handled by them, but that some of their rules governing the radiation limits on shipping containers would be violated.

From a purely economical viewpoint, it appears to be very desirable to use the Hanford-exposed material. The Atomic Energy Commission will have to evaluate the proposed method from a security and safety point of view; i.e., airplane crash, etc.

If the use of Hanford material is approved, a more detailed study can be started immediately. No further work is planned on this problem until we hear from you.

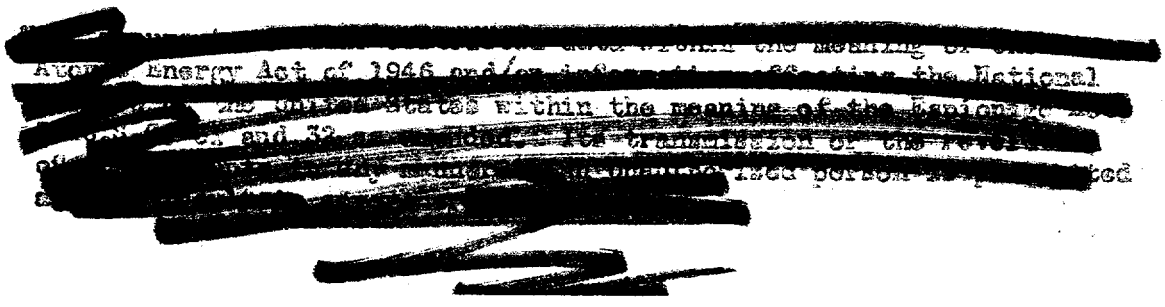
Very truly yours,

L B Emlet

L. B. Emlet
General Superintendent
Operating Department

LBE:wq

1-3. J. C. Stewart
4. Prescott Sandidge
5. E. J. Murphy
6. M. C. Leverett
7. E. J. Witkowski
8. L. B. Emlet
9. Central Files



	USING CLINTON MATERIAL (Approx. Cost Figures from letter, J. C. Stewart to W. J. Williams)		USING HANFORD MATERIAL		REMARKS
	BATCH	ANNUAL 6 Batches/Yr	BATCH	ANNUAL 6 Batches/Yr	
anium Used	900 slugs - 2,250#	5,400 slugs - 13,500#	30 slugs - 240#	180 slugs - 1,440#	1) 40 to 80-day exposure of slugs
rie Content	5,260 C	31,600	5,600 C	33,700	2) Hanford flux estimated ten times higher than Clinton.
ries Isolated	2,500 C	15,000	2,500 C	15,000	3) Estimated two days travel from Hanford to Clinton Labs.
SAVINGS	--	--	2,010# of U	12,060# of U	4) Saving of 2,000 lbs. of uranium/batch if Hanford material is used.
anium Cost	$10,700.00	$ 64,200.00	$ 1,140.00	$ 6,840.00	5) Metal estimated to cost $4.75/lb. as 100-lb. billits.
ug Preparation Cost	18,000.00	108,000.00	900.00	5,400.00	6) "X" slug preparation estimated at $20.00 each.
TOTAL	28,700.00	172,200.00	2,040.00	12,240.00	7) "T" slug preparation estimated at $30.00 each.
					8) Saving of $26,600.00/batch on slugs.
ansportation Cost (Hanford to Knoxville and return)	--	--	6,750.00	40,500.00	9) Air transportation from Hanford-$6,250. Empty shield returned by freight-$500.
ocessing Labor	4,900.00/mo	59,000.00	3,700.00/mo	44,500.00	10) Hanford material will reduce labor by an estimated 25%.

	USING CLINTON MATERIAL (Approx. Cost Figures from letter, J. C. Stewart to W. J. Williams)		USING HANFORD MATERIAL		REMARKS
	BATCH	ANNUAL 6 Batches/Yr	BATCH	ANNUAL 6 Batches/Yr	
intenance	$1,600.00/mo	$19,200.00	$1,600/00/mo	$19,200.00	11) Maintenance costs assumed to be the same, but in all probability they would be less if Hanford material was used.
terials	1,860.00/mo	22,400.00	930.00/mo	11,200.00	12) Materials cost reduced by an estimated 50% if Hanford material is used.
ansportation to Site "Y"	3,375/batch	20,200.00	3,375/batch	20,200.00	
rect Overhead	255.00/mo	3,060.00	255.00/mo	3,060.00	
direct Overhead	15,000.00/mo	180,000.00	15,000.00/mo	180,000.00	
nk Farm Costs	1,800.00/mo	21,600.00	900.00/mo	10,800.00	13) Tank Farm costs reduced by an estimated 50% if Hanford material is used.
TOTAL	28,790.00	325,460.00	32,510.00	329,460.00	
GRAND TOTAL	57,490.00	497,660.00	34,550.00	341,700.00	
SAVINGS	--	--	$22,940.00	$155,960.00	

CLINTON LABORATORIES
CENTRAL FILES NUMBER

47-10 276

B-137

Date October 20, 1947

Subject Ltr. - Ba(Run #21, Shipment # 29)

INV. 64

File

Those Eligible To Read The Attached

By E. J. Witkowski/H. Blauer

Copy # 5

To Joseph A. Leary

C. file

Before reading this document, sign and date below:

Name	Date	Name	Date

INV. 65

#1326

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

This document consists of 1 pages and 0 figures,
No. 5 of 6 copies, Series A.

[redacted]

CONTRACT W35-058 ENG 71

MONSANTO CHEMICAL COMPANY
CLINTON LABORATORIES
P. O. BOX [illegible]
OAK RIDGE, TENNESSEE

CLINTON LABORATORIES
CENTRAL FILES NUMBER

October 20, 1947

47-10-276

Classification Cancelled
Or Changed To [illegible]
By Authority of [illegible]
By [illegible]
Date 8/25/71

Mr. Joseph A. Lenzy
P. O. Box 1663
Santa Fe, New Mexico

Dear Mr. Lenzy:

We are shipping Run #1 (Shipment #2) to you today.

[redacted]

[redacted]

[redacted]

[redacted]

Very truly yours,

MONSANTO CHEMICAL COMPANY
Clinton Laboratories

By J. W. Kennedy for L. Blaser

By J. W. Kennedy for L. Blaser

JWK
cc: J. A. Lenzy
E. M. C. Kinsolving
E. D. Eddy
A. Keeling 7116
A. Conrad 7116

[redacted]

[redacted]

[redacted]

47-10-276

Copies 3,

Sent to Vault 4

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-11- 461

B-137

Date November 22, 1947

File

Subject Re: Rala Shipment # 30

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 5

To J. A. Leary

Central files

Before reading this document, sign and date below:

Name	Date	Name	Date

INV. 64

EWN 95

This document has been approved for release to the public by.

Technical Information Officer
ORNL Site

3/10/95
Date

[illegible] consisting of 5 pages. A

CONTRACT W35-058 ENG 71

1. J.A. Leary
2. E.J. Witkowski
3. L.B. Emlet
4. Reading File
5. Central File

MONSANTO CHEMICAL COMPANY
CLINTON LABORATORIES

Classification Cancelled ~~or Changed~~ P. O. BOX W
TO OAK RIDGE, TENNESSEE
By Authority of AUG 26 1971 November 22, 1947
AG
Name Title Date

CENTRAL FILES NUMBER
47-11- 261

UNCLASSIFIED (Insert appropriate classification level and category)
by authority of T. F. DAVIS 10-18-93 (Authority for change in classification) (Date)
by [signature] (Signature of Person making change) 3/29/94 (Date)
Verified by: [signature] (Signature of person verifying change) 3/29/94 (Date)

Mr. Joseph A. Leary
P. O. Box 1663
Santa Fe, New Mexico

Re: RaLa Shipment #30

Dear Mr. Leary:

We are turning over this shipment to the Atomic Energy Commission today. The same method of product measurement which we have used in the past indicates approximately 1/100 curies of Barium present at L.S.T. 1200 E.S.T. on November 21, 1947.

We question the accuracy of this measurement since the instrument used for the direct radiation measurement depends on your direct radiation readings which we have been unable to completely understand.

After our last telephone conversation, I thought that our problems were solved but, unfortunately, they are not; we are more confused now than ever before. Our chemists still insist that Dr. G. Friedlander had at one time reported to us the number of curies of Barium shipped from Clinton National Laboratory at our L.S.T. I understood you to say that you reported the total number of curies of Lanthanum present in our product at your time of measurement and now it appears possible that you may have reported the number of curies of Lanthanum which you recover in one milking as measured at your separation time.

It is apparent that before any accurate measurements can be made here, it will be necessary for us to standardize the method of reporting the quantity of product between Los Alamos and Clinton National Laboratory. The only sure way to accomplish this with the least difficulty (for us, at least) is to have you calculate from your radiation measurements and report to us the total number of curies of Barium at our L.S.T. shipped from Clinton National Laboratory in all shipments, #10 through #30. To eliminate future misunderstandings, we would also appreciate your adopting this method of reporting the quantity of product in all future shipments.

We are sorry that we were unable to make this shipment on the originally scheduled date and we hope that you will encounter a great deal less trouble in using this material than we had in producing if for you.

The next run is tentatively scheduled to start on December 31, 1947, and to be shipped on January 9, 1948. We will assume that this shipping date meets with your approval and proceed to make arrangements accordingly, unless we are notified to the contrary before December 26, 1947.

Very truly yours,
E. J. Witkowski
E.J. WITKOWSKI
Superintendent, 706-D Area

EJW:wq

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-11 53

B-137

Completed

Date November 4, 1947

File C.F.

Subject Request for X-Metal Slugs

Those Eligible To Read The Attached

By H. M. Feder

Copy # 5

To L. B. Emlet

H. L. Reid

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date
DeLR	11/6/47		
ML	11.7.47		
E-22			

INV. 64

#1326

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-11-53

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-11-461

B-137

Date November 22, 1947

File

Subject Re: Rala Shipment # 30

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 5

To J. A. Leary

Central files

Before reading this document, sign and date below:

Name	Date	Name	Date

#1326

...ment consists of [illegible]
and 0 figures
5 of 5 copies, Series A

SECRET

CONTRACT W35-058 ENG 71

MONSANTO CHEMICAL COMPANY

CLINTON LABORATORIES

OAK RIDGE, TENNESSEE

Classification Cancelled [illegible]
TO [illegible]
By Authority of [illegible] AUG 23 1971
AHG [illegible]
Name [illegible]

[illegible] 1947

CENTRAL FILES NUMBER
47-11-461

1. J.A. Leary
2. R.J. [illegible]
3. L.B. [illegible]
4. Reading File
5. Central File

[illegible] J. [illegible] Leary
P. O. Box 1663
Santa Fe, New Mexico

Re: [illegible] Shipment [illegible]

Dear Mr. Leary:

We are [illegible] this shipment to the Atomic Energy Commission today. The same method of product measurement which we have used in the past indicates approximately 1100 curies of Barium present as of [illegible] 1200 E.S.T. on [illegible], 1947.

We [illegible] the accuracy of this [illegible] made [illegible] the direct radiation measurement [illegible] which we have been unable to [illegible].

After our last telephone conversation [illegible] problems were solved but, unfortunately, they [illegible] now than ever before. Our chemists still [illegible] and at one time reported to us the number of [illegible] Clinton National Laboratory at our L.S.T. [illegible] you reported the total number of curies of [illegible] of shipment, and now it appears [illegible] the number of curies of Lanthanum [illegible] as measured at your separation time [illegible]

It is apparent that before any [illegible] made here, it will be necessary for us to [illegible] regarding the quantity of product between [illegible] laboratory. The only sure way to accomplish [illegible] (for us, at least) is to have you [illegible] measurements and report to us the total [illegible] L.S.T. shipped from Clinton National Laboratory [illegible] through [illegible]. To eliminate future misunderstanding [illegible] appreciate your adopting this method of reporting [illegible] in all future shipments.

We are sorry that we were unable to [illegible] the originally scheduled date and we hope that you will [illegible] much trouble in using this material than we [illegible].

The next run is tentatively scheduled [illegible] 1947, and to be shipped on January 7, 1948. [illegible] shipping date meets with your approval and [illegible] accordingly, unless we are notified to the [illegible].

Very truly yours,

[signature]

[illegible]
[illegible] Superintendent, [illegible]

[illegible]

SECRET

B-03

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-12-74

Classification Cancelled
By Authority Of DOE
By [illegible] Date AUG 2 1971

B-137

Completed

Date November 28, 1947

File C.7.

Subject Shipment #31 (Run #22A)

Those Eligible To Read The Attached

By E. J. Witkowski per Harris Blauer

Copy # 3

To J. A. Leary

K. B. Lemlet

Before reading this document, sign and date below:

Name	Date	Name	Date
LBE			

INV. 63

INV. 64

CLASSIFICATION CANCELLED
ADD signature
11/19/95
Date

Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 24, 1994.

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

#1326

ument consists of 1
ges and 0 figures.
No. 3 of 5 copies, Series A

[redacted]

CONTRACT W35-058 ENG 71

MONSANTO CHEMICAL COMPANY
CLINTON LABORATORIES

P. O. BOX W
OAK RIDGE, TENNESSEE

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-12- 74

January 14, 1947

Mr. Joseph A. Lary
P. O. Box 1663
Santa Fe, New Mexico

Dear Mr. Lary:

[redacted]

Very truly yours,

E. J. Witkowski per
Harris Blauer

E. J. WITKOWSKI per Harris Blauer
706-D Area Superintendent

CLASSIFICATION CANCELLED

[redacted] 1/19/95
ADD signature Date

Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, [redacted]

[redacted]

"This document contains restricted data within the meaning of the [redacted] Act of 1946 [redacted] Section 1 [redacted] transmission or disclosure of its contents in any manner to an unauthorized person is prohibited by law. Information so classified may be imparted only to persons in the employ of the United States or citizens of the United States known to be loyal and discreet who have a need to know the same, and may be communicated by them only to persons of the same status. Carelessness or indifference in the observance of this regulation or any rule or regulation adopted pursuant thereto is punishable by law. Unauthorized persons receiving such information must report the fact to the Commission, Washington, D. C., forthwith."

[redacted]

file B-13 (R.I.) E.J. Witkowski

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-12- 413

CLASSIFIED ROUTING SLIP

LOS ALAMOS SCIENTIFIC LABORATORY

FROM R. W. SPENCE GROUP _____ DATE _____

Before reading this document, sign as indicated below:

NAME	DIV. AND GROUP	SIGNATURE	DATE RECEIVED
E. J. WITKOWSKI		E.J. Witkowski	Dec 20 1947

#1326

[redacted]

THIS DOCUMENT CONSISTS OF 3 PAGE(S)
NO. 1 OF 4 COPIES, SERIES A

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P. O. Box 1663
Los Alamos, New Mexico

CLINTON LABORATORIES
CENTRAL FILES NUMBER
47-12- 413

December 9th, 1947

IN REPLY
REFER TO: LAB-CMR-4-23

Mr. E.J. Witkowski
Superintendent, 706-D Area
Clinton National Laboratory
Oak Ridge, Tenn.

Dear Ed:

The purpose of this letter is to attempt to clear up the confusion existing in connection with the measurement of RaLa and RaBa sources. Perhaps the best way to do this is to trace in an historical fashion the way such measurements have been made here at Los Alamos from the earliest days of RaLa to the present.

The original method of measuring sources was to use Victoreen ionization chambers (the square jobs with three ranges). These Victoreen meters were calibrated using radium sources. After we had obtained a reading for a RaLa source at a known distance we could use our calibration charts to determine how many grams of radium at one meter gave the same reading on the Victoreen as the RaLa source (assuming the inverse square law to be valid). This number then was used to express the strength of the RaLa source in "radium-equivalents." We fell into the habit of using the word "curie" in place of "radium-equivalent" even though it was clear that we had not measured "curies" at all since the gamma spectrum of RaLa is quite different from the gamma spectrum of radium. I know that Gerhart Friedlander did attempt to determine experimentally the relationship between a radium-equivalent and a curie (the latter defined as 3.7×10^{10} disintegrations per second) but he told me that the accuracy of the results was poor and it is my belief that the results were never used in reporting source strengths to Clinton. At any rate by early 1945 it had become established procedure to use the word "curie" as the unit for source strengths and the only way the fiction was acknowledged was to place the word in quotation marks.

I might say that there were at least three factors which made even the term "radium-equivalent" somewhat dubious. First, all scattering effects were ignored; second, no correction was made for the absorption of gamma radiation in air, even though we knew that such absorption was not negligible at the distances of 20-40 feet usually used for the Victoreen measurements; third, the Victoreen meter measured both gammas from RaLa and from RaBa. The

[redacted]

last effect was corrected for, since we found experimentally that for a source in which the Ba^{140} and the La^{140} were in radioactive equilibrium, roughly 90% of the observed Victoreen reading was due to La^{140} gammas and 10% due to Ba^{140} gammas.

The value for the strength of the shipments as reported back to Clinton were arrived at, then, in the following way: when the La^{140} activity had reached a maximum a few days after arrival, it was measured with Victoreen meters. Using the calibration charts we expressed the La^{140} activity in "radium equivalents" after first subtracting 10% of the Victoreen reading to correct for the Ba^{140} gammas. Knowing the decay and growth curves and the time when the last Ba-La separation was made at Clinton, we then calculated the strength of the Ba^{140} at the time of meaaurement and at the time of the last separation. Although the activity was probably expressed in "curies" any similarity between these "curies" and genuine, HTG (Honest to God) curies was purely coincidental - and the chance of such a coincidence occurring was vanishingly small. Experience soon showed that if you people at Clinton said you sent us 1000 curies of Ba^{140} (from radiochemical analysis) as measured at the last separation time, we would usually measure 1000 "curies" of La^{140} about five days later.

When, in late 1945, we quit using the Victoreen meters for measuring and used instead an ionization chamber mounted inside our RaLa chemistry building, we were anxious not to change the magnitude of the "radium-equivalent" we had been using, for we wanted no confusion between the physics group here at Los Alamos and ourselves. Therefore, we measured the same RaLa sources with both Victoreens and our new Levine-meter (as the new measuring device was called) and secured a kind of calibration for our Levine-meter. Shortly after this time certain new construction was erected which made it impossible to measure sources with Victoreens as we had done in the past. We were worried about how we could re-calibrate our Levine-meter if something ever went wrong, so we measured the readings the Levine-meter gave when a known amount of radium (1.5 c.) was placed at a given distance from the ionization chamber. This, in effect, has become our calibration; when changes in the Levine-meter were made (and such changes have been made in the past year or so) the changed set-up was calibrated with radium and correct factors used so that the readings of the rebuilt instrument corresponded to the original Levine-meter which had been calibrated against Victoreen measurements using RaLa sources. In theory, then, our unit of activity has not changed since RaLa operations began. In practice there has probably been some change due to the inaccuracies of the various calibrations, but the change cannot have been very great.

I do not know in detail how you determine the Ba^{140} activity but I assume that you now measure in some way the Ba^{140} gammas after the La^{140} has been completely removed. I think it is clear that any correlation between the Ba^{140} gamma activity you measure and the La^{140} gamma activity we measure must be empirical. If the correlation is not constant then some factor is operating to throw either your reading or our reading off. For example, a difference in scattering or absorption could occur if the set-up were not closely similar each time; or your readings would not be consistent if an appreciable amount of La^{140} remained in the Ba^{140} some times. We have a fair check on the consistency of our measurements because the physics group also measures the sources we prepare for them and

discrepancies are soon noted. Generally speaking discrepancies of more than 5% do not occur, although there have been a few cases when the discrepancy amounted to about 10%.

I would suggest that we continue to compare the Ba^{140} activity you measure at the last separation time with the La^{140} activity we measure when the La^{140} has grown to a maximum (about five or six days after the last separation time). It makes no difference what units either of us express our results in so long as each of us is consistent. If the correlation is constant between your results and our results then we are, from a practical point of view, in good shape. If the correlation is not constant, then we must find out what's going haywire.

There are other details which could be mentioned but this letter is long enough as it is. If you feel that the present situation is so unsatisfactory that something should be done immediately to obtain better agreement between your measurements and ours, then I believe you had better visit us, or some of us had better come to Oak Ridge to see you so that we can thrash out measurement procedures satisfactory to all of us.

Sincerely yours,

R. W. Spence

R.W. Spence

RWS:AZ

B-137

48-12-294

Date December 29, 1948

File

Subject Bala Production Facilities

Those Eligible To Read The Attached

By A. H. Holland

Copy# 2A

To C. N. Rucker

INV. 64

C. N. Rucker

Before reading this document, sign and date below:

Name	Date	Name	Date

ANI

This document has been approved for release to the public by:

David C. Hamm 3/9/95
Technical Information Officer
ORNL Site
Date

12-31-48

[redacted]

UNITED STATES
ATOMIC ENERGY COMMISSION

In Reply Refer To:
RMRP:JS

Classification Cancelled
~~Or Changed To~~ _____
By Authority Of _____
By [redacted] Date AUG 31 1971

Oak Ridge, Tennessee
December 29, 1948

CLASSIFICATION CANCELLED
Ted Davis 3/8/95
ADD signature Date
Single [illegible] of CCRP-declassified documents [illegible] zed by DOE Office
Declassifi[illegible] August 22, 19[illegible]

Carbide and Carbon Chemicals Corporation
Post Office Box "P"
Oak Ridge, Tennessee

Attention: C. E. Rucker, Jr., Executive Director
Oak Ridge National Laboratory

Subject: RALA PRODUCTION FACILITIES

Gentlemen:

The program for Rala work, outlined in your letter of December 2, 1948, is approved by this office. Your plans to keep the present plant operable and to carry on process improvement with the available man-power seems the best course to pursue. We appreciate the fact that schedules of other research programs and the present lack of work space prevents you from commencing development on a new separation process.

Since the future Rala work at ORNL depends both on successful use of Hanford slugs and on the effect of Rala runs on atmospheric contamination, we will appreciate your forwarding to this office all information bearing on these subjects.

Sincerely yours,

Albert M. Holland, Jr., M.D.
Director, Research and Medicine

cc: L. B. Emlet, ORNL
C. E. Center, K-25
R. W. Cook, AEC

Shilling:mw

[redacted]

B-137

[redacted]

Date December 17, 1948

File Operation - Rala

Subject Rala Content of Hanford Slugs for Run #28

Those Eligible To Read The Attached

By L. B. Emlet

Copy# 2 A

To Roy Beaton

C. N. Rucker

Before reading this document, sign and date below:

	Name	Date
	Rucker, C. N.	
2	Barnett, S. C.	
1	Baranowski, F.P.	
	FILE	

Name	Date

TRANSMITTAL DATED 12-26-48

This document consists of 2 pages
No. 1 of 6 copies, Series A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

December 17, 1948

Mr. Ray Isaton
General Electric Company
Hanford Engineer Works
Richland, Washington

Subject: RAA CONTENT OF HANFORD SLUGS FOR RUN #18

Dear Ray:

The telephone connection that we had for our conversation on December 15, 1948, was very poor and probably accounted for some of the misunderstandings that existed. We sent out a teletype today requesting thirty-eight (38) units from a maximum flux and a minimum exposure period of forty (40) days. I hope that you will have these slugs selected carefully so that they will contain approximately 7,000 curies total.

[illegible] which Rex Stilling mentioned in the teletype you [illegible] 75, 115 curies/slug at time of dissolving, was a calculation based on our best guess as to the exposure flux and duration of your pile. The actual curie-content was 72.3/slug as determined by analysis of the dissolver solution and corrected for decay at 2.8.F. which was 9:110, November 21, 1948. Since we shipped a total of 1,380 curies, this was a chemical yield of 92.3%. This yield is slightly lower than normal since the average for 1947 was 98.3%. The Run #17 which used four Hanford irradiated material had a yield of 71%. There have been instances in the past, however, when the Cell A losses were exceptionally high that resulted in yields of less than 80%.

If you correct the dissolver analysis result of 72.3 curies/slug to discharge time from the pile, you will see that they average about 115 curies/slug. We, therefore, assumed that although the slugs were picked at random, the total quantity shipped to us was about 4,500 at the time of discharge from your pile.

We plan the next run to start on January 2, 1949, depending upon the date of arrival of the shipment from Hanford. We hope that the chemical yield, as well as the purity of the product from this next run will be considerably better than that experienced in Run #18. We recently wrote a memorandum to C. E. Larson giving him some suggestions on results of Run #18 and discussing preliminary data from our investigation of the contaminant in the product. A copy of this memorandum was sent to W. K. Eisty.

M. Day

fil Rocha

OAK RIDGE NATIONAL LABORATORY

CENTRAL FILES NUMBER

48-12-152

c.7.

INV. 64

DATE December 15, 1948

SUBJECT RaLa Production from Hanford Slugs and Product Contamination Studies

COPY NO. 64

TO C. N. Rucker

FROM E. J. Witkowski and L. B. Emlet

Before reading this document, sign and date below:

NAME	DATE	NAME	DATE

SPECIAL REREVIEW FINAL DETERMINATION

CLASS.____ AUTH._____

REVIEWERS/VERIFIERS	CLASS.	DATE
1) R S Baker	U	8/6/80
2) AT Gresky	U	8/15/80

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

DISTRIBUTION:

1. C. N. Rucker
2. A. H. Holland, Jr., AEC, Oak Ridge
3. W. M. Harty, GE, Hanford
4. J. A. Leary, Los Alamos
5. D. W. Mueller, Los Alamos
6. A. F. Rupp
7. M. D. Peterson
8. C. E. Winters
9. J. A. Lane
10. E. J. Witkowski
11. L. B. Emlet

12-14. Central Files

12-20-48

RAIA PRODUCTION FROM HANFORD SLUGS AND PRODUCT CONTAMINATION STUDIES

December 15, 1948

Raia Run #28, the first in which Hanford-irradiated slugs were used, was very successful from the standpoint of our processing. No unusual difficulties were encountered and only minor changes in the old process were required.

The quantity of product produced and shipped was only 1,380 curies while at least 2,000 curies were anticipated. The chemical analyses of the dissolver solution indicated that the thirty-eight, four-inch slugs used contained only 4,500 curies at the time of pile discharge while the original calculations indicated that over 10,000 curies should have been present providing that the pile operated normally and the slugs were exposed at maximum neutron flux. This lack of product was at first thought to be a result of the abnormal operation of the Hanford "B" pile. In checking with Hanford, however, we learned that their calculations, which take into consideration the abnormal operation of the pile, indicate that 8,100 +-5% curies were present at the time of discharge. The reason for this discrepancy in curie content is not known. We do feel certain, however, that the errors in our analyses could not contribute materially toward explaining the difference; all of the analyses made during processing checked well, the material balance was normal, and the several radiation readings on samples and at the entrance to the cell showed a low quantity of product. We are requesting Hanford to review their calculations in an attempt to explain this disagreement.

Under normal circumstances, material from our pile could have been used to increase the amount of product finally isolated. Unfortunately it was not practical at this time because of the excessive pile-down time due to the installation of the new exhaust air filter units.

Even though the quality of these slugs was much poorer than anticipated, their use was proven to be economical. The run was completed in five days as compared to the usual ten-day period, waste solutions were of low volume and more concentrated product solutions resulted. We intend to use them in the next run scheduled for January 10, 1949, when it is hoped that more information will be obtained which will offer an explanation of what happened to the slugs used in Run #28.

[redacted]

Witkowski and Emlet to Rucker
December 15, 1948

Rala Production from Hanford Slugs and Product Contamination Studies

On November 8 and 9, 1948, Mr. Leary and Drs. Mueller and White, all of Los Alamos, visited us to discuss the possibility of eliminating some of the contaminants from our product. They felt that the impurities, suspected to be organic matter, were contributing a great deal to the product losses encountered during processing at Los Alamos. These losses also resulted in radiation exposure to their operating personnel.

During our conversations, various potential sources of contamination were discussed and it was decided that the following points would be investigated:

1. A dirty product evaporation head heater. This head heater is exposed to the cell atmosphere between runs and it appeared possible that some dirt was collected on this heater which was washed into the product during evaporation.

2. Refluxing of vapors in the product evaporation off-gas line. It was thought that such action would result in washing back of stainless steel corrosion products into the product.

3. Polymerization of the ether or alcohol, or the impurities present in these solvents which are used in the purification process.

4. The Tygon tubing used for solution addition lines and all transfer lines to and from the glass purification equipment.

Each of the above four sources of potential contamination were investigated as follows:

1 & 2. An attempt was made to correlate the length of time during which the product evaporation equipment was idle before each run and the quality of product as reported by Los Alamos. It was thought that the amount of dirt which might accumulate on the head heater would depend on the time it was idle. No results were obtained from this comparison.

1 & 2. Continued

In addition, two dummy evaporations were made using an inactive solution of barium chloride. Both runs turned out to be very clean, much cleaner than the usual product; no organic material was found in either of these runs.

These dummy runs made it evident that the product evaporation operation was not the main source of product contamination. The possibility of a dirty head heater causing any difficulty was also shown to be unlikely since the product of the first dummy run was clean in spite of the fact that the heater had been idle for several months before the run was made.

3. Because it is almost impossible to duplicate the extreme radiation to which the HCl-ether and HCl-alcohol solutions are subjected during a regular run, no conclusive results are available to indicate the possibility of product contamination by polymerization of these reagents or their impurities. From the data available, there appears to be no relationship between the length of time required for the filtration of the HCl-ether or HCl-alcohol wastes (time of contact between solution and product) and the quality of the product reported by Los Alamos. This problem is being investigated further.

4. The possibility of contamination by Tygon tubing was investigated by making two dummy runs through the entire fuming nitric and HCl-ether purification and the product evaporation processes. All conditions in the first run were identical to those of a regular run except for the absence of radiation. The product from this run had a tan color similar to that of regular runs. When $BaCl_2$ was dissolved, it was found to contain some insoluble foreign matter composed of approximately ten percent carbon.

The second run through the purification steps was made after the Tygon solution addition line was replaced with an MFP-10 plastic tube which is inert to practically all reagents. No other tubes could be replaced at that time because of the limited amount of time before the start of Run #28. This dummy run turned out much cleaner than the first. Upon dissolving of the product very little foreign material was found; not enough was available for a carbon analysis.

Witkowski and Emlet to Rucker
December 15, 1948

RaLa Production from Hanford Slugs and Product Contamination Studies

4. Continued

These two dummy runs plus some laboratory tests run on Tygon tubing itself indicate that Tygon contributed, at least a portion of the contaminants found in the product. The laboratory tests show that Tygon is not very resistant to the reagents used in the purification process. It is nitrated by the fuming nitric acid and the nitrated material is soluble in ether.

As previously mentioned, no attempt was made to replace more than just the solution addition line before the start of Run #28. The only other change made in the purification steps was that specially-purified ether and HCl were used instead of the C.P. grade normally used. The alcohol for product washing was also eliminated.

The report from Los Alamos on the product of Run #28 was disappointing. They report that the product was dirty and that they lost a large portion of it because of the difficulty encountered in dissolving it from the shipping cone. They think that this difficulty was caused by what appeared to be a drop of oil on the shoulder of the cone. This we cannot explain. They did not experience a high loss in the hydroxide precipitation as they normally do (probably because they filtered the initial solution in HCl), but they did get a "crud" formation which gave them trouble during the oxalate precipitation and filtration.

Since the only source of contamination evident at the present time is the Tygon tubing, we have decontaminated our small cells in preparation for the replacement of all Tygon tubing wherever possible. We believe that it will be possible to eliminate Tygon completely in one of the duplicate sets of glassware equipment. The other set of equipment will have at least all of the Tygon product transfer lines and solution addition lines replaced. As an added precaution, purified reagents will be used in the purification process.

In addition to these immediate corrective measures, plans are now being made to investigate the effects of radiation on ether and oxalates. Judging from our limited experience with oxalates we suspect that they break down under beta-gamma radiation. It is only a guess but this may account for at least a portion of the troubles encountered at Los Alamos with the last shipment.

We have suggested that Los Alamos continue the filtration of their initial solution of our product. Our dummy runs indicate that the removal of the "crud" at this stage is relatively simple and should prevent interference later in the process.

Witkowski and Emlet to Rucker
December 15, 1948

Rala Production from Hanford Slugs and Product Contamination Studies

At the same meeting with the Los Alamos representatives, the quantity of inert barium (from Hanford slugs) which could be expected in 10,000 and 20,000-curie shipments was also discussed. The results of our calculations, made on the assumption that the existing process would be used, is indicated in the table below. The slug-irradiation time is assumed to be between forty and one hundred days at maximum Hanford flux.

Curies in Shipment	2,500	10,000	20,000
No. of Slugs Used (8" Hanford slugs)	15	50	110
Milligrams of inactive barium	285-715	950-2400	2100-5250
Milligrams of inactive barium/1000 C.	114-286	95-240	105-262.

During Rala Run #28 the personnel of the Technical Division sampled the cell ventilation air and the gases from dissolver and other process vessels. The results of this investigation are contained in a memorandum from C. P. Coughlin and S. E. Beall to C. E. Winters, dated December 7, 1948; subject: "Radiation Hazard Measurements for the Period November 26 to December 3, 1948; C.F. No. 48-12-104.

As a result of this study, a filter unit, composed of two thicknesses of American Air Filter Company glass fiber F.G. #50 and one thickness of C.W.S. #6 paper are being installed in the cell ventilation system prior to the next run. Additional samples will be taken of the gases from the process vessels and dissolver to allow the design of equipment for their decontamination.

E. J. Witkowski

L. B. Emlet

wp

B-137

[redacted]

T & F

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-12-131

File C.7.

Those Eligible To Read The Attached

Copy# 5A

A. H. Emlet

Date December 9, 1948

Subject Request for 273 Hanford Production Slugs -IC-36

By C. N. Rucker

To A. H. Holland

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date
ABE	12/15		

This document has been approved for release to the public by:

David R Hamm 2/3/95
Technical Information Officer Date
ORNL Site

TRANSMITTAL DATED 12-10-48

[redacted]

[redacted]

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

3
5 8 0 A

December 9, 1948

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Dr. A. H. Holland, Jr.

Subject: REQUEST FOR 278 HANFORD PRODUCTION SLUGS - IC-36

NOT Rad!

Gentlemen:

An additional 278, 8 inch, Hanford production slugs (approximately 980 kgs of uranium) of as high a specific activity as possible are requested, in addition to the 252 slugs already received, in order to complete Redox investigations currently being made in the ORNL Pilot Plant.

A. Purpose and Necessity of Material

At present, the ORNL Technical Division Pilot Plant is engaged in Redox investigations to determine the chemical conditions and number of cycles necessary to adequately decontaminate the Hanford irradiated natural uranium from both fission products and plutonium. The original request for 252 production slugs was made, assuming the processing of Redox solutions would be made at the rate of approximately four 100 gallon batches per month and at a maximum activity level of 10-20% of the ultimate Hanford production plant. After two months of Redox Pilot Plant operation, it has been found that an additional quantity of Hanford irradiated uranium would be warranted because:

1. The amount of activity that can be handled safely in the ORNL Pilot Plant has increased from the originally estimated 10-15% to 100% of Hanford level.

2. The fission product activity of the uranium after the second cycle (IBU stream) is very low and an increase in specific activity is desired to increase the accuracy of the decontamination data.

3. Two months of full Hanford activity level runs are planned, starting February 1, 1949.

4. Other sites investigating this process have not and will not have adequately shielded experimental facilities to do these 100% Hanford level runs for six months to one year minimum.

[redacted]

[redacted]

A. Purpose and Necessity of Material (continued)

5. The data obtained from this processing will not only firmly establish the facilities required in the Hanford Redox test plant but will also help in crystalizing the processing equipment requirements for the actual production units and, thereby, save a large amount of time and money.

6. The plutonium involved in this transfer will not be lost, but will be returned to production channels after it has been decontaminated equivalent to at least two Redox plutonium cycles (2BP stream equivalent).

7. The ORNL Pilot Plant facilities are such that requests from other sites can be filled for reasonable amounts of actual full Hanford level Redox process solutions so that development work can proceed.

8. The material to be used in these 100% level runs should decay only approximately 60 days to conform as closely as possible to actual production operating conditions.

B. Description of Operation and Measurements

These slugs will be processed through the Pilot Plant equipment which will consist of dissolving, filtering, one cycle of uranium-plutonium extraction and stripping, and a second cycle of uranium extraction and stripping. The plutonium separated in this process will be stored temporarily in a tank for ultimate recovery and return to Atomic Energy Commission on or before May 5, 1949.

The data obtained will include all waste losses, overall yield, and decontamination factors for both uranium and plutonium necessary for the chemical design of both the Hanford test plant and Hanford production plants.

C. Safety Precautions

All safety precautions, covering the handling of both fission product and plutonium activity, will be strictly adhered to.

All security and accountability rules and procedures, covering the handling of source and fissionable materials, will be followed.

D. Disposal of Process Material

The aqueous waste streams, containing only minute amounts of uranium and plutonium but essentially all of the fission products, will be sent to the Tank Farm facilities for ultimate disposal.

The uranium, exclusive of that sent to other sites, will be sent to Tank W3 in the Tank Farm for storage.

The plutonium as the Redox 1BP stream will be stored temporarily with previously processed material until completion of the Redox investigations. This solution will then be returned to the second cycle equipment where it will be processed through at least one more cycle of extraction and stripping. It will then be concentrated and returned to the Atomic Energy Commission as an aqueous solution of plutonium nitrate approximately May 5, 1949.

E. Schedule for Shipments

The decay time for processing this material through the production plant has been set at 60 days. To conform to this condition and to meet the processing schedule of the Pilot Plant, the shipping schedule table given below has been evolved. It has been definitely found in the shipping of other material that this is a conservative schedule and can be met. If it is found that the shipping date for the material for the ORNL Hala run is within 3 to 5 days of those given below, the shipments can be combined. There is on hand at present sufficient transportation casks to fulfill this schedule.

Arrival date at ORNL	Number of 8" Slugs*	Date of Discharge From HWW Pile ± 10 days
1- 2-49	70	12- 4-48
1-26-49	70	12-12-48
2-15-49	70	12-20-48
3- 7-49	68	12-28-48

* Should 4" slugs be used, multiply the numbers in this column by two.

It should be noted that varying amounts of Redox solutions ICU, IBP, IEU are available for laboratory work at other sites and in particular at Argonne National Laboratory, Knolls Atomic Power Laboratory, and Hanford Engineer Works. Any such requests will be filled after processing through the proper AEC channels.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY
Original Signed By
C. N. Rucker

C. E. Rucker
Executive Director

JACox:esMc

Cy 1-3 A. H. Holland
4 C. E. Center
5 L. B. Emlet
6-7 C. E. Rucker
8 J. A. Cox

FILE RECORD SHEET

DATE: 12/9/45

CLASSIFICATION: Secret

SUBJECT: Req. for 272 Hanford Production Plug. 2C-36

TO: Holland

FROM: Rucker

NO. OF COPIES: 8 SERIES: a

DISTRIBUTION:

1a - Holland
2a - "
3a - "
4a - Centr
5a - Emlet
6a - Rucker
7a - "
8a - Cox

REMARKS:

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-12-84

e.7.

Date: December 6, 1948

Subject: Request for 278 Hanford Production Slugs

To: J. A. Cox

From: D. G. Reid

Copy 5

Classification Cancelled
~~Or Changed To~~
By Authority Of
By BMS Date AUG 30 197

INV. 64

Before reading this document, sign and date below:

INV 65

SPECIAL REREVIEW FINAL DETERMINATION

CLASS.____ AUTH._____

REVIEWERS/VERIFIERS	CLASS.	DATE
(1) R L Baker	U	8/6/80
(2) AT Gresky	U	8/15/80

Distribution List:

1-2. JACox
3. MDPeterson
4. CMRucker
5. EJMurphy
6. SMcLain
7. REBeaton (HEW)
8. JMarsden (KAPL)
9. SLawroski (ANL)
10. FLSteahly
11. RERichards (HEW)
12. WAllred (AEC, Oak Ridge)
13. WAllred (AEC, Oak Ridge)
14. DGReid
15. Reading File
16. Central File

This document has been approved for release to the public by:

David R Hamrin 1/30/95
Technical Information Officer, ORNL Site — Date

[redacted] date within the [redacted] Atomic Energy Act [redacted] USC
Wr[redacted]
[redacted] prohibited and may result in [redacted]

4.6

To: J. A. Cox Date: December 6, 1948

From: D. G. Reid

Subject: Request for 278 Hanford Production Slugs

A. Quantity and Description of Material Required

An additional 278, 8 inch, Hanford production slugs (approximately 980 Kg. of uranium) of as high a specific activity as possible are requested, in addition to the 252 slugs already received, in order to complete Redox investigations currently being made in the ORNL Pilot Plant.

B. Purpose and Necessity of Material

At present, the ORNL Technical Division Pilot Plant is engaged in Redox investigations to determine the chemical conditions and number of cycles necessary to adequately decontaminate the Hanford irradiated natural uranium from both fission products and plutonium. The original request for 252 production slugs was made, assuming the processing of Redox solutions would be made at the rate of approximately four 100 gallon batches per month and at an maximum activity level of 10-20% of the ultimate Hanford production plant. After two months of Redox Pilot Plant operation, it has been found that an additional quantity of Hanford irradiated uranium would be warranted because:

1. The amount of activity that can be handled safely in the ORNL Pilot Plant has increased from the originally estimated 10-15% to 100% of Hanford level.

2. The fission product activity of the uranium after the second cycle (IBU stream) is very low and an increase in specific activity is desired to increase the accuracy of the decontamination data.

3. Two months of full Hanford activity level runs are planned, starting February 1, 1949.

4. Other sites investigating this process have not and will not have adequately shielded experimental facilities to do these 100% Hanford level runs for six months to one year minimum.

[redacted]

B. Purpose and Necessity of Material (continued)

5. The data obtained from this processing will not only firmly establish the facilities required in the Hanford Redox test plant but will also help in crystalizing the processing equipment requirements for the actual production units and, thereby, save a large amount of time and money.

6. The plutonium involved in this transfer will not be lost, but will be returned to production channels after it has been decontaminated equivilant to at least two Redox plutonium cycles (2BP stream equivilant).

7. The ORNL Pilot Plant facilities are such that requests from other sites can be filled for reasonable amounts of actual full Hanford level Redox process solutions so that development work can procede.

8. The material to be used in these 100% level runs should decay only approximately 60 days to conform as closely as possible to actual production operating conditions.

C. Description of Operation and Measurements

These slugs will be processed through the Pilot Plant equipment which will consist of dissolving, filtering, one cycle of uranium-plutonium extraction and stripping, and a second cycle of uranium extraction and stripping. The plutonium separated in this process will be stored temporarily in a tank for ultimate recovery and return to AEC on or before May 5, 1949.

The data obtained will include all waste losses, overall yield, and decontamination factors for both uranium and plutonium necessary for the chemical design of both the Hanford test plant and Hanford production plants.

D. Safety Precautions

All safety precautions, covering the handling of both fission product and plutonium activity, will be strictly adhered to.

All security and accountability rules and procedures, covering the handling of source and fissionable materials, will be followed.

E. Disposal of Process Material

The aqueous waste streams, containing only minute amounts of uranium and plutonium but essentially all of the fission products, will be sent to the Tank Farm facilities for ultimate disposal.

E. Disposal of Process Material (continued)

The uranium, exclusive of that sent to other sites, will be sent to Tank W3 in the Tank Farm for storage.

The plutonium as the Redox IBP stream will be stored temporarily with previously processed material until completion of the Redox investigations. This solution will then be returned to the second cycle equipment where it will be processed through at least one more cycle of extraction and stripping. It will then be concentrated and returned to AEC as an aqueous solution of plutonium nitrate approximately May 5, 1949.

F. Schedule for Shipments

The decay time for processing this material through the production plan has been set at 60 days. To conform to this condition and to meet the processing schedule of the Pilot Plant, the shipping schedule table given below has been evolved. It has been definitely found in the shipping of other material that this is a conservative schedule and can be met. It it is found that the shipping date for the material for the ORNL RaLa run is within 3 to 5 days of those given below, the shipments can be combined. There is on hand at present sufficient transportation casks to fulfill this schedule.

Arrival date at ORNL	Number of 8" Slugs*	Date of Discharge From HEW Pile ± 10 days
1/2/49	70	12/4
1/25/49	70	12/12
2/15/49	70	12/20
3/7/49	68	12/28

* Should 4" slugs be used, multiply the numbers in this column by two.

It should be noted that varying amounts of Redox solutions ICU, IBP, IEU are available for laboratory work at other sites and in particular at Argonne National Laboratory, Knolls Atomic Power Laboratory, and Hanford Engineer Works. Any such requests will be filled after processing through the proper AEC channels.

D. G. Reid
D. G. Reid

sjk

B-137

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-12-126

File 4260 C.7.

Date December 2, 1948

Subject Rala Production Facilities

By C. N. Rucker

To A. H. Holland

Those Eligible To Read The Attached

Copy# 44

M D Peterson

Before reading this document, sign and date below:

Name	Date
M D Peterson	12/15/48
→ FLS	
return to MDP file	

Name	Date

JAN 65

ORNL

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

TRANSMITTAL DATED 12-13-48

[redacted]

This document consists of 2 pages
No. 4 of 9 copies, Series A

OAK RIDGE NATIONAL LABORATORY

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-12-126

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

[redacted]

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

December 2, 1948

Classification Cancelled
~~Or Changed To~~
By Authority Of
By BMS Date AUG 30 1971

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Dr. A. H. Snell, Jr.

Subject: [redacted]

Reference: (1) Letter from R. V. Ovist to K. J. Williams, dated 11/18/48, C.F. No. 48-11-168.
(2) Letter from A. H. Snell, Jr. to C. E. Center, dated 11/10/48, C.F. No. 48-11-147.

As stated in reference letter (2), there has been much concern about the condition of the concrete foundation and under the 706 building. Plans currently are underway for a limited survey of the floor and core drilling will be undertaken. A complete study of this condition would require an extensive dismantling of the cells and core drilling through the floor of the cells. The work of core drilling has been delayed by [redacted] which could not be moved in a week or two. After consulting with [redacted] we estimate that this work can be completed in approximately one week. The cost of the drilling by [redacted] will be in the neighborhood of $2,500.00. This work would show the cells currently above the floor level and, thus, should reveal the areas of concentration near the old process sewers. The old duct can then be grouted [redacted] to stabilize the possibility of a sink-in of the cell floor. A project request for this work is being prepared.

The [redacted] of the cells of Building 706 was mentioned in reference letter (1). Although it appears that the cost of moving the present equipment from the 706-D cells to other locations would be extremely high, probably between $100,000 and $200,000, it is planned that the [redacted] utilizing the 706 Building for this purpose to avoid any [redacted] efforts to diminish contamination [redacted] keeping the 706-D building in an operable condition.

Certain [redacted] interest [redacted] in modification of the present 706-D process and equipment to improve [redacted] and product quality, and to decrease maintenance and the possibility of air-borne activity. This calls for improvements in the method of separating the precipitates in the centrifuge, shielding all contact equipment in the purification cell, replacement of glassware and plastic tubing with metallic equipment, etc. It

cc: A. H. Snell, Jr.
W. E. Stumpf
[redacted]

[redacted]

"This document contains [redacted] of the [redacted] Espionage Act, [redacted] its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law. Information so classified may be imparted only to persons in the employment of the United States or citizens of the United States known to have a [redacted] and whose official duties require such knowledge or possession. Unauthorized persons [redacted] are subject to criminal liability."

CLASSIFICATION CANCELLED
ADD signature
Date 11/8/95

Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994

[redacted]

[redacted]

[redacted]

FILE RECORD SHEET

DATE: 12/2/45 CLASSIFICATION: Secret

SUBJECT: Rala Production Facilities

TO: Holland FROM: Rucker

NO. OF COPIES: 9 SERIES: A

DISTRIBUTION:

1a - Holland

2a - "

3a - "

4a - Peterson

5a - Witkowski

6a - Emlet

7a - Rucker

8a - "

9a - Center

REMARKS:

B-137

[redacted] B-13

Date November 29, 1948

File

Subject RALA

Those Eligible To Read The Attached

By John Shilling

Copy# 3A

To Files

L. B. Emlet

Before reading this document, sign and date below:

Name	Date	Name	Date
LBE			
[illegible] W	12/10/48		

TRANSMITTAL DATED 12-[illegible]

[redacted]

[redacted]

This Document Consists of 3 Pages
This is copy no. 3 of 9 copies
This is series A.

Files

November 29, 1948

John Shilling, Jr., Research Program Branch

RALA

REFER TO SYMBOL: RMRP:JS

On November 8, 1948, a conference was held on Rala at Oak Ridge National Laboratory. Attending from Los Alamos were White, Moeller, Leary; from Hanford were Seymore, Hollingshead, Harty and Stainken; from Oak Ridge National Laboratory were Emlet and Witkowski; and from AEC were Roth and Shilling. The Hanford representatives were at the Laboratory making a detailed study of all phases of Rala for the G.E. Company, looking toward the transfer of production to Hanford.

The meeting opened with a discussion by Leary of the diffiuclties at Los Alamos when the lanthanum was separated from the barium. Leary explained the method which they used to milk lanthanum from barium. A tall filter with cylindrical sides and a small sintered disc at the bottom is used and the lanthanum comes through the filter at the bottom. In these separations in which the yield has been poor, much activity has been found to cling to the inside of the filter wall. A black ring forms on the wall at the top of the liquid. This ring has contained as much as 60% of the active material. Leary thinks that the ring is organic, and he described the strong reagents necessary to remove it. The removal of this ring has caused over exposure to personnel.

Witkowski stated that before the final evaporation step, the solution of barium chloride appeared to be clear and he could not think of any place where organic matter could enter. It was generally agreed that the foreign matter might enter during the final evaporation. Certain changes could be made in the final evaporation equipment, particularly the vent line if the cell were decontaminated, but it was not desirable to decontaminate the cell, because the equipment was ready to go on the regular Rala run and further, such decontamination would react unfavorably on the particle problem study.

Leary had data with him which showed the yields obtained on the past sources. The dates of the runs were added to this data to see if long intervals between runs had any effect on the variation in yields. Apparently no conclusions could be drawn. Witkowski suggested that dummy runs with cold barium could be made to see if the foreign material

CAUTION

This [redacted] the

[redacted]

Files

November 29, 1948

John Shilling, Jr.

RALA

REFER TO
SYMBOL: RMRP:JS

showed up in the product. He also suggested that this might help to make the next regular run better by cleaning out the equipment.

The group discussed the amounts of inactive barium which might be in the product when 10,000 and 20,000 curie sources are made. Moeller said the barium does not effect the physicists. Moeller and Emlet agreed that ORNL would make a statement in writing to Los Alamos giving the amounts of inactive barium that will be in the product when Hanford slugs are used, and also when 20,000 curie sources are produced. NB

Moeller and Roth discussed the scheduling of deliveries to Los Alamos. We explained that Los Alamos must give twenty-one (21) days notice to ORDO if a source is not desired on the date scheduled. Moeller said he was expecting the first source in 1949 to arrive on January 10, and that a source would be required every five weeks thereafter, providing the sources are "good clean" ones. Los Alamos desires that the sources arrive early Monday or before, so that work on them can commence Monday morning.

In order to have sources arrive at Los Alamos on Monday, processing must start on the previous Monday, and the shipment must be made from ORNL on Saturday.

At the request of Moeller, we will make a schedule for the first three shipments in 1949, and circulate it to all concerned.

After the conference three dummy runs using inactive barium, were made in the Rala equipment. All of these gave a dirty or discolored product, and following this Witkowski tried to eliminate more tygon lines prior to Rala run November 17-27, on the assumption that organic material from them was the source of trouble.

The ventilating duct to the cells, which is the most doubtful part of the equipment and which is known to be in poor condition, was re-

[redacted]

Files

November 29, 1948

John Shilling, Jr.

RALA

REFER TO
SYMBOL: RMRP:JS

considered. Witkowski reported that the Operating Division had decided that a new and more accessible duct could be installed without difficulty, and that the present duct could be filled with concrete, the whole job to cost about $5,500.

John Shilling, Jr.

CC: R.W.Cook - J. C. Franklin
C. N. Rucker for L. B. Emlet
A. H. Holland - H. M. Roth

Shilling:mw

B-137

~~SECRET~~

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-202

Date November 22, 1948

File

Subject Bale Run #28, Shipment #36

Those Eligible To Read The Attached

By E. J. Witkowski

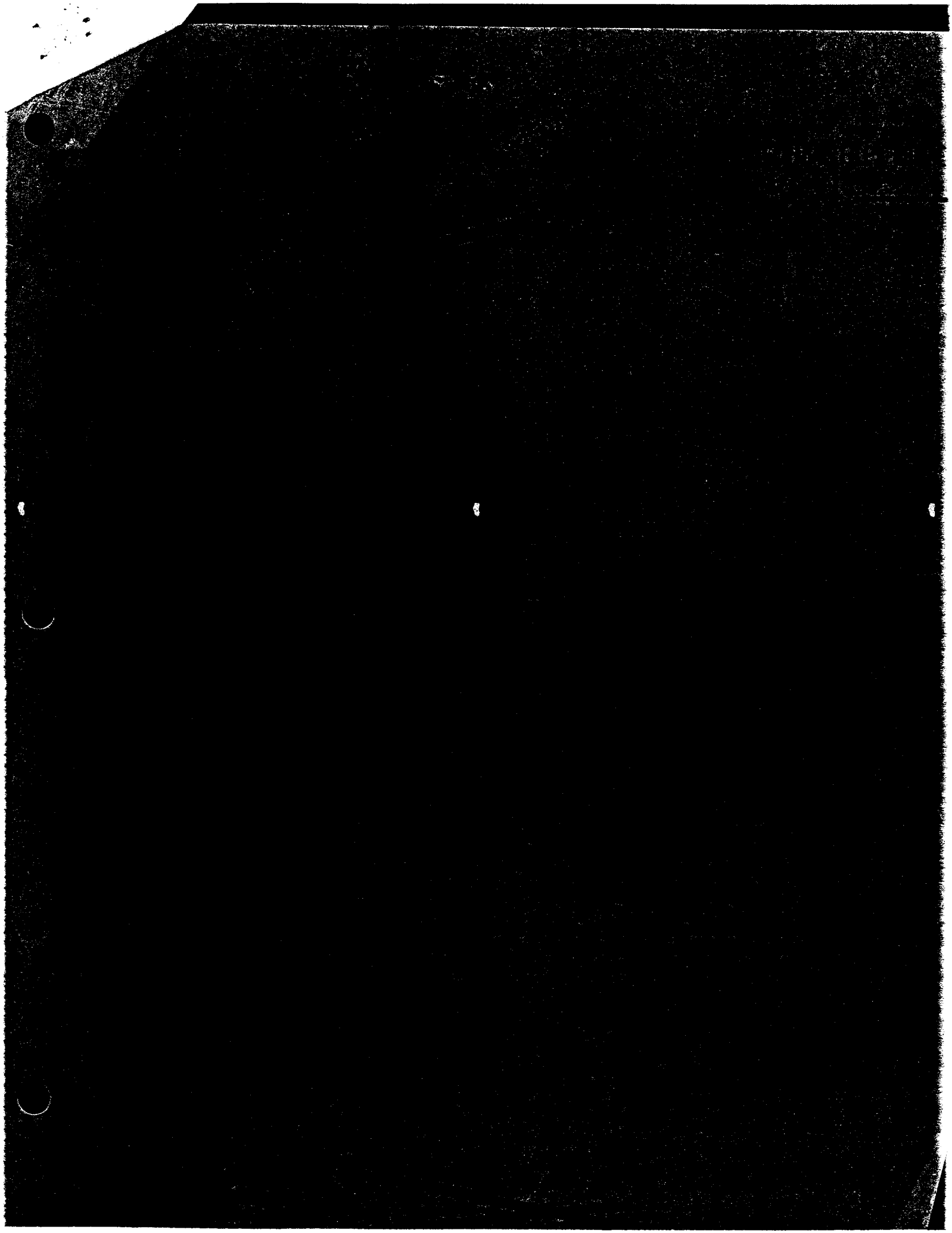
Copy# 5A

To J. A. Leary

C. Files
Mat. Gen. R.

Before reading this document, sign and date below:

Name	Date	Name	Date



B-137

~~SECRET~~

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-202

Date November 22, 1948

File

Subject Bala Run #28, Shipment #36

Those Eligible To Read The Attached

By E. J. Witkowski

Copy# 5A

To J. A. Leary

INV. 64

C. Files
Mat. Gen. R.

Before reading this document, sign and date below:

Name	Date	Name	Date

~~SECRET~~

November 22, 1948

This document consists of 1 pages and 0 figures
V of V copies, Series A

Mr. J. A. Leary
Los Alamos Scientific Laboratory
P.O. Box 1663
Los Alamos, New Mexico

Rala Run # 28, Shipment # 36

Dear Joe:

We are shipping to you today, approximately 1380 curies of Barium measured at LST 1310 MST on November 21, 1948. The small quantity of product in this shipment is due to the absence of sufficient product in the Hanford slugs which were used for the first time during this run. We have no explanation for this occurrence at the present time but we intend to investigate it thoroughly in order to eliminate the possibility of similar happenings in the future.

Although it was impossible to eliminate the use of all of the Tygon tubing during this run, we did eliminate most of it, hoping that the product purity would be greatly improved. In addition to this, we also used the purest reagents available in the final product purification. The appearance of the product, however, indicates that the results may be disappointing; it looks like most previous shipments. We hope that the appearance is deceiving and you find this product giving you no process difficulties.

Investigation of our process in an attempt to improve the quality of product is being continued. We hope to have sufficient data in the near future to make some improvements. You will receive a report on this work as soon as it is completed.

Yours very truly,

E. J. Witkowski

E. J. Witkowski

EJW:ja
cc:
1. J. A. Leary
2. E. J. Witkowski
3. L. B. Emlet
4. Reading File
5. Central File

B-137

11-58

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-125

Date November 10, 1948

File 4260

Subject Recent Discussions on Rule

Those Eligible To Read The Attached

By L. E. Emlet

Copy# 34

To C. E. Rucker

M D Peterson

Before reading this document, sign and date below:

Name	Date	Name	Date
MDP	11/15/48		
E. I. Stanley	11/18/48 Thanks		
W. K. Ergen	11/23/48		

INV

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

TRANSMITTAL DATED 11-24-48

TRANSMITTAL DATED 11-24-48

This document consists of 3 pages
No. 3 of 5 copies, Series A

T.D. 2/17/48 AUG 27 1971

November 10, 1948

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-125

Recent Discussions on RaLa

Within the past week there have been several separate discussions on the production of RaLa at Oak Ridge National Laboratory.

I. At a meeting on November 4, 1948, attended by Messrs. A. V. Peterson, AEC, Washington; Neil Carothers, AEC, Washington; H. M. Roth, AEC, Oak Ridge; G. E. Boyd, ORNL; and L. B. Emlet, ORNL, the following points were discussed:

A. It was pointed out that the physical condition of the present 706-D Building was unknown, particularly in regard to the underground ventilation dust. Inasmuch as it appeared that the Laboratory would be requested to continue RaLa production until late in 1950, some consideration would have to be given to extensive maintenance work. The condition of this dust is at present being investigated and a report with recommendations will be submitted within the next few weeks.

II. The feasibility of using Cells 4 and 5 of the 706 Building for future RaLa production was discussed. This is certainly a possibility but in all likelihood the cost of moving the equipment and making the necessary modifications would greatly exceed the cost of putting the 706-D Building in proper condition. This matter will be considered in the aforementioned report.

B. Mr. Peterson was asked to express the Atomic Energy Commission's feeling on the importance of RaLa production, as well as the need for an improved process. He explained that RaLa had a relatively high priority within the Atomic Energy Commission Production Division and that all reasonable means should be used to continue on a satisfactory production schedule. A shortage of this material would hamper the Los Alamos research program on atomic weapons to a considerable degree. Mr. Peterson further stated that from the Atomic Energy Commission standpoint it seemed quite reasonable to locate the future RaLa facilities at the site chosen for the high flux pile (thermal neutron flux of 10^{14}). Since the operation of a high flux pile is perhaps four to five years away, he questioned whether the Oak Ridge National Laboratory production facilities were adequate to continue for this period of time and if it would be desirable to continue the shipment of Hanford slugs to Oak Ridge National Laboratory and the shipment of product from Oak Ridge National Laboratory to Los Alamos. The group felt that some investigational work should be started as soon as possible to improve the

III.

present process with the thought of locating a production unit at the Hanford Works providing the feasibility study now being made by General Electric turns out satisfactorily. Mr. Rucker indicated that the Laboratory may be able to do some process improvement work on RaLa within the next six months or a year. This matter will be discussed in more detail with Mr. M. D. Petersen.

C. The next batch of RaLa, scheduled to start on November 17, 1948, will be made from Hanford-irradiated slugs. Scheduling of this and all future runs will require the coordination of the efforts of Los Alamos, Oak Ridge National Laboratory, and Hanford. For that reason, it was felt desirable to set up a rigid production schedule which could be followed as far as metal discharge and processing at Oak Ridge National Laboratory to supply the Los Alamos group with the material as they desire it. This schedule will be reviewed more thoroughly as soon as the November 17th run is completed.

II. Messrs. B. W. Mueller, J. A. Leary, and T. H. White visited the Laboratory on November 2 and 3, 1948. Their prime objective was to discuss the elimination of impurities from some batches of RaLa which they received. Approximately forty percent of the batches Los Alamos received from us result in low yields of La^{140} during the first "milking". The reason for these low yields is not known but it is suspected that these batches contain some impurity, probably a resin which adheres to the surface of their process equipment and absorbs the active material. Not only does this resin result in low yields but unnecessary radiation exposure of personnel is necessary to properly process the batch. During the visit of the above three men an investigational program was outlined which will be aimed at determining the sources of the resin or impurity. There appear to be three possible places where this material could get into the batch:

1. C. [redacted]
2. B. [redacted]
3. M. [redacted] mechanical introduction from dirty equipment in the 706-B cell.
4. A. [redacted]
5. L. [redacted] polymerization of the ether and alcohol washes used to purify the barium-chloride precipitate caused by the beta-gamma radiation.

C. The decomposition of the lanthanum oxilate during the "milking" step at Los Alamos.

A further report will be submitted on the results of this investigational program.

III. The following people from General Electric - Messrs. R. G. Hollingshead, W. M. Marty, F. P. Seymour, and F. A. R. Steinhaus - are preparing a feasibility report at the request of the Atomic Energy Commission on the installation of a RaLa production unit at Hanford. Their visit at the Laboratory will end on Friday, November 12, 1948, and they expect to have the report completed by December 1, 1948. The Laboratory has

[redacted]

willingly supplied them with a copy of our preceding report, all of the [illegible] and material reported on this properties. It does not have requested a copy of this completed report.

All of the above [illegible] are being mined only on a [illegible] report. Additional drilling information will be available within the next month or so.

ORIGINAL SIGNED BY
L. B. EMLET

L. B. Emlet

[illegible]
[illegible]
[illegible]
[illegible]
[illegible]
[illegible]

B-137

~~SECRET~~

B-L

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-39

Date November 2, 1948

File C.F.

Subject Hanford Slugs for RALA Production

Those Eligible To Read The Attached

By A. H. Holland

Copy# 24

To C. N. Rucker

~~C. N. Rucker~~
L. B. Emlet

COPY
Forwarded By
C. N. RUCKER

Before reading this document, sign and date below:

Name	Date	Name	Date
CJW	11/10/48		

TRANSMITTAL DATE 11-3-48

~~SECRET~~

UNITED STATES
ATOMIC ENERGY COMMISSION

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-11-39

In Reply Refer to:
RMRP:JS

Classification Cancelled
Authority of
By
Date AUG 27 1971

Oak Ridge, Tennessee
November 2, 1948

CLASSIFICATION CANCELLED
Ted Dacus 3/3/95
ADD signature Date
Single review of ORNL declassified documents was authorized by DOE Office of Declassification memo of August 24, 1994.

Carbide and Carbon Chemicals Corporation
P. O. Box "P"
Oak Ridge, Tennessee

Attention: C. E. Rucker, Jr., Executive Director,
Oak Ridge National Laboratory

Subject: HANFORD SLUGS FOR RALA PRODUCTION

Gentlemen:

Approval has been given to use Hanford slugs and to transport them in the Phoenix container by railway express to the Laboratory for the production of Rala.

The first shipment of slugs will arrive in Oak Ridge on or about November 17, 1948. Although the container was designed for nineteen eight inch slugs, this shipment and all future shipments will be of the four inch length. Therefore, the shipment will contain thirty-eight of the short slugs.

No further work is desired on the design or construction of a crash-proof container for the air shipment of Hanford slugs.

This document has been approved for release to the public by:

David R Harmon 3/10/95
Technical Information Officer, ORNL Site — Date

Sincerely yours,

Albert H. Holland, Jr., M.D.
Director of Research and Medicine

CC: C. E. Center
R. W. Cook

Shillingrmw

B-137

[redacted]

Date October 28, 1948

File C.7. [redacted]

Subject Re: Rala Run

Those Eligible To Read The Attached

By H. M. Roth

Copy# 3A

To Files

Before reading this document, sign and date below:

Name	Date	Name	Date

Transmittal Date 11-1-48

[redacted]

[redacted]

3 a 8

Files

October 28, 1948

Herman M. Roth, Chief, Research Division, Oak Ridge

RALA

REFER TO SYMBOL: RMR:HMR

Conversation with Emlet - 10/28/48.

Research Council concurred in making Rala run week of 15 November. It was agreed, therefore, that Rala slugs should arrive at Oak Ridge on the 17th and process to start then. Sources would be ready not later than the 27th, barring unforeseen circumstances. Also, by starting the 17th, X slugs would be available for "butting" if necessary (X Reactor to start up on the 11th). If source is finished in less than ten days, the additional time would be available for La buildup (Source held here).

Based on the above, source should arrive at Los Alamos on the 29th (Monday).

Emlet is to notify Leary at L.A.

Research Division is to make arrangements with Hanford to delay Redox slugs (from 7th) and make Rala shipment on the 13th.

Herman M. Roth

CC: C.N.Rucker
L. B. Emlet

Roth:mw

1017

[redacted]

FILE RECORD SHEET

48-10-371

DATE: 10/28/48

CLASSIFICATION: Confid.

SUBJECT:

TO: Files

FROM: Rath

NO. OF COPIES: 2 SERIES: A -

DISTRIBUTION:

3A-Rucker

3A-Emmet

REMARKS:

SECRET

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-10-185

-1-

Date October 15, 1948

File

Subject: Temporary Filters on 706-C and D Buildings

Those Eligible to Read the attached

Copy # 12

To: J. A. Lane

From: Stuart McLain

Before reading this document, please sign and date below:

CLASSIFICATION CANCELLED
DATE

DISTRIBUTION:

1. J. A. Lane
2. M. D. Peterson
3. C. N. Rucker
4. L. B. Emlet
5. J. C. Stewart
6. K. Z. Morgan
7. K. C. Brooks (AEC)
8. F. L. Culler
9. W. R. Gall
10. P. K. Davis (Austin Co.)
11. S. McLain
12. Central Files

This document contains [redacted] meaning of the Atomic [redacted] information affecting the National Defense of the United States within the meaning of the Espionage Act, 50 [redacted] as amended. Its transmission or the [redacted] contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalty.

SECRET

This document has been approved for release to the public by:

David C. Hamm 1/30/95
Technical Information Officer Date
ORNL Site

RELEASE APPROVED
BY PATENT BRANCH
4-16-59
DATE SIGNATURE

This document consists of 2 pages. No. 12 of 12 copies, Series A.

To: J. A. Lane

From: Stuart McLain

Subject: TEMPORARY FILTERS ON 706-C AND D BUILDINGS

The Atomic Energy Commission, through Mr. K. C. Brooks, has stated that we should go ahead immediately with the design of air cleaning and decontamination facilities to handle the off-gases and ventilating air from the 706-C and D Buildings.

You are hereby authorized to undertake the design of such facilities with suitable equipment to scrub the off-gases and vessel-vent gases from the 706-C and D Buildings and the off-gases and the vessel-vent gases, but not the cell-ventilating air in Building 205. This project is to receive the highest priority and overtime is authorized.

In a discussion with Mr. Emlet, it was decided that the off-gases and the vessel-vent gases cannot be run up the short stack but must be run to the 205 stack. The hood gases from the C Building must also be scrubbed and run up the 205 stack, if possible.

The Austin Company will be asked by Mr. Stewart to aid you in every way in detailed design.

The scrubbers should remove a very high percentage of the iodine and acid gases. The filters should be two thicknesses of AAF FG No. 50 filterdown.

Stuart McLain

Stuart McLain

SMcL:lwb

[redacted]

This document consists of 2 pages.
This is Copy 4 of 20 copies.
Series A.

OAK RIDGE NATIONAL LABORATORY
Division of
Carbide and Carbon Chemicals Corporation
Oak Ridge, Tennessee

Contract Number W - 7405, Eng. 26

[redacted]

TO: C. E. Rucker

[redacted]

FROM: E. O. Wollan, J. A. Swartout, F. Western, and K. Z. Morgan

SUBJECT: Recommendations for Future Rala Runs, and Particle Problem.

October 11, 1948

Distribution:

1. C. E. Rucker
2. S. C. Barnett
3. S. McLain
4. F. Western
5. A. H. Weinberg
6. D. C. Bardwell
7. A. Hollaender
8. J. H. Frye
9. E. J. Murphy
10. E. B. Ashcraft
11. J. C. Stewart
12. L. B. Emlet
13. M. D. Peterson
14. J. S. Felton
15. J. A. Swartout
16. E. O. Wollan
17. F. Western
18. K. Z. Morgan
19. Central Files
20. Central Files

[redacted]

This document contains restricted data within the meaning of the Atomic Energy Act of 1946 and/or information affecting the National Defense of the United States within the meaning of the Espionage Act, 50 U. S. C. 31 and 32 as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalty.

[redacted]

[redacted]

TRANSMITTED DATE 10-12-48

[redacted]

OAK RIDGE NATIONAL LABORATORY

October 12, 1948

TO: C. N. Rucker

FROM: E. O. Wollan, J. A. Swartout, F. Western, and K. Z. Morgan

SUBJECT: Recommendation for Future RaLa Runs and Particle Problem.

E. O. Wollan, J. A. Swartout, F. Western, and K. Z. Morgan met on October 11, 1948, and made the following recommendations:

1) That no RaLa runs be made until and unless appropriate devices for removing all particulate material be installed in the off-gas line leading from the 706-D Building to the 205 stack, and in the duct leading to the short cell ventilation stack.

2) That the next RaLa run be timed so that the principal discharge of airborne radioactive material take place over the weekend when a minimum number of persons is on the plant site.

3) That serious consideration be given to requiring all personnel on the plant site during a RaLa run to wear appropriate masks.

[redacted]

E. O. Wollan

J. A. Swartout

F. Western

K. Z. Morgan

/fsc

[redacted]

B-18

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-9-281

B-137

Date ~~September 22, 1948~~

File

Subject ~~TELETYPE: Rala Process Solutions~~

Those Eligible To Read The Attached

By ~~S. R. Capirio~~

Copy # 3 & 4

To ~~A. V. Peterson~~

INV. 64

X B Emlet

Before reading this document, sign and date below:

Name	Date	Name	Date

This document has been approved for release to the public by:

David R. Hamm 3/10/95
Technical Information Officer
ORNL Site
Date

[redacted]

FORM AEC-210 [redacted]

(Insert classification)

COPY

U. S. ATOMIC ENERGY COMMISSION
CLASSIFIED MESSAGE

USE WHERE REQUIRED

*THIS DOCUMENT CONSISTS OF 2 PAGES
NO. 3 OF 3 COPIES, SERIES D

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
SE-3-281

SIGNATURE OF CERTIFYING OFFICIAL

/s/ S. R. Sapirie

DATE OF MESSAGE

September 22, 1948

FROM: USAEC, OAK RIDGE

TO: USAEC, WASHINGTON D C

FOR A. V. PETERSON

MSG NR 502 DTG GR 207

[redacted]

Classification Cancelled or Changed
TO
By Authority of
AEC AUG 27 1971
Name Title Date

MESSAGE
(Must be typed double space)

PRIORITY

REF URPHONE SEPT 17 TO ARMSTRONG. RALA PROCESS SOLUTIONS NOT ADAPTABLE TO EXTRACTION OF ZR DASH CB. ESTIMATED TIME FOR DEVELOPMENT OF PROCESS TO EXTRACT ZR DASH CB FROM RALA SOLUTIONS SIX MONTHS TO ONE YEAR. AFTER PROCESS DEVELOPED, PRODUCTION ESTIMATED TO BE 1000 TO 1500 CURIES PER RALA RUN, USING ORNL METAL. ESTIMATED YIELD USING HANFORD METAL SAME AS ABOVE. USE OF HANFORD METAL ALLOWS INCREASED SIZE OF RALA BATCHES IN WHICH CASE ZR DASH CB COULD ALSO BE INCREASED TO MAXIMUM OF ABOUT 5000 CURIES PER RUN. UTILIZING ORNL METAL IN FISSION PRODUCT SEPARATION PROCESSES OUTSIDE OF RALA PRODUCTION FACILITIES AND WITH INSTALLATION OF NEW EQUIPMENT ESTIMATED PRODUCTION OF ZR DASH CB IS 50 CURIES PER WEEK. USING HANFORD METAL AND THE SAME EQUIPMENT ESTIMATED PRODUCTION IS 100 CURIES PER WEEK.

(Do not type below this line)

*Complete if CONFIDENTIAL (when originator deems it necessary) or if message bears higher classification.

See additional instructions on reverse side.

[redacted]

(Insert classification)

CLASSIFICATION CANCELLED
DOE Classification Officer 8/27/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Classification memo dated August 22, 19[illegible]

AEC-210

[redacted]

(Insert classification)

USE WHERE . IRED

*THIS DOCUMENT CONSISTS OF 2 PAGES
NO. 3 OF 3 COPIES, SERIES D

COPY

U. S. ATOMIC ENERGY COMMISSION
CLASSIFIED MESSAGE

SIGNATURE OF CERTIFYING OFFICIAL

/s/ S. R. Sapirie

DATE OF MESSAGE

September 22, 1948

FROM:

USAEC, OAK RIDGE

TO: USAEC, WASHINGTON D C

FOR A. V. PETERSON

MSG NR 502 DTG GR 207

[redacted]

MESSAGE
(Must be typed double space)

PRIORITY

AFTER ALL AUTHORIZATIONS ARE RECEIVED AT LABORATORY TIME LAG FOR EQUIPMENT INSTALLATION AND TESTING ON THE 50 CURIE PRODUCTION SCHEME WILL BE APPROXIMATELY 60 DAYS. PRODUCT WOULD BE A CRUDE ZR DASH CB FRACTION WITH ABOUT 10 PERCENT RADIOACTIVE CONTAMINATION IN OXALIC DASH HYDROCHLORIC ACID SOLUTION. PRINCIPAL CONTAMINANTS WILL BE SR AND PU. TOTAL AMOUNT OF PU IN A 50 CURIE BATCH WOULD PROBABLY NOT EXCEED 100 MICROGRAMS END REF RRP JWR-

/s/ S. R. Sapirie
Acting Deputy Manager

DISTRIBUTION: Series B -
1 - Sapirie
2 - Rucker
3 - Emlet

Ruch:rmh
1:30 p.m.
Distribution (Series A) 1-Teletype; 2-Research files.

(Do not type below this line)

*Complete if CONFIDENTIAL *(when originator deems it necessary)* or if message bears higher classification.

See additional instructions on reverse side.

[redacted]

(Insert classification)

64070

B-137

[redacted] B-13

AUG 26 1971

OAK RIDGE NATIONAL LABORATORY (13)

CENTRAL FILES NUMBER 48-10- 81

Date October 5, 1948

[redacted] Authority Of File

By [redacted]

Subject Increased Production of RaLa

INV 77

Those Eligible To Read The Attached

By C. N. Rucker

Copy# 5 A

To A. H. Holland

L. B. Emlet

Before reading this document, sign and date below:

Name	Date	Name	Date

64 ANT

CLASSIFICATION CANCELLED

DATE OCT 13 1977

DECLASSIFICATION OFFICER
OAK RIDGE NATIONAL LABORATORY
TY DELEGATED BY ERDA 8-15-77

This document consists of 3 pages
No. 5 of 9 copies, Series A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-10-81

October 5, 1948

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Dr. A. H. Holland, Jr.

Subject: INCREASED PRODUCTION OF Zr-Nb

Reference: (1) MAHH, Letter from A. H. Holland, Jr. to S. H. Fugler - 9/21/48 - S.T. No. 48-9-189, Shipping Zr-Nb Requirements.
(2) Letter from C. E. Normyle to R. W. Cook - 9/1/48 - Zr-Nb Production at Oak Ridge National Laboratory, Final Report, S.T. No. 48-8-108.
(3) Letter from R. E. Maloy to J. C. Stewart - 10/15/47 - Use of Hanford Material for Zr-Nb Production.

In reference (1) you inquired about increasing the size of Zr-Nb batches from 2,000 curies to 10,000 and 20,000 curies and for information on the maintenance, the expansion possibilities, and the expected life of the present Zr-Nb production facilities. It is not possible to answer all of these points factually since the effects of high gamma activities on equipment and process steps are not known. It appears fair to assume that minor modifications of the existing equipment will allow the production of 10,000 and 20,000-curie batches of Zr-Nb from Hanford irradiated uranium. The following breakdown for these larger-sized batches may be of interest:

	10,000-Curie Batch	20,000-Curie Batch
Hanford Rings	80	110
(87 lbs. - approx. 6 lbs.)		
Surviving (Time of Discharge)	480	880
Total Curies Discharged	87,600	88,000
Travel Time (Hanford to Oak Ridge by Rail Express)	3 days	3 days
Process Time	5 days	7 days
Product Loss (80% at L.S.T.)	8,400 curies	16,800 curies
Decay Loss	(10 days)-11,000 curies	(15 days)-20,200 curies
Quantity Shipped	10,000 curies	20,000 curies.

[redacted]

shipping containers for the slugs similar to the one now being tested at Hanford should be satisfactory for transporting the slugs from Hanford to Oak Ridge. Since this type of container will only hold nine-teen Hanford slugs, several of them will have to be made available. The use of larger containers is possible but would necessitate the replacement of hoists and alterations to the building superstructure.

The present shipping container may have to be enclosed in a steel-lead-lined shell to reduce the surface radiation to an acceptable level. Our calculations indicate that the present type container would measure 400 mr/hr to 800 mr/hr with 10,000 and 20,000-curie shipments. It is not feasible to use a different or larger type of shipping container because major modifications within the cell block would be necessary.

Many minor modifications and perhaps some unforeseen major equipment changes may be necessary before 10,000 or 20,000-curie Bala runs can be made. These changes should become evident during the processing of Hanford slugs for the 2,500-curie batches. At present investigational work is proceeding on improving the final purification equipment which is a weak point in the existing facilities.

No detailed maintenance cost data is available for the present building and equipment. It has been estimated that during the past year approximately $75,000.00 has been spent on cell decontamination, repairs, replacements, etc.. It seems fair to assume that maintenance costs will increase during the next few years due to natural deterioration of the old equipment. In addition, the presently planned 250-foot off-gas stack and air decontamination equipment must be provided for safe operation of this facility.

Information of the last two points, i.e., - expansion of the present facilities and its anticipated life -, is more difficult to find. In 1946 (2) it was predicted that the life of the present cell blocks and equipment was, at most, three years or about June 1, 1951. This was based largely on the unknown condition of the exhaust duct which cannot be safely inspected. This same memorandum noted the inefficiency of the present process which is better illustrated by the data in the table on page one of this letter.

The expansion and even the maintenance of the present facilities is questionable when you consider the improvements that would be possible in a newly developed process. As pointed out in a previous letter (3), 10 grams of U^{235} from a depleted fuel rod of a High Flux Pile (10^{14}) will furnish 2,500 curies of Ba^{140}, while the use of Hanford slugs (3) will reduce the current consumption of uranium by a factor of 10. The potential value of other fission products (Te^{131}, Zr^{95}-Cb^{95}, etc.) should also be considered when a new Bala process is developed since they could possibly be isolated as by-products. The lack of manpower (4) to assign to this development problem prevents us from starting on it immediately.

[redacted]

Original Signed By:
G. V. Hucker
Executive Director

B-7

48-9-159

B-137

Date September 16, 1948

File

Subject Bids - Carrier for Canning Plugs

Those Eligible To Read The Attached

By C. E. Parker/L. B. Emlet

Copy # 9A

To A. H. Holland, Jr.

EJ Witkowski

Before reading this document, sign and date below:

INV. 64

Name	Date	Name	Date
EJ. W.			

IN

[redacted]

[redacted] 9 9 A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

154

September 16, 1948

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Classification Cancelled [redacted]
TO
By Authority of
ATC AUG 26 1971
Name Title Date

Attention: Dr. A. H. Holland, Jr.

Subject: NALA - CARRIER FOR HANFORD SLUGS

Reference: Letter from F. H. Belcher to C. E. Nuckor dated August 20, 1948; subj: NaLa-Proposal to Use Hanford Slugs; C.F. No. 48-8-306.

Gentlemen:

In the reference letter you request that more specific data be supplied concerning the ability of the designed container (coded Phoenix) to withstand a plane crash and an accompanying fire. A review of this problem has been made by our technical staff and it is their considered opinion that the lead shielding of the container would not withstand impacts associated with a plane crash.

In all probability the lead would flow breaking open the steel shell. To build a crash-proof container of steel (using no lead) would increase the weight from 6,400 pounds to approximately 10,000 pounds. A more complete study of crash-proof containers, using hardened lead or other dense materials, appears justified in view of the need for rapid transportation of radioactive materials with short half lives.

Rather than delay the use of Hanford slugs any longer, the following program is suggested:

1. Load the container with Hanford-irradiated slugs to test its shielding properties and to determine the temperature rise. (The container was shipped to Hanford on September 8, 1948.)

2. Assuming that the above tests are satisfactory, the container can be loaded with nineteen Hanford-irradiated slugs and shipped by special rail express to Oak Ridge.

[redacted]

Preliminary investigations of special rail express shipments indicate that a carrier can be transported from Hanford to Oak Ridge in approximately four days at a cost of about $1,550.00. This is about three days slower than air transportation and would result in fifteen percent loss of NaLa. This loss should not seriously affect the operation since the carrier was designed sixty percent oversize.

We recommend that the Atomic Energy Commission approve the use of Hanford-irradiated slugs for the production of NaLa utilizing special rail express for the shipment of the slugs. If you feel that it is desirable, we will design a crash-proof container for air shipments of large quantities of irradiated materials.

We do not plan any further work on this project unless it is requested by the Atomic Energy Commission.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY
Original Signed By
C. N. Rucker

C. E. Rucker
Executive Director

LBMalet:wp

1-2. A. H. Holland, Jr.
3. F. H. Belcher
4. C. E. Center
5-6. C. E. Rucker
7. L. B. Malet
8. J. A. Lane
9. E. J. Witkowski

SECRET

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-7-248

B-137

Date July 22, 1948

Subject Bala Run #26, Shipment #34

By E. J. Witkowski

To J. A. Leary

INV. 64

Product Shipments

File

Those Eligible To Read The Attached

Copy # 3A

R. Files

Before reading this document, sign and date below:

Name	Date	Name	Date

SECRET

~~SECRET~~

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-7-248

operated by
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE TENNESSEE

July 22, 1948

This document consists of [illegible] pages and [illegible] Copies, Series [illegible]

Classification Cancelled
By Authority Of
By [illegible] Date [illegible]

[illegible]

[illegible] sent [illegible] ORY to the Atomic Energy Commission [illegible] A for 1320 HFT on July 21, 1948 was [illegible] pounds of 7306 white. The product [illegible]

[illegible] for the color of the product. No [illegible] processing the all operations appeared [illegible] process satisfactory.

[illegible] as soon as possible, the approximate date [illegible] will be each shipment.

Yours very truly,

E. J. Witzemann

E. J. Witzemann

[illegible]

CLASSIFICATION CANCELLED
ADC Signature
Date [illegible]
Date [illegible] review of CCRD [illegible]
declassifications authorized by [illegible]
[illegible] memo of August 21, [illegible]

[illegible] restricted data within the meaning of [illegible] for the meaning [illegible] Sec. 2 of [illegible] Comm. [illegible]

~~SECRET~~

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-9-51

B-137

Date September 4, 1948

File

Subject Bale Run # 27, Shipment #35

Those Eligible To Read The Attached

By E. J. Witkowski

INV. 64

Copy # 4A

Reading Files

To J. A. Leary

Before reading this document, sign and date below:

Name	Date	Name	Date

INV. 65

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-9-51

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

Classification Cancelled [redacted]
To
By Authority of
AEC
Name
AUG 26 1971
Title Date

This document consists of 1 pages and 0 figures
No. 4 of 5 copies, Series A

CLASSIFICATION CANCELLED
ADD signature
11/12/95
Date
Single review of CGRP declassified documents was authorized by DOE Office of Declassification memo of August 28, 1995

Dr. J. A. Leary
Los Alamos Scientific Laboratory
P.O. Box 1663
Los Alamos, New Mexico

Subject: Pig No. 27, Shipment # 32

Dear Joe:

The Atomic Energy Commission has picked up this shipment today. The product contained [redacted] series of boring at ICP Oak Ridge on September 3, 1948. Its appearance is normal.

The platinum on the plug used in this shipment had been slightly damaged and it was necessary for us to repair it, rather crudely, in order to prevent it from slipping off the plug. We would appreciate your improving on our job.

In order that we may schedule some our other work with some degree of efficiency, we would appreciate your letting us know, as soon as possible, the date of the next shipment. We will also be very anxious to hear your appraisal of this product.

Yours very truly,

E. J. Witkowski

E. J. Witkowski

EJW:jw
cc:
1. J. A. Leary
2. E. J. Witkowski
3. L. B. Emlet
4. Reading File
5. Central File

"This document contains [redacted] of the [redacted] transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law. Violators are subject to criminal penalty."

[redacted]

B-137

Date 4/12/48

File Operations - R & L

Subject [illegible] - Proposal to Use Hanford Slugs

Those Eligible To Read The Attached

By C. E. Tucker

Copy # 10 a

C. N. Ruche

To F. E. Belcher

Before reading this document, sign and date below:

	FR ANP
	& CR ANP

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

July 12, 1948

U. S. Atomic Energy Commission
Oak Ridge Laboratory Division
Post Office Box E
Oak Ridge, Tennessee

Attention: Mr. F. H. Belcher

Subject: RALA - PROPOSAL TO USE HANFORD SLUGS

References: Letter from John Shilling, Jr., to Prescott Sandidge; "RaLa - Proposal to Use Hanford Slugs"; dated January 5, 1948. (4)

Gentlemen:

In the reference letter you requested that Oak Ridge National Laboratory develop and construct a container for transporting slugs from Hanford to Oak Ridge. This container has been constructed and is ready for your inspection. Prints are attached.

As recommended by you, the container was designed to be fire and crash-proof. Sufficient magnetic material was used in the construction to allow detection if buried underground. It is our understanding that a small package of water soluble dye can be purchased and attached to the container which will mark its location if it is dropped in water.

If this container meets with your approval, there remain several other details that must be taken care of before Hanford slugs can be used for the production of RaLa.

1. Fabrication of a second container.

2. Alterations to existing electric hoists.

3. Shipment of the carrier to Hanford for a trial loading and radiation measurements.

4. Arrangements for air transportation of the loaded carrier from Hanford to Oak Ridge. (It is our understanding that the Atomic Energy Commission will handle this matter.)

We do not plan to do any of this additional work until the Atomic Energy Commission has approved the use of the Hanford material.

Our original proposal to use Hanford slugs for RaLa production was made in October, 1947. (2) Since several personnel changes have been made since that time, a review of the problem is presented.

Since the spring of 1945, the production of Ba^{140} has been carried on in the present facilities, using slugs irradiated at Oak Ridge National Laboratory. An average of six batches per year have been made thus far at a direct cost of approximately $498,480.00 per year. Adjusting for continuing expenses, the cost averages approximately $57,500.00 per batch.

After the Atomic Energy Commission indicated to the Laboratory management last August (1), that RaLa requirements would continue for an extended period of time, a study was made to determine the possibility of using Hanford irradiated slugs to replace the present slugs irradiated at Oak Ridge National Laboratory. The results of this study were submitted to the Atomic Energy Commission on October 15, 1947. (2) These studies indicated that the use of Hanford slugs was feasible and economical. The direct cost per year would be approximately $341,700.00 for six batches (a saving of $156,000.00) or adjusting for continuing expenses, it would amount to $34,500.00 per batch (a saving of $23,000.00 per batch).

This study also indicated that a substantial saving in the amount of uranium used would be realized. The present process uses approximately 2,250 pounds to produce one 2500-curie batch of product while the proposed method would use only 240 pounds to produce the same quantity. The total saving in uranium per year would therefore be 12,528 pounds.

In addition to the savings in cost amd material already mentioned, the processing time would be decreased from the present nine days per batch to approximately four days. The waste storage space which has reached a critical point would also be conserved.

Only minor process and equipment changes would be required to adapt our facilities to the use of Hanford slugs. These changes would consist of fabrication of two special slug carriers and alterations to the existing electric hoists to permit lifting of these carriers. The total cost of alterations was estimated at $10,000.00. The slugs would be transported from Hanford by an airplane at a cost of $6,250.00 per trip and the empty carrier returned by freight at a cost of $500.00.

On October 20, 1947, the Atomic Energy Commission submitted an estimate of future RaLa requirements to the Laboratory management. (3)

These estimates showed that the requirements for the following two years would be increased from six to ten 2500-curie batches per year and that after a two-year period, it is possible that the requirements will be increased to eight 10,000-curie batches per year. Under these conditions, much greater savings than those previously anticipated would be realized.

On January 5, 1948, (4) the Atomic Energy Commission notified the Laboratory management that it was definitely interested in the project and that as soon as a suitable slug container was developed and constructed, an approval for the entire proposal would be considered. The basic design features requested by the Atomic Energy Commission was that the container should be fireproof, crash-proof, and capable of withstanding intense heat and impact. It should also contain sufficient magnetic material to allow detection if buried underground or under water and release a dye on contact with water. On January 27, 1948, (5) a schedule for the design, construction, and testing of the container was suggested by the Atomic Energy Commission. This schedule called for the testing to be completed on August 1, 1948.

Calculations for the design of the container were completed by February 13, 1948. All calculations were based on the assumption that the slugs would be charged into the carrier eight hours after being discharged from the Hanford piles. A summary of the results of the calculations are as follows:

1. About twelve Hanford slugs will be required to produce one run containing 2,500 curies of Ba^{140}.

2. The radiation intensity, using ten inches of lead for shielding will be approximately nine mr/hr at the surface of the carrier.

3. If the carrier could be designed with relatively small clearances (.005 inch) between the various parts, the maximum temperature of the slugs will be 245° F. (The slugs were calculated to have heat evaluation of fifty-five watts each eight hours after discharge.)

A design of the container based on the above information was completed on March 15, 1948. A copy of the drawing was submitted to the General Electric Company at Hanford (7) to solicit their comments on the feasibility of the loading of slugs into the container. They replied that the design was satisfactory. (8)

The fabrication of the container was completed on June 22, 1948. The total weight of the container and slugs is approximately 6,500 pounds. The assembly drawing (D3994) and a verbal description of the container are enclosed.

Thermal conductivity tests (9) on the carrier were made by electrically heating "dummy" slugs placed inside of the carrier to simulate the conditions expected with "hot" slugs. The maximum temperatures which can be expected in transit, according to these tests, are tabulated below:

Location	Temperature ° F.
Surface of container	176°
Basket	320°
Slugs	425°.

These tests are based on the rate of heat discharged by the slugs at the time the carrier is loaded at Hanford (eight hours after pile discharge). The decay of short-lived fission products was not taken into account; it was assumed that thermal equilibrium would be reached while the rate of heat discharged by the slugs would remain constant. It is therefore reasonable to expect that the actual temperatures will be considerable lower than those shown above. As an added safety feature, the use of which is not anticipated, this carrier can also be force cooled by connecting it to a source of compressed air while in transit.

Since it is not possible to duplicate the intensity of radiation of the Hanford slugs which will be used for this process, no radiation tests were made on the carrier. These tests, as well as heat transfer tests under actual conditions, can be made at Hanford prior to the first shipment of slugs.

We shall be glad to furnish any other information you may need to reach a decision on this matter.

Very truly yours

OAK RIDGE NATIONAL LABORATORY

C. N. Rucker

C. N. Rucker
Executive Director

LBEmlet:wp
1-5. F. H. Belcher
6. C. E. Center
7. L. B. Emlet
8. E. J. Witkowski
9-10. C. N. Rucker
11. Central Files

Attachments:

1. List of reference letters.
2. Print-"Carrier for Large Slugs Assembly" -D3994.
3. Verbal description of the container, - by J. J. Wallace - March 15, 1948.

REFERENCES

1. Letter from C. E. Winters to Prescott Sandidge - August 25, 1947 - "RaLa Production" - Central File No. 47-8-385.

2. Letter from L. B. Emlet to J. C. Stewart - October 15, 1947 - "Use of Hanford Material for RaLa Production" - Central File No. 47-10-234.

3. Letter from C. E. Winters to Prescott Sandidge - October 20, 1947 - "RaLa Production" - Central File No. 47-10-320.

4. Letter from John Shilling, Jr., to Prescott Sandidge - January 5, 1948 -"RaLa - Proposal to Use Hanford Slugs" - Central File No. 48-1-107.

5. Letter from F. H. Belcher to S. R. Sapirie - January 27, 1948 - "RaLa - Proposal to Use Hanford Slugs" - Central Files No. 48-1-395.

6. Letter from J. A. Lane to L. B. Emlet - February 13, 1948 - "Carrier for Hanford Slugs" - Central File No. 48-2-202.

7. Letter from L. B. Emlet to C. W. J. Wende - March 19, 1948 - "Use of Hanford-Irradiated Slugs for RaLa Production" - Central File No. 48-3-324.

8. Wire from W. P. Overbeck to L. B. Emlet - April 20, 1948.

9. Letter from H. C. Savage to C. E. Winters - June 29, 1948 - "Summary of Thermal Tests on Hanford Slug Carrier" - Central File No. 48-7-9.

CARRIER FOR "W" SIZE SLUGS

Following is a description of the mechanical festures of the carrier shown on accompanying drawing, entitled "Carrier for Large Slugs - Assembly", No. D3994.

The carrier has a capacity of nineteen (19) "W" size slugs, a minimum shield thickness of ten inches of lead (or its equivalent of lead and steel), and a total weight of 6,522 pounds. The carrier is composed of four main parts; i.e., carrier body, lead-filled plug, locking bar, and slug basket. The design of these four parts was based on the following considerations:

1. Minimum weight consistent with the necessary shield thickness (see classified document, C.F. No. 48-2-202).

2. Adequate strength for rough usage.

3. Simplicity for underwater loading and unloading.

To obtain minimum weight, studies were made of various slug nesting arrangements and for this particular number of slugs, the hex shape shown was found to be the most compact and, thereby, give minimum outside dimensions for a carrier. Further, the ends of the carrier body were chamfered to eliminate superfluous shielding at the corners. A cylinder was chosen for the body shell because there is very little added weight over a hex and it is much simplier to construct and is also stronger.

To provide the necessary strength, the lead shield is covered inside and out with a skin of steel. This skin will eliminate the tendency of lead to creep, protect otherwise exposed lead surfaces and restrain the deformation of the lead in case of impact. Insofar as possible, these steel skin plates were made cylindrical or conical in shape for maximum strength. The outside and bottom of the carrier body are 3/8" thick mild steel and all other steel plates except the conical ends are $\frac{1}{4}$" thick, Type 347 stainless steel.

Heat conduction and dissipation are provided for in the following manner: To improve thermal conductivity, the fits between slugs and slug tubes and between slug basket and body of carrier have been held to a practical minimum (nominal clearance on diameter for slugs .019", for basket .005"). It is expected that slugs will be sized at the source by means of a ring gauge or other device to permit the use of this clearance. Heat dissipation will be by means of air convection and surface radiation. To increase the cooling surface, sixty-eight (68) $\frac{1}{2}$" O.D. tubes on 21-5/8" diameter tube circle have been cast in the lead shield. This increases the surface area by 13.2 square feet or approximately 46%. The total surface area then is 41.5 square feet.

Forced convection is quite possible by making use of the plenum chamber formed at each end of the carrier by the conical ends and using the tapped (3/4 NPT) holes in the wall of the carrier to connect blower hose to. However, it is not anticipated that forced convection will be required and the pipe plugs shown in the holes mentioned above will normally be removed to allow free convection.

Simplicity has been a prime requirement since the carrier must be loaded and unloaded under water. Also, simplicity means less costly construction.

The locking bar is held in place by two pins. Each is provided with a 3/8" diameter hole for a lock and/or a seal. This bar, of course, can safely be placed or removed, with the plug in place, when the carrier is out of the water. The plug can be removed under water by means of the eye provided and a hoist or chain fall. Next, the slug basket can be lifted out in the same manner (by means of the folding handle) so that the slugs are more accessible for lifting out with tongs. Should a slug stick in the tube, it can then be driven out with a $\frac{1}{2}$" diameter rod through the hole in the bottom plate of the slug basket. To facilitate loading under water, the top ends of the slug tubes are flared to 30° angle, $\frac{1}{4}$" deep. The inside diameter at the top end of the tube then is 1.60".

At the receiving end of shipment, the slugs will be transferred to charging machine, now being constructed, for introducing slugs into process equipment.

Other requirements have been met in the following manner:

Should the carrier become buried in the ground, it could be detected by the magnetic property of the mild steel in the body.

Not shown on the drawing is a cartridge or package of dye that can be attached to some part of the carrier that would serve to show its location should it be immersed in water.

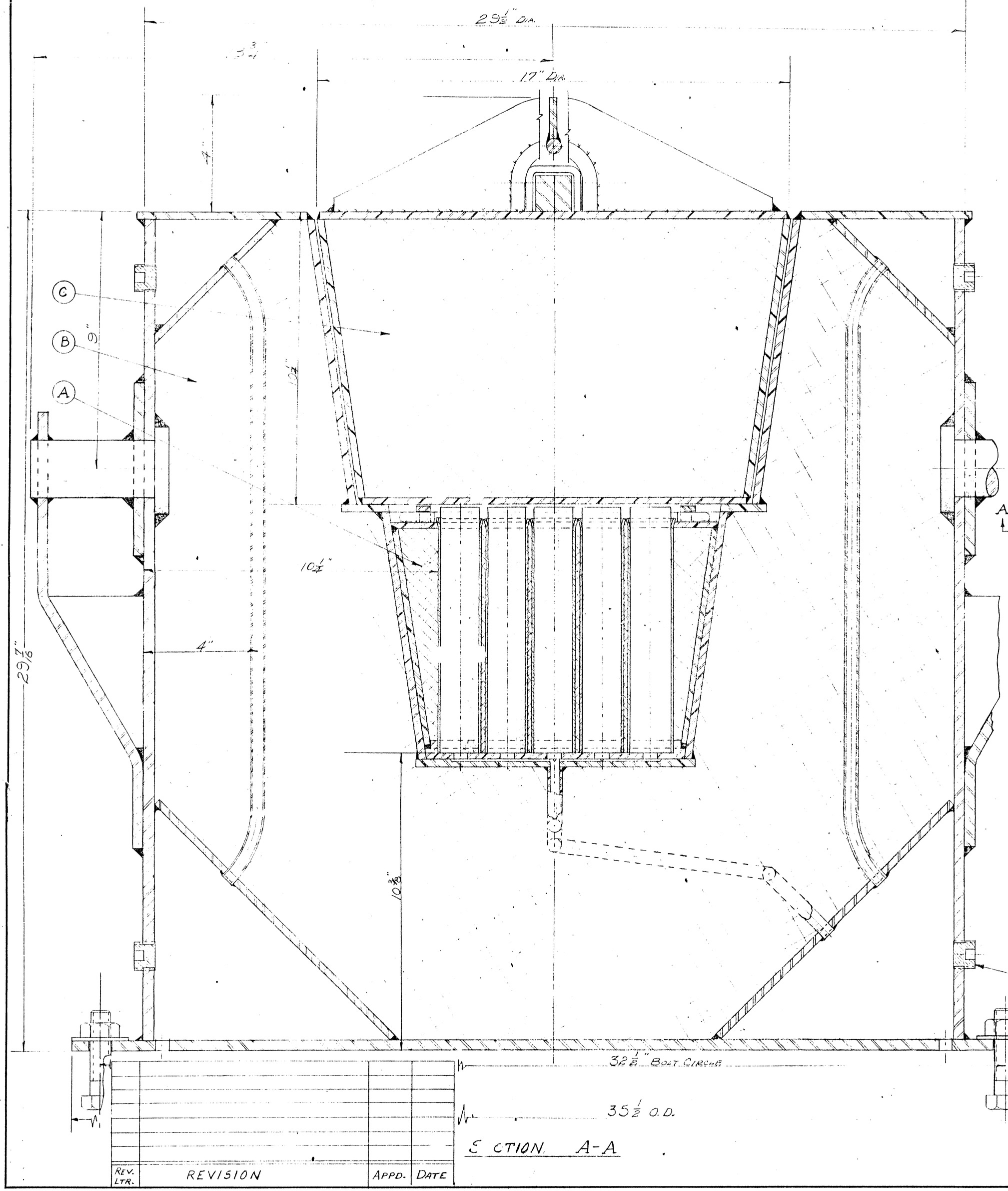
The bottom plate of the carrier body provides a flange by which it can be bolted down to make it safe for air shipment.

J. J. Wallace
March 15, 1948

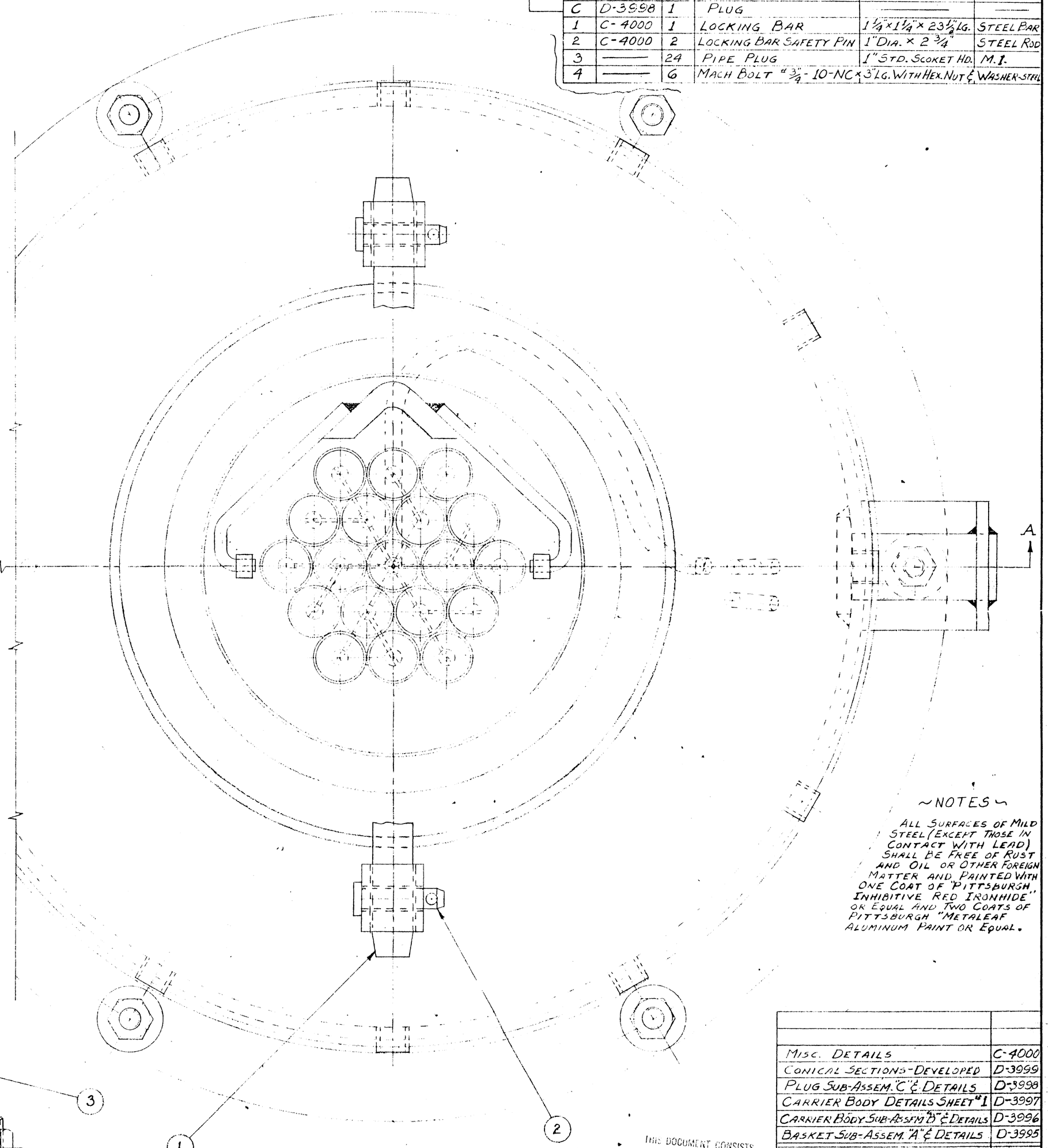
D-3994

PARTS LIST

ITEM NO.	DWG. NO.	NO. REQ'D	NAME	FINISHED SIZE	MATERIAL
A	D-3995	1	BASKET	———	———
B	D-3996	1	CARRIER BODY	———	———
C	D-3998	1	PLUG	———	———
1	C-4000	1	LOCKING BAR	1 1/8" x 1 1/4" x 23 1/2" LG.	STEEL BAR
2	C-4000	2	LOCKING BAR SAFETY PIN	1" DIA. x 2 3/4"	STEEL ROD
3	———	24	PIPE PLUG	1" STD. SOCKET HD.	M.I.
4	———	6	MACH BOLT "3/4-10-NC x 3" LG. WITH HEX. NUT & WASHER-STEEL		



SECTION A-A



TOP VIEW (WITH PLUG REMOVED)

~NOTES~

ALL SURFACES OF MILD STEEL (EXCEPT THOSE IN CONTACT WITH LEAD) SHALL BE FREE OF RUST AND OIL OR OTHER FOREIGN MATTER AND PAINTED WITH ONE COAT OF "PITTSBURGH INHIBITIVE RED IRONHIDE" OR EQUAL AND TWO COATS OF PITTSBURGH "METALEAF ALUMINUM PAINT OR EQUAL.

REV. LTR.	REVISION	APPD.	DATE

REFERENCE DRAWINGS	Dwg. No.
MISC. DETAILS	C-4000
CONICAL SECTIONS-DEVELOPED	D-3999
PLUG SUB-ASSEM. "C" & DETAILS	D-3998
CARRIER BODY DETAILS SHEET #1	D-3997
CARRIER BODY SUB-ASSEM "B" & DETAILS	D-3996
BASKET SUB-ASSEM. "A" & DETAILS	D-3995

THIS DOCUMENT CONSISTS OF 1 PAGES
NO. 10 OF 11 COPIES
SERIES B

#4062

THIS DRAWING HAS BEEN CLASSIFIED AS: ~~SECRET~~
PER

BLDG. 706-D
CARRIER FOR LARGE SLUGS ASSEMBLY

CLINTON NATIONAL LABORATORY
OAK RIDGE, TENN.

D. Francis 5-5-48	C. Lyon 7-21-48	A. J. K. 7/23-48	CAE W.A. 7/24/48	Blue 7/26/48	[illegible] 7/26/48

C-409-NR
SCALE: HALF
D-3994

B-13

B-137

Date 7/8/48

File

Subject Re: Ba140 Shipment No. 33

Those Eligible To Read The Attached

By J. A. Leary

Copy # 1
E. J. Witkowski

To E. J. Witkowski

Before reading this document, sign and date below:

EJW 7/14/48

[redacted]

THIS DOCUMENT CONSISTS OF 1 PAGE(S)
NO. 1 OF 4 COPIES, SERIES A

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P. O. Box 1663
Los Alamos, New Mexico

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-7-122

IN REPLY
REFER TO: LAB-CMR-10-16

July 8, 1948

Mr. E. J. Witkowski
Superintendent, 706-D Area
Clinton National Laboratory
Oak Ridge, Tennessee

Dear Ed:

Confirming our telephone conversation of July 2, 1948, we are expecting Ba^{140} Shipment No. 33 to arrive at this site on or about July 26, 1948. We would prefer that the barium activity does not exceed 2500 curies at last separation time.

In the near future we plan to make minor alterations on the large shipping shield. As soon as these plans are completed, they will be sent to you for approval. No changes in the shipping cone or plug are contemplated.

Yours very truly,

Joe

Joseph A. Leary

JAL:mw
cc: D. W. Mueller
Central Records
File

CLASSIFICATION CANCELLED
DATE SEP 14 1977
For the U. S. Energy Research and Development Administration
PSB
Division of Classification

[redacted]

CLASSIFICATION CANCELLED
ADD signature 1/19/95 Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

[redacted]

7-18

B-137

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-7-97

Date

Subject July 7, 1948
Mala Production at Oak Ridge

By National Laboratory

To F. H. Belcher
C. E. Rucker

INV. 64

File 4267

Those Eligible To Read The Attached

Copy # 44

M. A. Patterson

Before reading this document, sign and date below:

Name	Date	Name	Date
M. A. Patterson	7/12/48		
F. L. Steahly	7/12/48		
~~WKE~~			
~~FRD~~			
~~A. J.~~			
~~TCAP~~			

INV.

This document has been approved for release to the public by:

David C. Hamm 2/3/95
Technical Information Officer, ORNL Site — Date

UNITED STATES
ATOMIC ENERGY COMMISSION

In Reply Refer To:
LAH:JS

10341

Classification Cancelled
Changed to
By Authority Of
By ARB Date AUG 26 1971

Oak Ridge, Tennessee
July 7, 1948

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-7-97

Oak Ridge National Laboratory
Division of Carbide and Carbon Chemicals Corporation
Oak Ridge, Tennessee

Attention: Mr. C. E. Rucker

Subject: RALA PRODUCTION AT OAK RIDGE NATIONAL LABORATORY

Gentlemen:

Reference is made to your letters dated April 7 and May 4, 1948, same subject.

The Division of Production, Washington, has advised that it appears desirable for the Laboratory to continue Rala operations at a minimum of expense through 1949. This decision is based upon the understanding that Rala production, at a level consistent with Los Alamos requirements as presently known, can be performed at the Laboratory by making minor alterations in the existing building, constructing a 250 foot stack (which will also be required for continued production of radioisotopes) and using Hanford irradiated material.

You are requested to continue Rala production operations. We understand that the total cost of alterations and new construction to allow continuing production will not exceed $225,000. The suggestion is made that an appropriation request covering this work be submitted.

Hanford Works is being considered as a permanent site for Rala production, and the General Manager has indicated his desire to determine the feasibility of transferring the operations there by 1950. Arrangements are being made for representatives of Hanford to survey the Rala facilities and current operations at the Laboratory and you will be advised of these developments.

In your letter of April 7, 1948, you recommended that development work start immediately on a new Rala process, making provisions for

Mr. C. N. Rucker
July 7, 1948

the large scale isolation of other valuable waste products, such as Zr^{95} and Cb^{95}. You are requested to start such development as soon as possible since the General Manager desires that this be undertaken at the Laboratory regardless of the final location of permanent facilities. Please submit for submission to higher authority a detailed proposal for this development indicating the scope of the program, estimated schedules and costs.

Very truly yours,

F. H. Belcher, Chief
Oak Ridge Laboratory Division

CC: L. B. Emlet
M. D. Peterson
C. E. Center

Shilling:mym

[redacted]

B-137

Date May 27, 1948

File

Subject Isotope and RaLa Production

Those Eligible To Read The Attached

By L. B. Emlet

Copy # 3A

To C. N. Bucker

C. Files

Before reading this document, sign and date below:

Name	Date	Name	Date

[redacted]

[redacted] This report consists of 2 pages. No. 0 figures. No. 3 of 5 copies. Series A

INTER-COMPANY CORRESPONDENCE

(SENDER'S NAME) COMPANY CARBIDE AND CARBON CHEMICALS CORP. LOCATION Post Office Box P, OAK RIDGE, TENN.

CLASSIFICATION CANCELLED
Jed Davis 3/14/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22 1994

TO C. N. Rucker
LOCATION
ATTENTION
COPY TO

DATE May 27, 1948

OAK RIDGE NATIONAL LABORATORY CENTRAL FILES NUMBER

ANSWERING LETTER DATE

CF-48-5-336

SUBJECT Isotope and RaLa Production

Reference:
1. Letter from L. B. Emlet to C. N. Rucker - 3-18-48 - Present and Proposed Radioisotope Processing Facilities
2. Letter from C. N. Rucker to R. W. Cook - 4-7-48 - RaLa Production at Oak Ridge National Laboratory
3. Letter from F. H. Belcher to C. N. Rucker - 4-22-48 - RaLa Production at Oak Ridge National Laboratory
4. Letter from C. N. Rucker to F. H. Belcher - 5-4-48 - Facility Requirements for RaLa Production

The following comments on isotope and RaLa production are submitted to assist you in your scheduled meeting with AEC officials on Saturday, May 29, 1948. For the most part they are extracted from the reference letters.

Isotope Production

1. Isotope shipments have increased from 20 to 300 per month with no additional facilities being provided.

2. The chemical separation of isotopes with existing facilities is hazardous and inefficient.

   a. Approximately 10% of the personnel receive more than tolerance amounts of weak radiation (beta and soft gamma) each week. Over exposure to strong radiation (gamma) average less than ½ of 1%.

3. If isotope production is to continue at Oak Ridge National Laboratory, new facilities must be provided, regardless of hesite chosen for a high flux reactor.

4. If this country is to keep abreast of the Canadians in isotope production, a new high flux reactor must be provided.

5. A project for providing the isotope production facilities has been proposed and is awaiting approval.

This document has been approved for release to the public by:
Technical Information Officer
ORNL Site
Date 3/15/95

Classification Cancelled
~~Or Changed To~~
By Authority Of
By [redacted] Date AUG 26 1971

[redacted]

[redacted]

RaLa Production

1. If RaLa is to be produced safely at Oak Ridge National Laboratory, a new 250 foot off gas stack must be provided. (This stack is included in the appropriation request for the new isotope facilities previously mentioned.)

2. RaLa production can continue at Oak Ridge National Laboratory until about 1950 with the present facilities if a new stack is provided. Either Hanford or locally exposed material can be used for this period. Hanford slugs will be more economical.

3. Development work should start immediately to provide a new process and equipment for isolating Ba 140 from exposed uranium.

4. Future RaLa production facilities should be located at the source of material rich in fission products; i.e., Hanford or the site chosen for the high flux pile.

More detailed information on the isotope and RaLa production problems is included in the reference letters.

This document has been approved for release to the public by:

Technical Information Officer ORNL Site — Date

L. B. Emlet

Copy 1 - C. N. Rucker
2 - C. N. Rucker
3 - Central File
4 - L. B. Emlet
5 - L. B. Emlet

[redacted]

B-137

Date 6/19/48

Subject [redacted]

By C. E. Ducker

To [redacted]

(2) File Operations - RaL,

Those Eligible To Read The Attached

Copy # 10 a

C. E. Ducker

Before reading this document, sign and date below:

&

Pages and 1 figures.
No. 10 of 11 copies, Series A.

[redacted]T

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

July 12, 1948

U. S. Atomic Energy Commission
Oak Ridge Laboratory Division
Post Office Box E
Oak Ridge, Tennessee

Attention: Mr. F. H. Belcher

Subject: RALA - PROPOSAL TO USE HANFORD SLUGS

Reference: Letter from John Shilling, Jr., to Prescott Sandidge; "RaLa - Proposal to Use Hanford Slugs"; dated January 5, 1948. (4)

Gentlemen:

In the reference letter you requested that Oak Ridge National Laboratory develop and construct a container for transporting slugs from Hanford to Oak Ridge. This container has been constructed and is ready for your inspection. Prints are attached.

As recommended by you, the container was designed to be fire and crash-proof. Sufficient magnetic material was used in the construction to allow detection if buried underground. It is our understanding that a small package of water soluble dye can be purchased and attached to the container which will mark its location if it is dropped in water.

If this container meets with your approval, there remain several other details that must be taken care of before Hanford slugs can be used for the production of RaLa.

1. Fabrication of a second container.

2. Alterations to existing electric hoists.

3. Shipment of the carrier to Hanford for a trial loading and radiation measurements.

4. Arrangements for air transportation of the loaded carrier from Hanford to Oak Ridge. (It is our understanding that the Atomic Energy Commission will handle this matter.)

We do not plan to do any of this additional work until the Atomic Energy Commission has approved the use of the Hanford material.

Our original proposal to use Hanford slugs for RaLa production was made in October, 1947. (2) Since several personnel changes have been made since that time, a review of the problem is presented.

Since the spring of 1945, the production of Ba^{140} has been carried on in the present facilities, using slugs irradiated at Oak Ridge National Laboratory. An average of six batches per year have been made thus far at a direct cost of approximately $498,480.00 per year. Adjusting for continuing expenses, the cost averages approximately $57,500.00 per batch.

After the Atomic Energy Commission indicated to the Laboratory management last August (1), that RaLa requirements would continue for an extended period of time, a study was made to determine the possibility of using Hanford irradiated slugs to replace the present slugs irradiated at Oak Ridge National Laboratory. The results of this study were submitted to the Atomic Energy Commission on October 15, 1947. (2) These studies indicated that the use of Hanford slugs was feasible and economical. The direct cost per year would be approximately $341,700.00 for six batches (a saving of $156,000.00) or adjusting for continuing expenses, it would amount to $34,500.00 per batch (a saving of $23,000.00 per batch).

This study also indicated that a substantial saving in the amount of uranium used would be realized. The present process uses approximately 2,250 pounds to produce one 2500-curie batch of product while the proposed method would use only 240 pounds to produce the same quantity. The total saving in uranium per year would therefore be 12,528 pounds.

In addition to the savings in cost amd material already mentioned, the processing time would be decreased from the present nine days per batch to approximately four days. The waste storage space which has reached a critical point would also be conserved.

Only minor process and equipment changes would be required to adapt our facilities to the use of Hanford slugs. These changes would consist of fabrication of two special slug carriers and alterations to the existing electric hoists to permit lifting of these carriers. The total cost of alterations was estimated at $10,000.00. The slugs would be transported from Hanford by an airplane at a cost of $6,250.00 per trip and the empty carrier returned by freight at a cost of $500.00.

On October 20, 1947, the Atomic Energy Commission submitted an estimate of future RaLa requirements to the Laboratory management. (3)

These estimates showed that the requirements for the following two years would be increased from six to ten 2500-curie batches per year and that after a two-year period, it is possible that the requirements will be increased to eight 10,000-curie batches per year. Under these conditions, much greater savings than those previously anticipated would be realized.

On January 5, 1948, (4) the Atomic Energy Commission notified the Laboratory management that it was definitely interested in the project and that as soon as a suitable slug container was developed and constructed, an approval for the entire proposal would be considered. The basic design features requested by the Atomic Energy Commission was that the container should be fireproof, crash-proof, and capable of withstanding intense heat and impact. It should also contain sufficient magnetic material to allow detection if buried underground or under water and release a dye on contact with water. On January 27, 1948, (5) a schedule for the design, construction, and testing of the container was suggested by the Atomic Energy Commission. This schedule called for the testing to be completed on August 1, 1948.

Calculations for the design of the container were completed by February 13, 1948. All calculations were based on the assumption that the slugs would be charged into the carrier eight hours after being discharged from the Hanford piles. A summary of the results of the calculations are as follows:

1. About twelve Hanford slugs will be required to produce one run containing 2,500 curies of Ba^{140}.

2. The radiation intensity, using ten inches of lead for shielding will be approximately nine mr/hr at the surface of the carrier.

3. If the carrier could be designed with relatively small clearances (.005 inch) between the various parts, the maximum temperature of the slugs will be 245° F. (The slugs were calculated to have heat evaluation of fifty-five watts each eight hours after discharge.)

A design of the container based on the above information was completed on March 15, 1948. A copy of the drawing was submitted to the General Electric Company at Hanford (7) to solicit their comments on the feasibility of the loading of slugs into the container. They replied that the design was satisfactory. (8)

The fabrication of the container was completed on June 22, 1948. The total weight of the container and slugs is approximately 6,500 pounds. The assembly drawing (D3994) and a verbal description of the container are enclosed.

Thermal conductivity tests (9) on the carrier were made by electrically heating "dummy" slugs placed inside of the carrier to simulate the conditions expected with "hot" slugs. The maximum temperatures which can be expected in transit, according to these tests, are tabulated below:

Location	Temperature ° F.
Surface of container	176°
Basket	320°
Slugs	425°.

These tests are based on the rate of heat discharged by the slugs at the time the carrier is loaded at Hanford (eight hours after pile discharge). The decay of short-lived fission products was not taken into account; it was assumed that thermal equilibrium would be reached while the rate of heat discharged by the slugs would remain constant. It is therefore reasonable to expect that the actual temperatures will be considerable lower than those shown above. As an added safety feature, the use of which is not anticipated, this carrier can also be force cooled by connecting it to a source of compressed air while in transit.

Since it is not possible to duplicate the intensity of radiation of the Hanford slugs which will be used for this process, no radiation tests were made on the carrier. These tests, as well as heat transfer tests under actual conditions, can be made at Hanford prior to the first shipment of slugs.

We shall be glad to furnish any other information you may need to reach a decision on this matter.

Very truly yours

OAK RIDGE NATIONAL LABORATORY

C. N. Rucker

C. N. Rucker
Executive Director

LBEmlet:wp
1-5. F. H. Belcher
6. C. E. Center
7. L. B. Emlet
8. E. J. Witkowski
9-10. C. N. Rucker
11. Central Files

Attachments:

1. List of reference letters.
2. Print-"Carrier for Large Slugs Assembly" -D3994.
3. Verbal description of the container, - by J. J. Wallace - March 15, 1948.

REFERENCES

1. Letter from C. E. Winters to Prescott Sandidge - August 25, 1947 - "RaLa Production" - Central File No. 47-8-385.

2. Letter from L. B. Emlet to J. C. Stewart - October 15, 1947 - "Use of Hanford Material for RaLa Production" - Central File No. 47-10-234.

3. Letter from C. E. Winters to Prescott Sandidge - October 20, 1947 - "RaLa Production" - Central File No. 47-10-320.

4. Letter from John Shilling, Jr., to Prescott Sandidge - January 5, 1948 -"RaLa - Proposal to Use Hanford Slugs" - Central File No. 48-1-107.

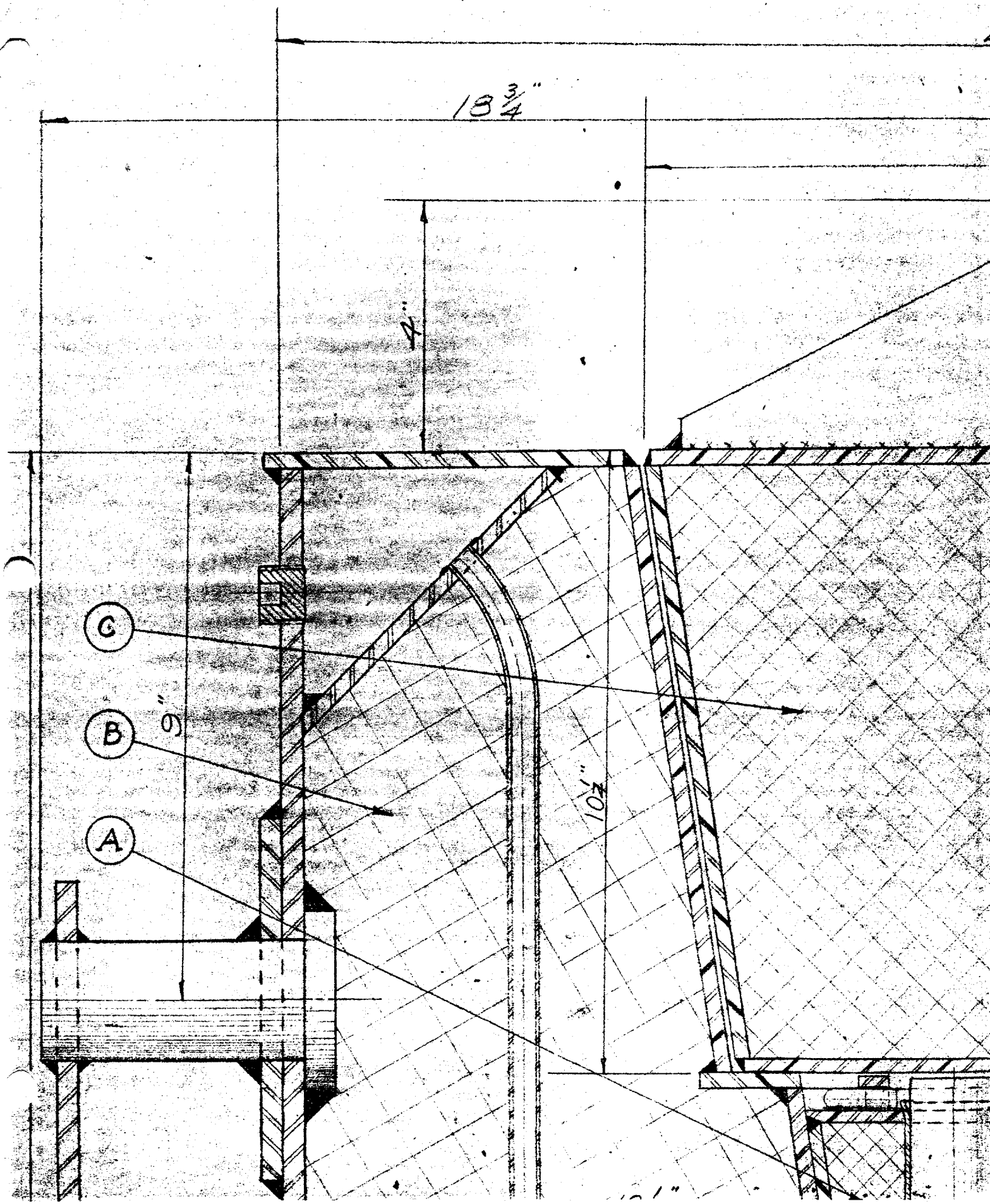
5. Letter from F. H. Belcher to S. R. Sapirie - January 27, 1948 - "RaLa - Proposal to Use Hanford Slugs" - Central Files No. 48-1-395.

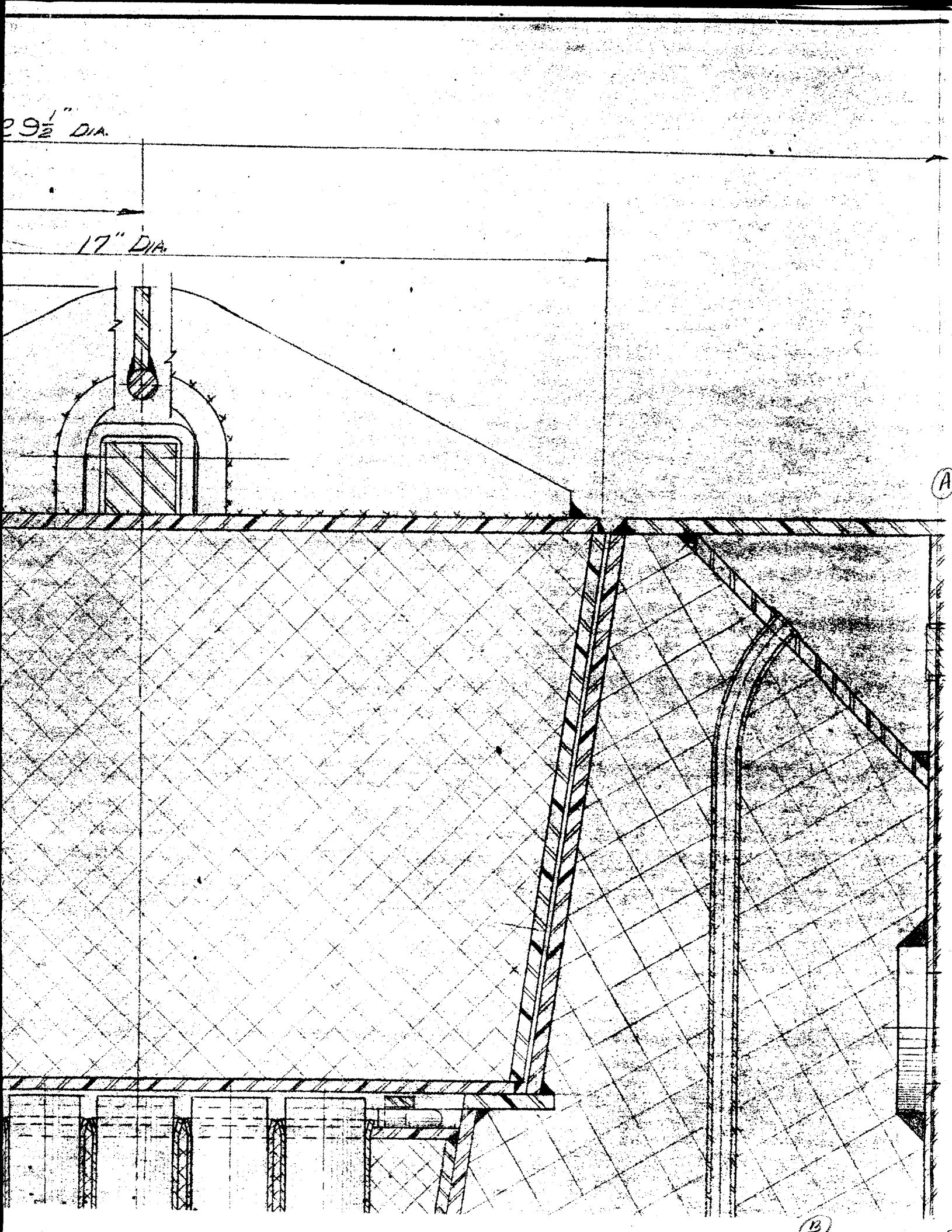
6. Letter from J. A. Lane to L. B. Emlet - February 13, 1948 - "Carrier for Hanford Slugs" - Central File No. 48-2-202.

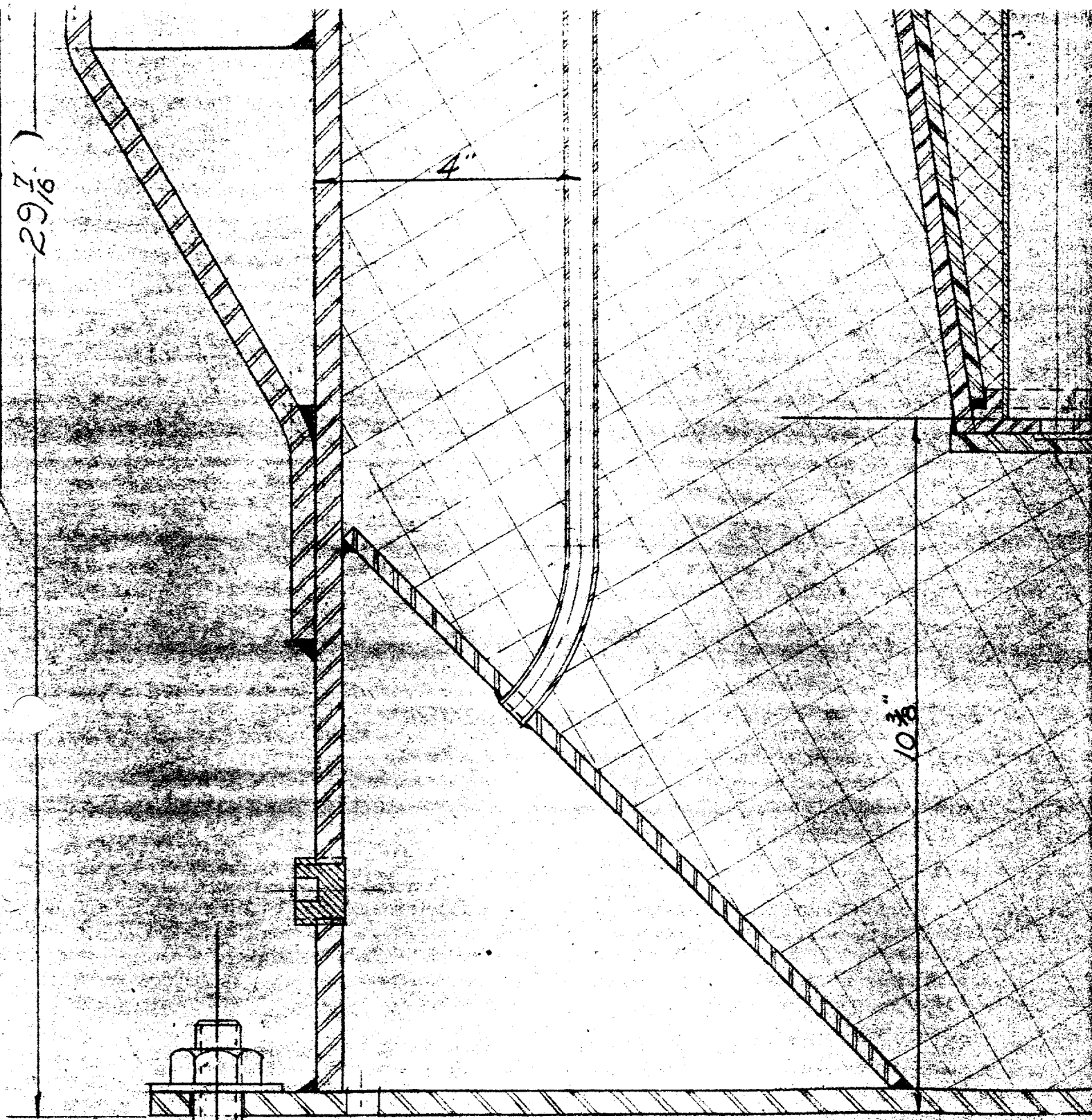
7. Letter from L. B. Emlet to C. W. J. Wende - March 19, 1948 - "Use of Hanford-Irradiated Slugs for RaLa Production" - Central File No. 48-3-324.

8. Wire from W. P. Overbeck to L. B. Emlet - April 20, 1948.

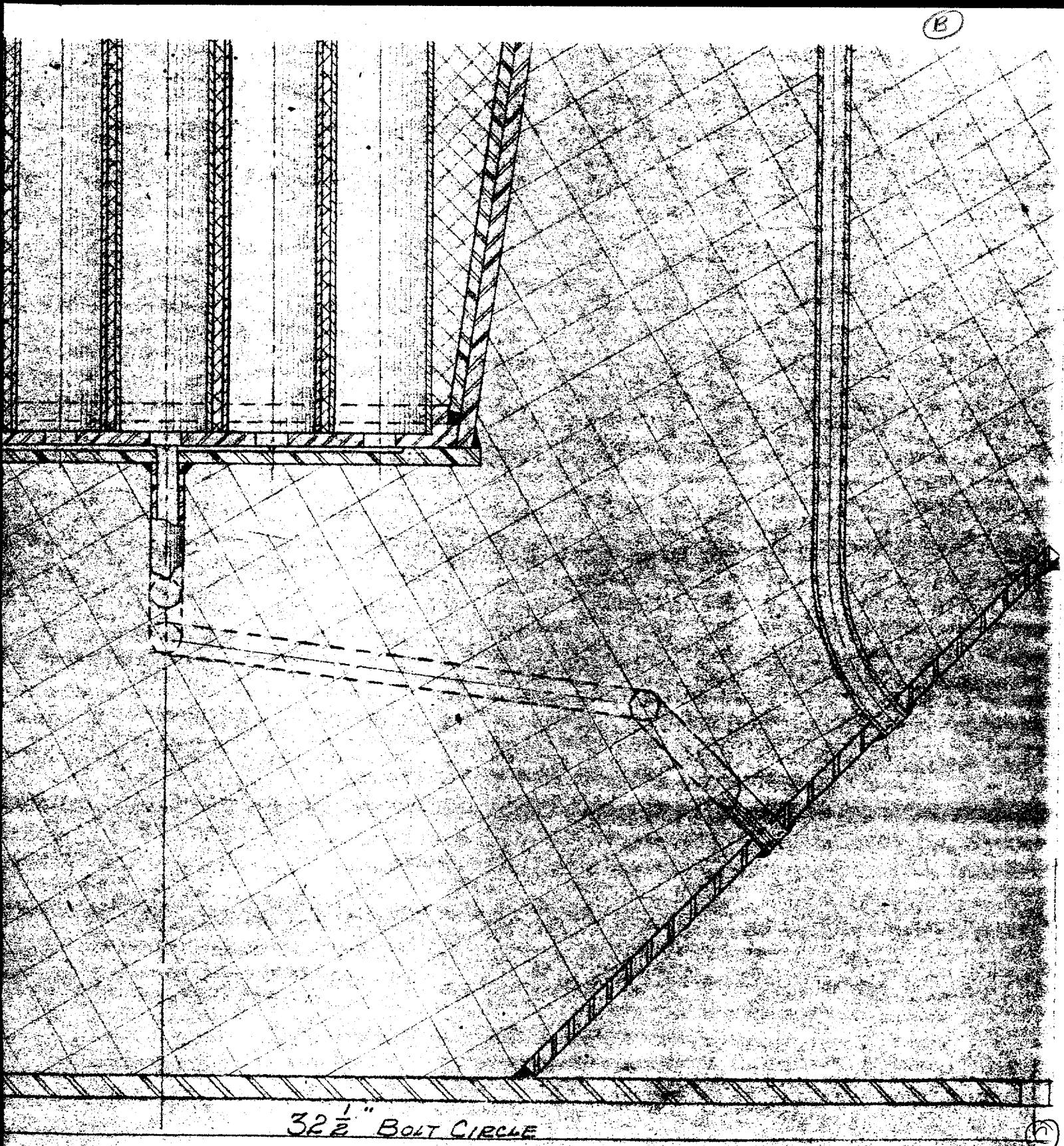
9. Letter from H. C. Savage to C. E. Winters - June 29, 1948 - "Summary of Thermal Tests on Hanford Slug Carrier" - Central File No. 48-7-9.


19 3/4"
4"
C
B
A
10"

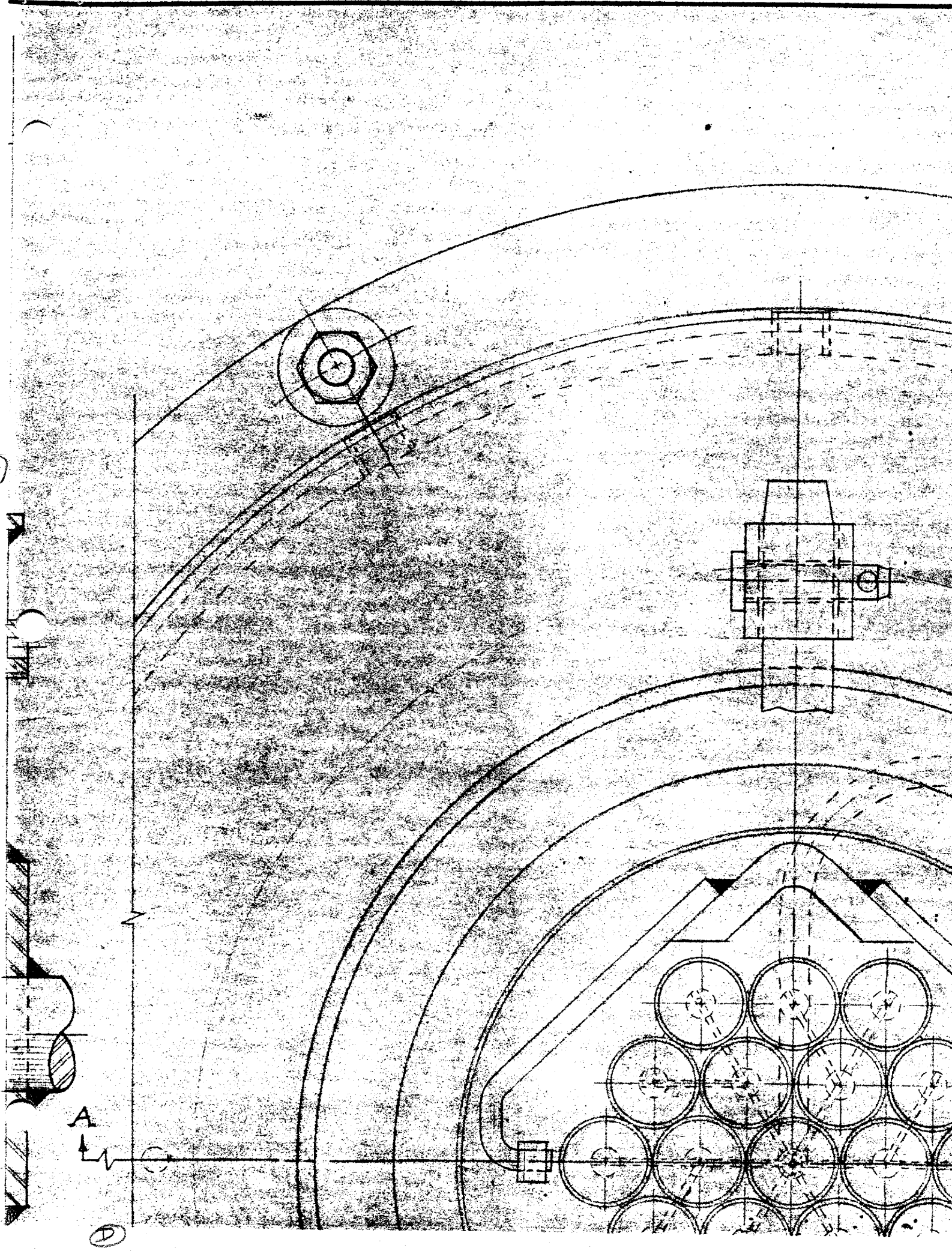

29½" DIA.
17" DIA.
A
B



REV. LTR.	REVISION	APPD.	DATE



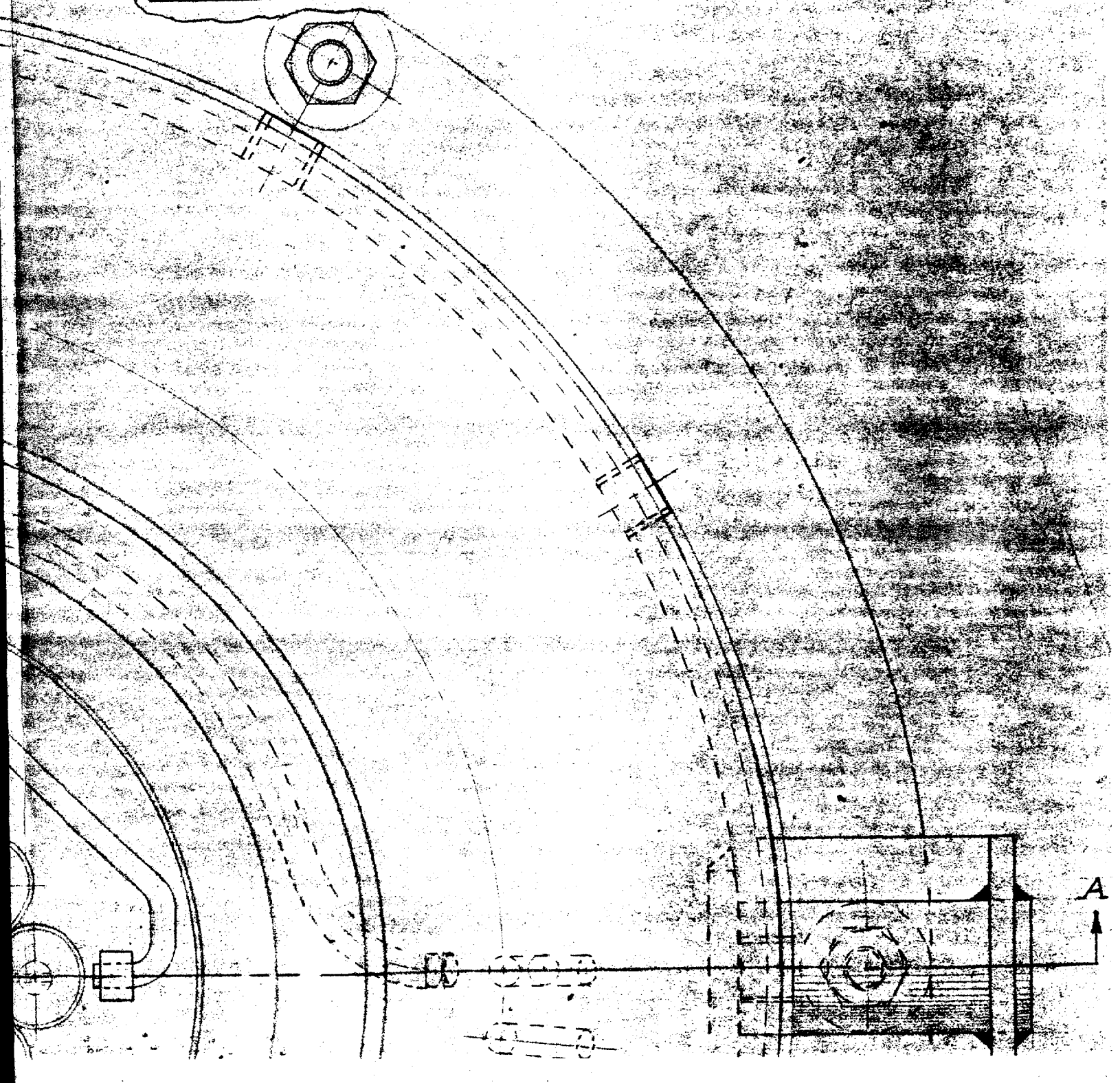
ECTION A-A

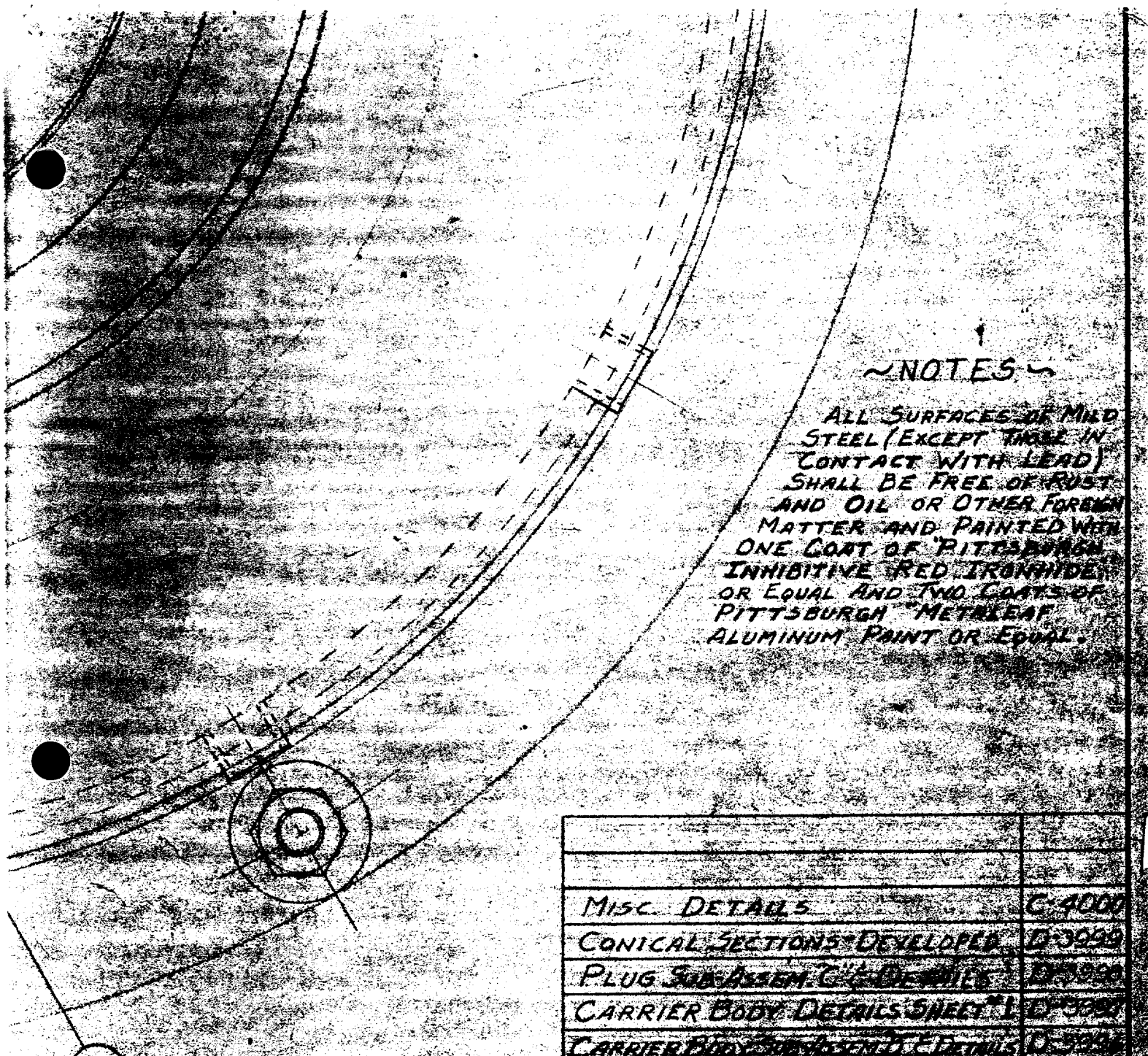

A
A
D

D-3994

PARTS LIST

ITEM NO.	DWG. NO.	NO. REQ'D	NAME	FINISHED SIZE	MATERIAL
A	D-3995	1	BASKET	———	———
B	D-3996	1	CARRIER BODY	———	———
C	D-3998	1	PLUG	———	———
1	C-4000	1	LOCKING BAR	1 1/4" × 1 1/4" × 23 1/2" LG.	STEEL BAR
2	C-4000	2	LOCKING BAR SAFETY PIN	1" DIA. × 2 3/4"	STEEL ROD
3	———	24	PIPE PLUG	1" STD. SCOKET HD.	M.I.
4	———	6	MACH BOLT # 3/4 - 10-NC × 3" LG. WITH HEX NUT & WASHER		STEEL





~NOTES~

ALL SURFACES OF MILD STEEL (EXCEPT THOSE IN CONTACT WITH LEAD) SHALL BE FREE OF RUST AND OIL OR OTHER FOREIGN MATTER AND PAINTED WITH ONE COAT OF "PITTSBURGH INHIBITIVE RED IRONHIDE" OR EQUAL AND TWO COATS OF PITTSBURGH "METALEAF" ALUMINUM PAINT OR EQUAL.

MISC. DETAILS	C-4000
CONICAL SECTIONS DEVELOPED	D-3990
PLUG SUB-ASSEM. C & DETAILS	D-3992
CARRIER BODY DETAILS SHEET #1	D-3993
CARRIER BODY SUB-ASSEM. B & DETAILS	D-3994
BASKET SUB-ASSEM. A & DETAILS	D-3995
REFERENCE DRAWINGS	D-W-[illegible]

(2) PLUG REMOVED)

THIS DOCUMENT CONSISTS OF 1 PAGES
NO. 10 OF 11 COPIES
SERIES B

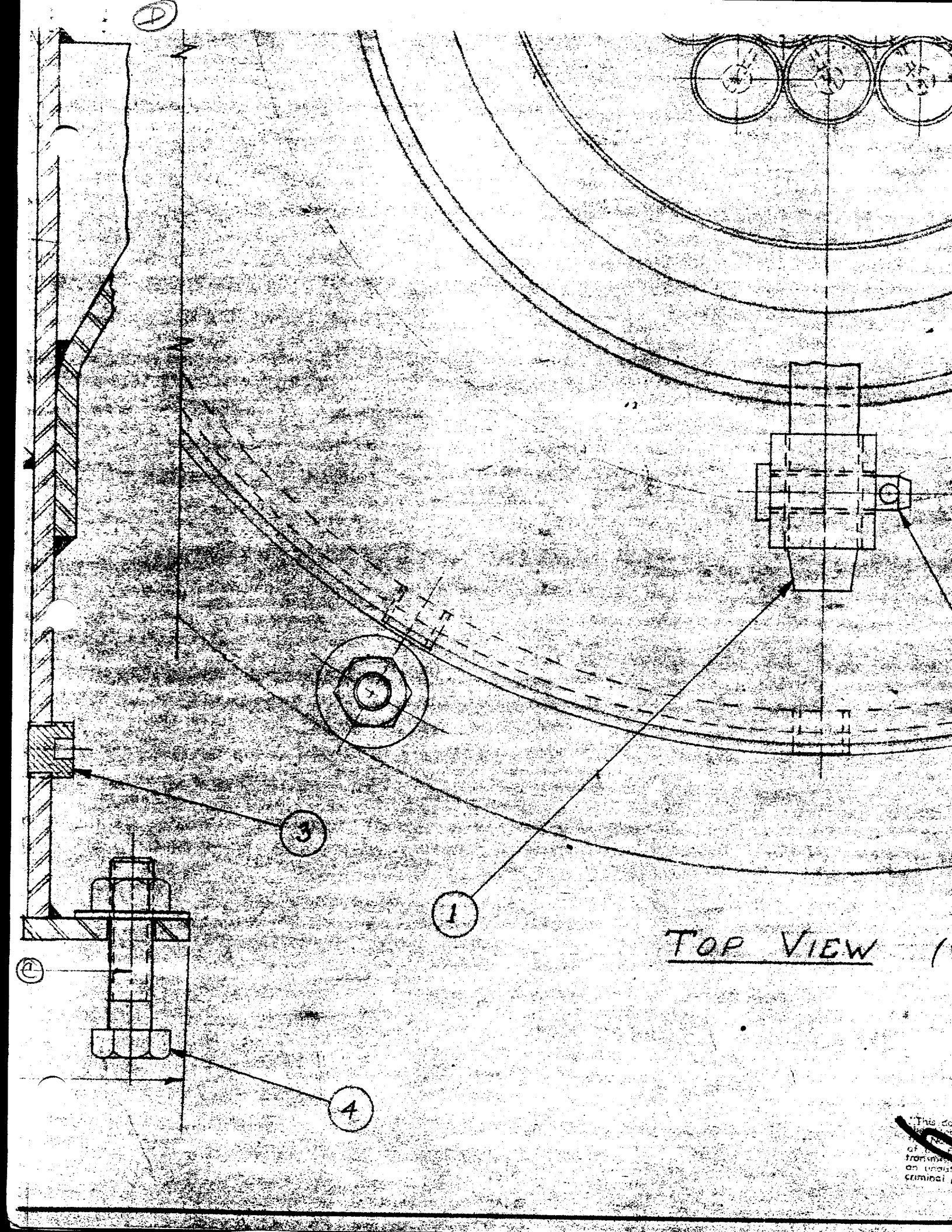
BLDG. 706-D
CARRIER FOR LARGE SLUGS
ASSEMBLY

THIS DRAWING HAS BEEN CLASSIFIED AS:-
~~SECRET~~
PER

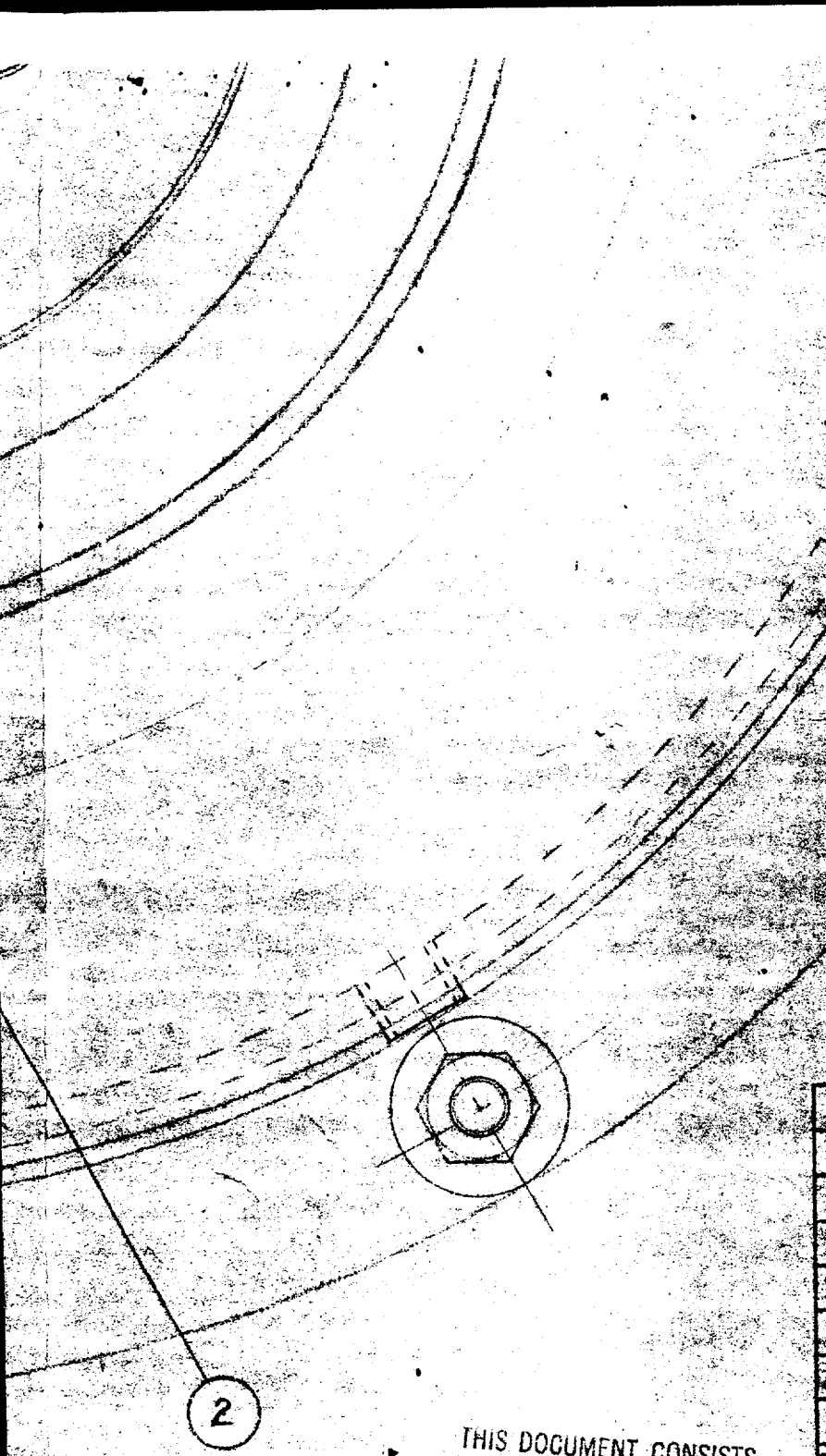
CLINTON NATIONAL LABORATORY
OAK RIDGE, TENN.

Francis D. 3-5-48	[illegible] 4-21-48	[illegible] 4-23-48	[illegible] 4-23-48	[illegible] 4-23-48	[illegible] 4-23-48	10

C-409-MR
SCALE: HALF
D-3994



TOP VIEW (



WITH PLUG REMOVED)

~NOTES~

ALL SURFACES OF M
STEEL (EXCEPT THOSE
CONTACT WITH LEAL
SHALL BE FREE OF RU
AND OIL OR OTHER FOR
MATTER AND PAINTED V
ONE COAT OF "PITTSBU
INHIBITIVE RED IRONHID
OR EQUAL AND TWO COATS
PITTSBURGH "METALEAF
ALUMINUM PAINT OR EQUAL.

MISC. DETAILS	C-4
CONICAL SECTIONS DEVELOPED	D-3
PLUG SUB-ASSEM'G & DETAILS	D-3
CARRIER BODY DETAILS SHEET #1	D-3
CARRIER BODY SUB-ASSEM'B & DETAILS	D-3
BASKET SUB-ASSEM'B A & DETAILS	D-3
REFERENCE DRAWINGS	DWG

THIS DOCUMENT CONSISTS OF 1 PAGES
NO. 10 OF 11 COPIES
SERIES B

BLDG. 706-D
CARRIER FOR LARGE SLUG ASSEMBLY

THIS DRAWING HAS BEEN CLASSIFIED AS:—
~~SECRET~~
PER

CLINTON NATIONAL LABORATORY
OAK RIDGE, TENN.

Engrg.	Engr. Dept.	Engr.	Engr.	Engr.	Engr.	Engr.
D. 3-5-48	C. 4-21-48	R. 4-23-48	4-23-48	4-23-48	4-23-48	4-23-48

C-409-MR
SCALE: HALF

D-3994

CARRIER FOR "W" SIZE SLUGS

Following is a description of the mechanical festures of the carrier shown on accompanying drawing, entitled "Carrier for Large Slugs - Assembly", No. D3994.

The carrier has a capacity of nineteen (19) "W" size slugs, a minimum shield thickness of ten inches of lead (or its equivalent of lead and steel), and a total weight of 6,522 pounds. The carrier is composed of four main parts; i.e., carrier body, lead-filled plug, locking bar, and slug basket. The design of these four parts was based on the following considerations:

1. Minimum weight consistent with the necessary shield thickness (see classified document, C.F. No. 48-2-202).

2. Adequate strength for rough usage.

3. Simplicity for underwater loading and unloading.

To obtain minimum weight, studies were made of various slug nesting arrangements and for this particular number of slugs, the hex shape shown was found to be the most compact and, thereby, give minimum outside dimensions for a carrier. Further, the ends of the carrier body were chamfered to eliminate superfluous shielding at the corners. A cylinder was chosen for the body shell because there is very little added weight over a hex and it is much simplier to construct and is also stronger.

To provide the necessary strength, the lead shield is covered inside and out with a skin of steel. This skin will eliminate the tendency of lead to creep, protect otherwise exposed lead surfaces and restrain the deformation of the lead in case of impact. Insofar as possible, these steel skin plates were made cylindrical or conical in shape for maximum strength. The outside and bottom of the carrier body are 3/8" thick mild steel and all other steel plates except the conical ends are $\frac{1}{4}$" thick, Type 347 stainless steel.

Heat conduction and dissipation are provided for in the following manner: To improve thermal conductivity, the fits between slugs and slug tubes and between slug basket and body of carrier have been held to a practical minimum (nominal clearance on diameter for slugs .019", for basket .005"). It is expected that slugs will be sized at the source by means of a ring gauge or other device to permit the use of this clearance. Heat dissipation will be by means of air convection and surface radiation. To increase the cooling surface, sixty-eight (68) $\frac{1}{2}$" O.D. tubes on 21-5/8" diameter tube circle have been cast in the lead shield. This increases the surface area by 13.2 square feet or approximately 46%. The total surface area then is 41.5 square feet.

Forced convection is quite possible by making use of the plenum chamber formed at each end of the carrier by the conical ends and using the tapped (3/4 NPT) holes in the wall of the carrier to connect blower hose to. However, it is not anticipated that forced convection will be required and the pipe plugs shown in the holes mentioned above will normally be removed to allow free convection.

Simplicity has been a prime requirement since the carrier must be loaded and unloaded under water. Also, simplicity means less costly construction.

The locking bar is held in place by two pins. Each is provided with a 3/8" diameter hole for a lock and/or a seal. This bar, of course, can safely be placed or removed, with the plug in place, when the carrier is out of the water. The plug can be removed under water by means of the eye provided and a hoist or chain fall. Next, the slug basket can be lifted out in the same manner (by means of the folding handle) so that the slugs are more accessible for lifting out with tongs. Should a slug stick in the tube, it can then be driven out with a $\frac{1}{2}$" diameter rod through the hole in the bottom plate of the slug basket. To facilitate loading under water, the top ends of the slug tubes are flared to 30° angle, $\frac{1}{4}$" deep. The inside diameter at the top end of the tube then is 1.60".

At the receiving end of shipment, the slugs will be transferred to charging machine, now being constructed, for introducing slugs into process equipment.

Other requirements have been met in the following manner:

Should the carrier become buried in the ground, it could be detected by the magnetic property of the mild steel in the body.

Not shown on the drawing is a cartridge or package of dye that can be attached to some part of the carrier that would serve to show its location should it be immersed in water.

The bottom plate of the carrier body provides a flange by which it can be bolted down to make it safe for air shipment.

J. J. Wallace
March 15, 1948

[redacted]

B-13

OAK RIDGE NATIONAL LABORATORIES
CENTRAL FILES NUMBER
48-5- 89

B-137

(d)

Date May 5, 1948

File

Subject Re: Shipment No. 33

Those Eligible To Read The Attached

By J. A. Leary

Copy # 1A

To E. J. Witkowski

E. J. Witkowski

Before reading this document, sign and date below:

Name	Date	Name	Date
H.B.	5/11/48		
EJW	5/11/48		

[redacted]

THIS DOCUMENT CONSISTS OF 1 PAGE(S)
NO 1 OF 4 COPIES, SERIES A

UNIVERSITY OF CALIFORNIA
LOS ALAMOS SCIENTIFIC LABORATORY
(CONTRACT W-7405-ENG-36)
P. O. Box 1663
Los Alamos, New Mexico

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-5-89

IN REPLY
REFER TO: LAB-CMR-10-10

May 5, 1948

CLASSIFICATION CANCELLED
DATE SEP 14 1994
For the U. S. Energy Research and Development Administration
PSB
Division of Classification

Mr. E. J. Witkowski
Superintendent, 706-D Area
Clinton National Laboratory
Oak Ridge, Tennessee

Dear Ed:

In confirmation of our telephone conversation of May 3, 1948, we are sending the following information as regards Shipment No. 33:

Date received at Los Alamos - March 16, 1948.
La^{140} activity at 1230 Hrs. (E.S.T.), on 3/16/48 - 2920 "curies".
Estimated Ba^{140} activity at L.S.T. (1030 Hrs. E.S.T. on 3/12/48) - 4,170 curies.

Due to limitations in our present equipment the first milking of this shipment was not made until March 24, at which time the activity had decayed to 2305 c. An overall yield of less than 30% was obtained after considerable difficulty with most of the loss occurring at the oxalate precipitation step. When the oxalate filtrate container was decontaminated several weeks later, a considerable bulk of dark gelatinous residue was observed in the filtrate. We cannot account for its presence, and see no way in which we could have introduced such a large amount of impurity. No trouble was encountered in the second, third, or fourth milking.

At present we are undergoing minor alterations of process equipment. It is anticipated that operations will be resumed during the latter part of June. We would therefore like to establish June 25 as a tentative delivery date of Shipment No. 34. A more specific date will be requested by telephone about June 8, 1948.

We hope that this is compatible with your plans. In the event that it is not, please notify us and we will make the necessary changes, as our schedule is quite flexible.

Very truly yours,

J. A. Leary

J. A. Leary

JAL:mw
cc: D. W. Mueller
[redacted]
Central Records
File

[redacted]

CLASSIFICATION CANCELLED
ADD signature
Date 11/19/95
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

[redacted]T

OAK RIDGE NATIONAL LABORATORIES
CENTRAL FILES NUMBER
48-5- 47

B-137

Date May 4, 1948

File

Subject Facility Requirements for RALA Production

Those Eligible To Read The Attached

By C. N. Rucker/L. B. Emlet

Copy # 4A

To F. H. Belcher

~~J. C. Stewart~~

~~W & V-A (15)~~

DWC 6(2)

Before reading this document, sign and date below:

Name	Date	Name	Date

INV 64

INV 65

This document has been approved for release to the public by:

David R. Hamm 2/9/95
Technical Information Officer
ORNL Site
Date

[redacted]RET

[redacted]

2

0

f 8 A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
48-5-47

May 4, 1948

Classification Cancelled
~~Or Changed To~~ _____
By Authority Of _____
By _____ Date AUG 25 1971

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Mr. F. H. Belcher

Subject: FACILITY REQUIREMENTS FOR RaLa PRODUCTION

Ref: LABR:JS - F. H. Belcher to C. E. Runkar, dated April 22, 1948 - subj: RaLa Production at Oak Ridge National Laboratory

Gentlemen:

In the reference letter information on the two following points was requested:

1. Alterations and additions that will be necessary to continue RaLa production at Oak Ridge National Laboratory with the existing facilities for the next two years, including an estimate of the costs.

2. What new facilities will be required if RaLa production is to continue at Oak Ridge National Laboratory indefinitely and an estimate of this cost.

Past experience allows us to make estimates with a reasonable degree of accuracy on the first point. An expenditure of $225,000.00 to $500,000.00 will be required to continue RaLa production at the Oak Ridge National Laboratory for the next two years. The cost of this program will depend on whether Oak Ridge or Hanford exposed slugs are used. The use of Oak Ridge material will require additions and alterations estimated at $500,000.00. The maximum size batch with locally exposed material will be limited to 5,000 curies. By using Hanford exposed uranium, a 12,000-curie batch is possible with an expenditure of $225,000.00. (1)

(1) Note - For a comparison of operating costs of Oak Ridge vs. Hanford slugs, see memorandum - L. B. Emlet to J. C. Stewart, dated October 15, 1947; subj: Use of Hanford Material for RaLa Production.

[redacted]

[redacted]

Regardless of the source of the uranium used, a 250-stack to handle radioactive process gases is essential to provide safe operating conditions. The cost of this installation is estimated to be about $210,000.00. It is planned that this stack will not only handle the RaLa process gases but will also provide a stack for active gases from the 706-C Building (Hot Laboratory) and the additional facilities required for the production of radioisotopes.

If Oak Ridge exposed slugs are used, a new waste metal storage tank will probably have to be installed to handle the large amounts of uranium. The cost of this tank is estimated at $275,000.00. The use of Hanford-irradiated slugs will eliminate the need for this tank. However, $15,000.00 will be required for the fabrication of shipping containers and other handling equipment for the Hanford slugs.

Information on the second point, i.e. - RaLa production at Oak Ridge National Laboratory for an indefinite period - is not readily accessible. The continued use of the present process or equipment should be ruled out at once. The precipitation process now in use was developed under the war-time urgency and although it supplied Ba^{140} in the quantities required, it is grossly inefficient. To accurately estimate the costs of providing a new process and new equipment will require a large scale development study. It is our present thinking that the production of RaLa should be combined with the production of other desirable fission products, such as zirconium (Zr^{95}) and columbium (Cb^{95}). This could best be done by using Hanford-exposed uranium, or preferably by using the fuel rods of enriched uranium from a high flux pile (flux of 10^{14} or greater). The cost of such a chemical separation unit will depend on the batch size, the type of process, and other unknown factors. Using the construction costs of the present building (706-D was built for $500,000.00 in 1944) as a guide, it seems fair to predict that better and safer facilities can be provided for less than $1,000,000.00. When you consider that at present our annual operating costs for RaLa are about $500,000.00, this expenditure does not appear to be excessive. An improved process and equipment would most certainly reduce these expenses.

The above information and that supplied in our previous letters(1)(2) give a rather complete picture of the RaLa production problem. We would appreciate learning your decision on the RaLa program as soon as possible.

(2) C. N. Rucker to R. W. Cook, dated April 7, 1948; subj: RaLa Production at Oak Ridge National Laboratory

Very truly yours,

C. N. RUCKER
Executive Director

LBEmlet:wp

1-3. F. H. Belcher
4. J. C. Stewart
5. L. B. Emlet
6-8. C. N. Rucker

[redacted]

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

COPY

Central Files
No.
48-4-106
~~(DOE 5th Ed)~~
DOE 6(5)

April 7, 1948

U. S. Atomic Energy Commission
Oak Ridge Directed Operations
P. O. Box E
Oak Ridge, Tennessee

Attention: Mr. R. W Cook, Deputy Manager

Subject: RALA PRODUCTION AT OAK RIDGE NATIONAL LABORATORY

Gentlemen:

INV. 65

In the Program Review Meeting held at Oak Ridge National Laboratory on March 31, 1948, several questions were raised concerning the future of RaLa production at this site. It was generally agreed that this problem would have to be discussed with Mr. W. J. Williams. This memorandum, which will attempt to briefly outline our view of the RaLa picture, results from our telephone conversation of Spril 6, 1948, on this subject.

The present RaLa production building (706-D) was designed, built, and placed in operation early in 1945 during the wartime rush. Many shortcuts were taken in process development, design, and construction because of the urgency to produce substantial amounts of radioactive Ba^{140}.

It is difficult to predict the life of the present building. The interior of the concrete cells and, particularly, the concrete ventilation ducts (located below the floor level of the cells) are badly corroded. The black iron beams and tank supports are being continually replaced. It is extremely doubtful if the building will remain in operable condition for more than three years without extensive maintenance.

In October, 1947, we received the following production estimates (1) from the Los Alamos Laboratory:

1948 & 1949 - 25,000 curies/year in ten equally spaced shipments.

1950 - 80,000 curies/year in eight equally spaced shipments.

(1) Letter from C. E. Winters, AEC, to Prescott Sandidge dated October 20, 1947; subj: RaLa Production.

[redacted]

During the summer of 1947 a study was made of the potential capacity of the present RaLa production facilities. Using Oak Ridge irradiated uranium, a maximum production of 7,000 curies/batch can be realized. Probably, however, a more realistic figure would be 5,000 curies/batch. If Hanford irradiated slugs are transported to Oak Ridge by plane, at least 12,000 curies of RaLa can be isolated/run. The use of Hanford uranium for RaLa production has other desirable features.(2)

1. Conservation of uranium. - At the present time we use about 2,000 pounds of Oak Ridge exposed slugs to produce 2,500 curies of RaLa. Two hundred pounds of Hanford material will produce the same amount of RaLa, thus, saving approximately 1,800 pounds of uranium.

2. Increased waste metal storage space. - The Oak Ridge waste metal storage system has sufficient free space to store the metal wastes from approximately fifteen more RaLa runs, using X-10 exposed uranium. If Hanford exposed material is used, the Tank Farm Area will provide waste metal storage space for an indefinite period.

In January, 1948, the Atomic Energy Commission(3) requested us to develop and construct a container for transporting Hanford irradiated slugs to Oak Ridge by plane. This container has been designed and we are now awaiting approval of this carrier from the Hanford Engineer Works.

From a long-range view, it is desirable to locate the RaLa production at the site chosen for the High Flux Pile (flux of 10^{14}). Rough estimates indicate that ten grams of U^{235} from a depleted fuel rod could be used to produce 2,500 curies of RaLa.

Lack of knowledge concerning the future requirements of RaLa and the existing uncertainty on the location of a High Flux Reactor lead us to the following recommendations, which are submitted for your consideration:

1. Erect a 250-foot stack and make other necessary renovations to the existing RaLa production equipment to provide adequate facilities for <u>safely</u> processing exposed uranium.

(2) Letter from L. B. Emlet, Clinton Laboratories, to J. C. Stewart, AEC, dated October 15, 1947; subj: Use of Hanford Material for RaLa Production.

(3) Letter from John Shilling, Jr., AEC, to Prescott Sandidge, Clinton Laboratories, dated January 5, 1948; subj: RaLa - Proposal to Use Hanford Slugs.

2. Complete the preparatory work and start using Hanford exposed material for RaLa Production as soon as possible (perhaps by August, 1948).

3. Start development work immediately on a new RaLa process including the large scale isolation of other valuable fission products, such as the following:

Isotope	Half Life
Y^{91}	57 days
Zr^{95}	65 days
Cb^{35}	35 days
Ru^{103}	42 days
Ru^{106}	1 year.

The development work can be designed to use either normal uranium (Hanford irradiated) or enriched material from a high flux pile fuel rod as the starting material.

If more detailed information from us is necessary before the RaLa Program is determined, a conference with the interested parties can be arranged.

Very truly yours,

Original Signed By
C. N. Rucker
C. N. Rucker
Executive Director

LBE:wp
1-3 R. W Cook
4 F. H. Belcher
5 L. B. Emlet
6 C. N. Rucker File

INTER-COMPANY CORRESPONDENCE

(INSERT NAME) COMPANY CARBIDE AND CARBON CHEMICALS CORP. LOCATION Post Office Box P OAK RIDGE, TENN.

Doc. No. 48-4-465
per Central Files
11-27-56
mms

TO LOCATION Mr. C. N. Rucker

DATE April 5, 1948

Classification Cancelled

ANSWERING LETTER DATE

ATTENTION

COPY TO

Cr ~~Changed To~~ [redacted]

SUBJECT Comments on the Production of RaLa

By Authority Of [redacted]

By BMS Date AUG 27 1971

INV. 64

In the Program Meeting of Thursday, March 31, 1948, with members of the Atomic Energy Commission, a question was raised concerning the future of RaLa production. This memorandum will attempt to briefly outline the present procedure and plans, as well as make recommendations for future work and facilities based on our knowledge of the overall RaLa Program.

1. We are at present using approximately one ton of Clinton irradiated slugs to produce 2,500 curies of RaLa.

2. An average cost of $57,500.00 per batch has been estimated for this process (October, 1947).

3. Calculations indicate that we will be able to make the same quantity of RaLa from approximately two hundred pounds of Hanford irradiated material, thus reducing the uranium consumption by a factor of ten.

4. Processing of Hanford irradiated material would cost an estimated $34,500.00 per batch, or a savings of $23,000.00, all of which would be from conserving metal.

5. It is difficult to predict how long the present 706-D Building will last. The interior of the cells and, particularly, the concrete ventilation duct, which is located below the floor level of the cells, are badly corroded. Most of the black iron supports for the tanks have been corroded away by the use of decontamination acids so that they are continually being replaced.

6. In a letter from C. E. Winters, AEC, to Prescott Sandidge, dated October 20, 1947, it was predicted that for the years 1948 and 1949 Los Alamos would require approximately 25,000 curies of RaLa per year delivered in ten shipments. This letter also indicated the possibility that by 1950 approximately 80,000 curies per year would be required in eight equally spaced shipments.

This document has been approved for release to the public by: Technical Information Officer ORNL Site 3/9/95 Date

CLASSIFICATION CANCELLED ADD signature 2/8/95 Date Single rereview of CCRP-declassified documents was authorized by DOE Office of Classification memo of August 22, [illegible]

[redacted]

"This document contains restricted data [redacted] transmission [redacted] an unauthorized person is prohibited by law. [redacted] criminal penalty."

WCX-163 THIS FORM FOR INTER-COMPANY CORRESPONDENCE ONLY

[redacted]

7. Maximum production in the present Oak Ridge National Laboratory facility using Clinton slugs is about 7,000 curies per batch. The use of Hanford irradiated slugs will enable us to produce a maximum of 12,000 curies per batch. (Practical limits might be 5,000 and 10,000 curies, respectively.)

8. From a long range standpoint, it appears desirable to locate another RaLa production facility on the site chosen for a high flux reactor. Rough calculations show us that approximately ten grams of a depleted fuel rod from the High Flux Pile (flux of 10^{14}) would supply the customer with 2,500 curies of barium.

9. Because of the existing uncertainty as to future requirements of RaLa and the location of a high flux pile (enriched metal), the following recommendations are submitted for your consideration:

   a. Erect a new stack and do other renovation of the present 706-D Building to provide adequate facilities for the safe processing of Clinton irradiated material.

   b. Continue our present plans and minor design changes which will be required to handle Hanford irradiated material.

   c. Start using Hanford irradiated materials as soon as all of the problems have been solved. (Perhaps by August, 1948).

   d. Start research and development work immediately on a new RaLa process (also including the isolation of other valuable fission products).

If you care to discuss any of these points in more detail, this can be done at your convenience.

L. B. Emlet

LBE:wp

[redacted]

"This document contains restricted data within the meaning of the [redacted] of the transmission [redacted]

This document consists of [redacted] pages and 3 attachments. Copy 6 of 6 copies, Series A

G. L. B. Emlet Copy

Blind copies to: B-13
2. C. N. Rucker
3. F. H. Belcher (Att: J.Shilling)
4. J. A. Lane
5. E. J. Witkowski — att (1) - No print

[redacted]

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

March 10, 1948

Mr. C. E. J. Wende
General Electric Company
Hanford Engineer Works
Richland, Washington

Subject: USE OF HANFORD IRRADIATED SLUGS FOR RALA PRODUCTION

INV. 64

Dear Charlie:

In October of 1947 we completed a survey of the present Rala process with Clinton irradiated slugs and compared it with a proposed method of using Hanford irradiated material. The results of this study indicate that the use of Hanford slugs will reduce our processing time by about fifty percent and also conserve uranium metals. Our metal waste storage tanks are rapidly approaching their capacity so that this last point is particularly important. [illegible] was found to be the most compact and, thereby, give the most [illegible] Mr. J. A. Lane discussed the matter of loading and transporting Hanford irradiated slugs with you during his recent visit to Hanford. The attachments, I believe, will give you the necessary information to reach a decision as to whether or not you feel the design of the proposed carrier is satisfactory from your standpoint.

In a letter from the Atomic Energy Commission, dated January 8, 1948, they requested that we develop and construct a container which would be fireproof and gastight for the transportation of Hanford irradiated slugs to Oak Ridge National Laboratory. The attached print is the result of this study. Before we fabricate any of these containers, we would appreciate your comments to determine if it is of adequate design to allow loading at the Hanford Plant.

Very truly yours,

[redacted]
LOGAN B. EMLET
General Superintendent
Operating Division

Attachments:
(1) Print "Carrier for Large Slugs"
(2) Write-up explaining use of "F" Size Slug Carrier
(3) Memorandum, J. A. Lane to L. B. Emlet, dated February 16, 1948; subj: Carrier for Hanford Slugs; C.F.No. 48-2-202.

Sent to C Hunter Stone CF on 4/29

[redacted]

~~SECRET~~

CARRIER FOR "J" SIZE SLUGS

Following is a description of the mechanical features of the carrier shown on accompanying drawing, entitled "Carrier for Large Slugs - Assembly", ~~#~~ D-3994.

The carrier has a capacity of nineteen (19) "J" size slugs, a minimum shield thickness of ten inches of lead (or its equivalent of lead and steel), and a total weight of 6,522 pounds. The carrier is composed of four main parts; i.e., carrier body, lead-filled plug, locking bar, and slug basket. The design of these four parts was based on the following considerations:

1. Minimum weight consistent with the necessary shield thickness (see classified document, U.S.A.E.C. No. AECD-3638).
2. Adequate strength for rough usage.
3. Ventilation and dissipation of heat.
4. Flexibility for underwater loading and unloading.

To obtain minimum weight, studies were made of various slug nesting arrangements and for this particular number of slugs, the hex shape shown was found to be the most compact and, thereby, give minimum cask side dimensions for a carrier. Further, the ends of the carrier body were chamfered to eliminate superfluous shielding at the corners. A cylinder was chosen for the body shell because there is very little added weight over a box and it is much simpler to construct and is also stronger.

Other requirements have been met in the ground, it would

To provide the necessary strength, the lead shield is covered inside and out with a skin of steel. This skin will eliminate the tendency of lead to creep, protect otherwise exposed lead surfaces and restrain the deformation of the lead in case of impact. Insofar as possible, these steel skin plates were made cylindrical or conical in shape for maximum strength. The outside and bottom of the carrier body are 1/2" thick mild steel and all other steel plates except the conical ends are 1" thick, Type 347 stainless steel.

Heat conduction and dissipation are provided for in the following manner. To improve thermal conductivity, the fit between slugs and slug tubes and between slug basket and body of carrier have been held to a practical minimum (nominal clearance on diameter for slugs .010", for basket .020"). It is expected that slugs will be sized at the source by means of a ring gauge or other device to permit the use of this clearance. Heat dissipation will be by means of air convection and surface radiation. To increase the cooling surface, sixty-eight (68)

~~SECRET~~

This document contains restricted data within the meaning of the Atomic Energy Act of 1946 and information affecting the National Defense of the United States within the meaning of the Espionage Act, U.S.C. 50 and 32 as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited.

DOCUMENT SEPARATED FROM ENCLOSURE AS HANDLED

½" O.D. tubes on 21-5/8" diameter tube circle have been cast in the lead shield. This increases the surface area by 15.2 square feet or approximately 46%. The total surface area then is 61.8 square feet. Forced convection is quite possible by making use of the plenum chamber formed at each end of the carrier by the conical ends and using the tapped (3/4 NPT) holes in the wall of the carrier to connect blower hose to. However, it is not anticipated that forced convection will be required and the pipe plugs shown in holes mentioned above will normally be removed to allow free convection.

Simplicity has been a prime requirement since the carrier must be loaded and unloaded under water. Also, simplicity means less costly construction.

The locking bar is held in place by two pins. Each is provided with a 3/8" diameter hole for a lock and/or a seal. This bar, of course, can safely be placed or removed, with the plug in place, when the carrier is out of the water. The plug can be removed under water by means of the eye provided and a hoist or chain fall. Next, the slug basket can be lifted out in the same manner (by means of the folding handle) so that the slugs are more accessible for lifting out with tongs. Should a slug stick in the tube, it can then be driven out with a ½" diameter rod through the hole in the bottom plate of the slug basket. To facilitate loading under water, the top ends of the slug tubes are flared to 30° angle, ½" deep. The inside diameter at the top end of the tube then is 1.60".

At the receiving end of shipment, the slugs will be transferred to charging machine, now being constructed, for introducing slugs into process equipment.

Other requirements have been met in the following manner:

Should the carrier become buried in the ground, it could be detected by the magnetic property of the mild steel in the body.

[illegible] shown on the drawing is a cartridge or pellet of [illegible] that can be provided in some part of the carrier which would serve to show the location should it be lowered in water.

The bottom plate of the carrier body provides a flange [illegible] which it can be bolted down by means of suitable [illegible]

SECRET

B-13

MS21

KV59 PD WUX TDSK RICHLAND WASH APR 20 856A

L B EMLET

CLINTON LABS

DESIGN OF CONTAINER LOOKS SATISFACTORY TO US

W P OVERBECK GENL ELEC CO.

B-137

Date March 16, 1948

File

Subject Rala Run # 24, Shipment # 33

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 5A

To J. A. Leary

C. File

Before reading this document, sign and date below:

	&

OAK RIDGE NATIONAL LABORATORY

operated by
CARBIDE AND CARBON CHEMICALS CORPORATION

[redacted]

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

March 10, 1948

This document consists of 1 pages and 0 figures. Series A

[redacted]

Lab Run #24, Shipment # 3

[redacted] our radiation reading, taken at 24 hours after [redacted] contained approximately 3575 curies [redacted] at LST 1030 EST on March 14, 1948. The [redacted] of this measurement, however, is very questionable [redacted] of the radiochemical analyses made of our previous [redacted] and the abnormally rapid rate of increase of radiation [redacted] the product between LST and 20 hours after LST.

[redacted] process of removal of the product from the [redacted] It has also been noted that some foreign material [redacted] the shoulder of the cone. At this stage of the [redacted] impossible for us to correct this matter [redacted] the material was shipped that way.

[redacted] sincerely hope you encounter no difficulty in [redacted] this material and will be anxiously awaiting your [redacted] of our product.

Yours very truly,

E. J. Witkowski

E. J. Witkowski

[redacted] A. Leary
[redacted] J. Witkowski
[redacted] B. Kelly
[redacted] Reading File
[redacted] Central File

EJW:jc

CLINTON LABORATORIES

CENTRAL FILES NUMBER

48-2- 202

[redacted]

File 3109 5010

Date February 13, 1948

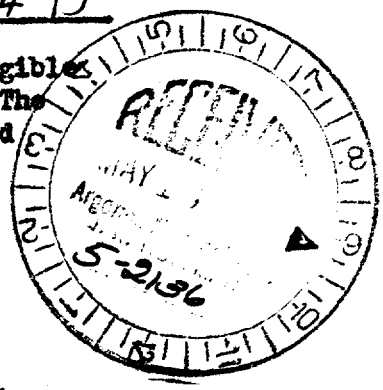
Copy # 4 D

Subject Carrier for Hanford Slugs

Those Eligible To Read The Attached

To: L. B. Emlet

From: J. A. Lane



Before reading this document, sign and date below:

Name	Date	Name	Date
[redacted]	2/17/48		

Distribution:

1. L. B. Emlet
2. L. B. Emlet
3. M. C. Leverett
4. J. R. Huffman
5. J. R. Huffman
6. J. A. Lane
7. Central Files

CLASSIFICATION CANCELLED

DATE 10/3/66

For The Atomic Energy Commission

Chief, Declassification Branch

This document consists of 6 pages and 0 figures. No. 4 of 7 copies. Series A.

[redacted]

February 13, 1948

To: L. B. Emlet

From: J. A. Lane

CARRIER FOR HANFORD SLUGS

The following calculations provide the basis for the design of a carrier to ship hot slugs from Hanford, which contain a total of 5,900 curies of Ba^{140} about eight hours after discharge from the pile.

Barium Activity

weight of slug = 8.17 lbs = 3710 grs.
grams of 25 per slug = 26.3
25 cross section = $\frac{6 \times 10^{23} \ (550 \times 10^{-24})}{235}$

$= 1.4 \ cm^2/gram$

For flux of 1×10^{13} neutrons/cm^2(sec), the number of fissions per second per slug is,

$$1.4 \ (10^{13}) \ 26.3 = 3.7 \times 10^{14}$$

The Ba-La activity at time of discharge is,

$$\frac{R(1-e^{-\lambda t})}{3.7 \times 10^{10}}$$

where, R = atoms Ba formed per second

λ = fissions/second times .0655

t = irradiation time, days

= decay constant of Ba^{140} = $\frac{0.693}{12.5}$

= .0553/day

[redacted]

Thus, $A_o = \frac{3.7 \times 10^{14} (.0655)}{3.7 \times 10^{10}}$

$= 655$ curies of Ba^{140} per slug

Barium Activity (alternate method)

For operation at 250,000 kw and 200 tons of metal in the pile, the hottest slugs being twice the average,

$$\frac{250{,}000 \times 2}{200} = 2500 \text{ kw/ton}$$

$$= 1.25 \text{ kw/lb}$$

$$= 10 \text{ kw per slug}$$

There are 3.1×10^{13} fissions/second per kw, or 3.1×10^{14} fissions per second per slug. This is equivalent to $A_o = 550$ curies of Ba^{140}.

After eight hours, the Ba activity is,

$$A = A_o e^{-.0553T} = 0.98 A_o$$

After an additional two days,

$$A = 0.88 A_o$$

Thus there will be 483 curies per slug on arrival of shipment.

A total of 5900 curies require 12 hottest Hanford slugs reacted about 60 days and cooled not more than 3 days.

Heat Evolution

The heat evolution during operation of the pile associated with 5900 curies of Ba is,

$$\frac{(5900)}{(.98)} \frac{10}{550} = 110 \text{ kw}$$

After eight hours the fractional heat given by Borst-Wheeler is,

$$6 \times 10^{-3}$$

Thus heat evolution of batch after eight hours is 660 watts or 2250 Btu/hour.

Radiation Intensity

Assume that slugs are packed in a cube 8" x 8" x 8". The radiation intensity is given by,

$$I = \frac{I_o}{uh} (F_1)$$

where, I = intensity at surface of container

I_o = intensity per unit volume at 1 cm

u = absorption coefficient of source material = 1.93/inch

h = depth of source, in

F_1 = function to correct for distribution of source (See Project Handbook, Chapter V)

For 10 inches of Pb shielding $F_1 = 1.9 \times 10^{-9}$

and, $I_o = 6900\ (9.4)\ 10^4$

$= 5.6 \times 10^8$ r/8 hrs @ 1 cm

thus, $I = \frac{5.6 \times 10^8}{(8)\ 1.93}\ 1.9 \times 10^{-9}$

$= .07$ r/8 hrs at surface of container.

This allows insertion of 1/2" cooling holes through carrier without increasing shielding thickness.

[redacted]

Temperature Rise of Slugs

a) At the surface of the container the air film rise is given by,

$$\Delta T_f = \frac{q}{hA}$$

For a cylindrical container 30" diam. x 30" high

$A = 24$ sq ft

$h = 1$ Btu/hr (sq ft)(°F)

$q = 2250$ Btu/hr

$$\Delta T_f = \frac{2250}{24 \times 1} = 94°F$$

If additional cooling holes are provided through the lead, for 1/2 inch holes (69 holes on 1" centers at radius of 11 inches) the additional area = 18 sq ft.

$$\Delta T_f = 55°F$$

b) The temperature rise through the lead carrier is given approximately by,

$$\Delta T_{Pb} = \frac{q}{4\pi k} \left(\frac{1}{r_i} - \frac{1}{r_o}\right)$$

where,

$k = 20$ Btu/hr (sq ft)(°F/ft)

r_i = internal radius = 5"

r_o = external radius = 17"

$$\Delta T_{Pb} = \frac{2250}{4\pi (20)} \left(\frac{1}{0.413} - \frac{1}{1.48}\right)$$

$$= 16°F$$

c) The temperature rise across an air gap between slug basket and carrier is,

$$\Delta T_a = \frac{ql}{kA}$$

where,

$k = 0.016$ Btu/(hr)(sq ft)(°F/ft)

$A = 2.2$ sq ft

l = clearance = 0.005"

$$\Delta T_a = \frac{(2250)}{(2.2)} \frac{.005}{12(.016)} = 55°F$$

d) The temperature rise through slugs is given approximately by,

$$\Delta T_s = \frac{q_o r^2}{6k}$$

$$= \frac{q}{8\pi rk}$$

where, q_o = heat generated per unit vol

k = thermal conductivity of slugs plus contacting medium

r = radius of basket

Assuming all uranium in basket $k = 12$, $r = 0.415$ ft, $q = 2250$,

$$\Delta T_s = \frac{2250}{8\pi (0.41)12} = 2^oF$$

If good thermal contact is maintained between slugs and carrier, the maximum slug temperature will be,

$$T_a + \Delta T_f + \Delta T_a + \Delta T_s + \Delta T_{Pb} = 245^oF$$

It is recommended that a carrier similar to that used for the shipment of 25 alloy slugs be used for shipment of hot Hanford slugs, with some modification of basket to provide good thermal contact. A sketch of this type carrier is given in drawing E-1191, "Large Size Slug Carrier".

J. A. Lane
Process Design Section

JAL/mmd

Special Report

SECRET

48-2-447

File

Copy # 2

INV. 64

Classification Cancelled
or Changed To
By Authority Of
By
Date

To: C. H. Perry

From: H. A. McClearen

Subject: Restricted Area Background Counts for Period 1/12/48 to 1/28/48, during Barium Run in 706-D.

Date: February 4, 1948

Before reading this document, sign and date below:

1. C. H. Perry
2. H. A. McClearen

SECRET

[redacted]

This document consists of 5 pages and no figures. No. 2 of 3 copies. Series A.

February 4, 1948

Ted Davis 11/30/95

To: C. H. Perry

From: H. A. McClearen

Subject: Restricted Area Background Counts for Period 1/12/48 to 1/28/48, during Barium Run in 706-D.

Conclusions: The data obtained in this survey is not complete enough to permit the direct correlation of rises in background activity with definite events in 706-D operation procedures.

The data obtained is good, in that it indicates the increased background in the restricted area during the barium run of 1/14/48 to 1/23/48. Graphs of the daily counts follow the same general curve with few exceptions for the ten different locations. The counts taken for two days before the run started were low. All counts were up considerably on 1/14/48, possibly corresponding to the first dissolving of slugs. Subsequent dissolving of thirteen batches of slugs kept the background high during the period 1/14/48 to 1/19/48. A great increase in background is noted for 1/22/48 to 1/23/48, since the product was removed from the cell and shipped during this period.

Recommendations: If it is desired to correlate the background activity variations with operating procedures it will be necessary to have the background activity recorded constantly, or at very short time intervals, at a number of different locations. The data thus obtained can then be compared with operating schedules for the various locations, and more definite conclusions can be drawn.

Details and Procedures:

Equipment used included a Higinbotham scaler, scale of 64, equipped with a standard thin-walled GM tube covered with one layer of bond paper. The GM tube and guard were cleaned and background wax reduced to a minimum. Counts were taken for eleven days over a seventeen day period at ten locations. These counts

[redacted]

were taken before, during and after the barium run. Graphs were drawn to give a comparative picture of the data.

HAM/jp

H. A. McClearen

This document contains restricted data within the meaning of the Atomic Energy Act of 1946 and/or information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C. [illegible] as amended. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalty.

LOCATION	PM 1-12-47 C/M	PM 1-13-47 C/M	PM 1-14-47 C/M	AM 1-16-47 C/M	AM 1-19-47 C/M	AM 1-20-47	PM 1-21-47	[illegible] 1-22-47	[illegible] 1-23-47	[illegible] 1-26-47	1-28-47
22' WEST OF 706-C	477	460	735	432	592	401	353	436	642	820	717
12' SOUTH OF 735-B	233	289	380	264	487	288	391	398	543	917	857
(10' S. OF OFF GAS LINE) 30' S.W. OF 205	583	574	1939	1501	2639	1642	1261	1623	1752	832	1,819
25' SOUTH OF 105	685	444	858	792	1023	695	571	1095	1435	1810	2,027
OVER NW DRAIN @ 115	1123	619	685	849	1720	495	1108	893	1210	927	712
10' N OF 706+D FAN HOUSE	3.9 M/H	6.0 M/H	5.2 M/H	4.5 M/H	6.6 M/H	6.0 M/H	5.8 M/H	14.0 M/H	21 M/H	26 M/H	25.5 M/H
8' S. OF 717 Q	625	569	906	692	1088	854	779	2239	1.4 M/H 5,727	6240	4 miles 5,982
5' S OF 706-D	269	243	673	264	401	328	347	358	636	594	586
25' S.W. CORNER 706-A	402	545	606	451	588	424	440	471	580	1148	578
RESTRICTED A. GATE	188	285	199	190	249	173	210	281	325	512	386

CLINTON LABORATORIES

CENTRAL FILES NUMBER

48-2- 155

B-137

File

Those Eligible To Read The Attached

Copy # 24

Central Files

INV. 64

INV. 65

Date January 30, 1948

Subject Re: Milking of Shipment No. 32

By J. A. Leary

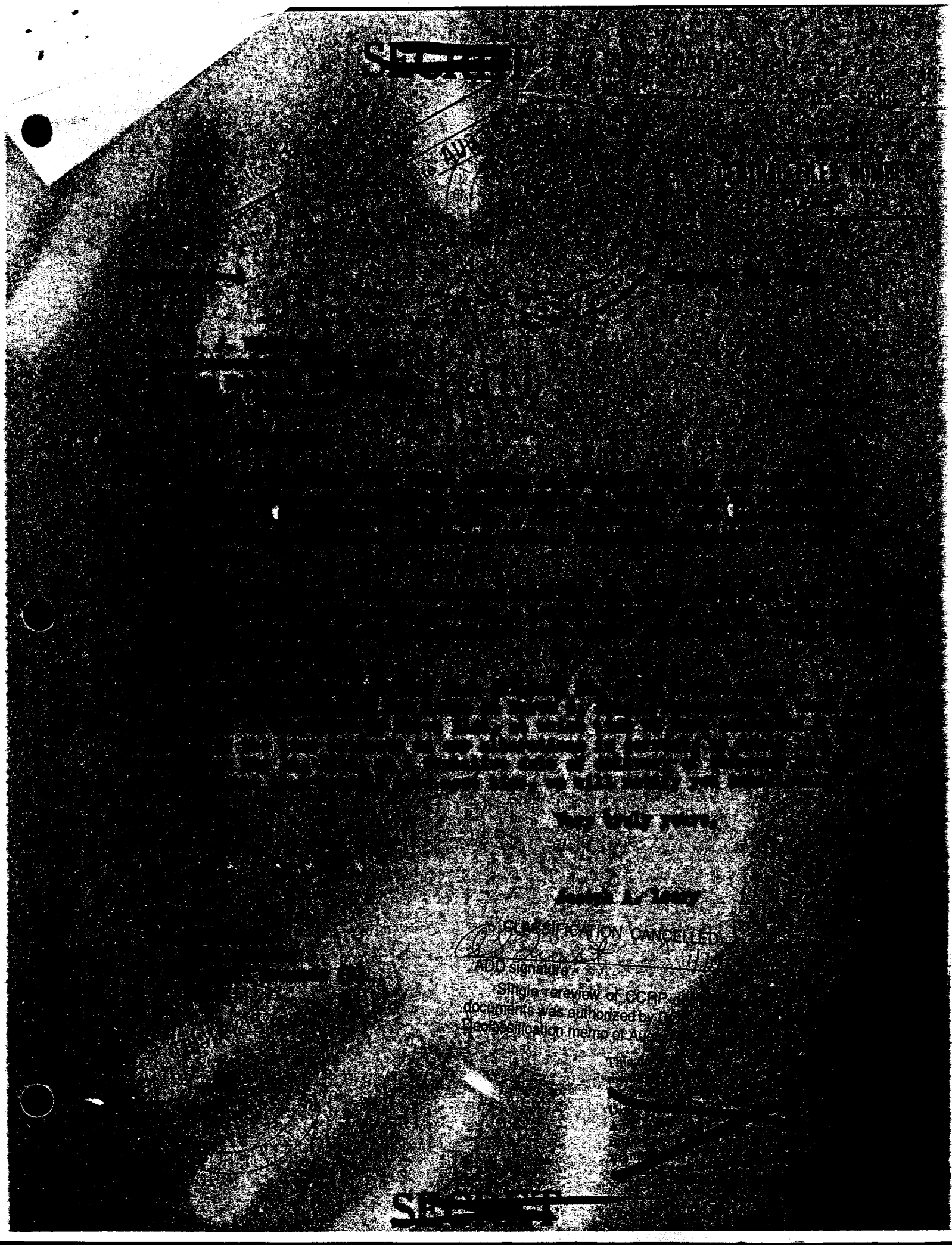
To E. J. Witkowski

Before reading this document, sign and date below:

Name	Date	Name	Date

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.


SECRET
CLASSIFICATION CANCELLED
ADD signature
SECRET

7-13

CLINTON LABORATORIES
CENTRAL FILES NUMBER
48-1- 395

B-137

Date H January 27, 1948

File

Subject RALA-PROPOSAL TO USE HANFORD SLUGS

Those Eligible To Read The Attached

By F. H. Belcher

Copy # 3A

To S. R. Sapirie

L. B. Emlet

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date
LBE	2/2/48		
EJW	2/4/48		

INV. 64

This document has been approved for release to the public by:

Technical Information Officer
ORNL Site

3/15/95
(Date)

S. R. Sapirie, Chief, Operations Division January 27, 1948

F. H. Belcher, Chief, Clinton Laboratories Division

RALA-PROPOSAL TO USE HANFORD SLUGS

CLINTON LABORATORIES 9863

CENTRAL FILES NUMBER
48-1-395

SYMBOL: AECX-211

This will confirm the conversation today between your Mr. Armstrong and our Mr. Shilling.

The present status of the project to design and construct a shipping container for slugs is as follows:

1. Monsanto Operating and Technical Departments are studying possible designs of the container.

2. There are indications that the slugs may have to be thermally cooled either before packing or in transit.

3. Mr. Leverett, of the Technical Department, is now at Hanford where he will check the heat content (Btu generated per pound of uranium) and the rate of cooling of slugs after discharge from the pile.

We estimated that the project will proceed as follows:

Step	Completion Date
1. Determine heat content and rate of cooling of newly discharged slugs.	Feb. 10, 1948
2. Determine heat output of slugs vs container size and shapes. Determine shield thickness.	Feb. 27, 1948
3. Design container.	Mar. 26, 1948
4. Approve project request.	Apr. 16, 1948
5. Fabricate container	July 1, 1948
6. Test, report and request approval to use.	Aug. 1, 1948

The proposed change in contractors at CNL increases the total time required by an estimated two months.

F. H. Belcher

Shilling:ew

Classification Cancelled
By Authority Of
By
Date AUG 26 1971

CLINTON LABORATORIES
CENTRAL FILES NUMBER
48-1-296

B-137

Date January 23, 1948

File

Subject Rala Shipment #32 (Run #23)

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 5A

To J. A. Leary

Central file

INV. 64

Before reading this document, sign and date below:

Name	Date	Name	Date

INV. 65

CONTRACT W-35-058 Eng-[illegible]

MONSANTO CHEMICAL COMPANY

DAYTON LABORATORIES

[redacted]

CENTRAL FILES NUMBER
48-1-396

January 22, 1945

This Document consists of [illegible]
[illegible] 2 pages.
Copy [illegible] Series A.

[redacted]
ADD signature
Single identifier of the
documents was authorized
Declassification review

[illegible] Leary
[illegible]
[illegible], New Mexico

Sale Shipment # 32 (Run #25)

Dear Joe:

[illegible] turned over this shipment to [illegible]
[illegible] product of LST 1800 HST was appr[illegible]
[illegible] by the old method, and 3690 units [illegible]
[illegible]. The product appeared very [illegible]

[illegible] hope you encounter no difficulty [illegible]
[illegible] anxiously awaiting to hear [illegible]

[illegible]

[illegible]

cc:
1. [illegible] Leary
2. [illegible] Wilkerson
3. [illegible] Mallinckrodt
4. Reading File
5. Central File

Classification Cancelled
[redacted]
By Authority of [illegible]
By [illegible]
DATE [illegible]

[redacted]

~~SECRET~~

B-137

Date January 7, 1949

File

Subject Re: Size of Rala Sources

Those Eligible To Read The Attached

By A. H. Holland

Copy # 20

To C. N. Rucker ~~C. N. Rucker~~

L. B. EMLET

Before reading this document, sign and date below:

EJW 1/20/49

~~RESTRICTED DATA~~

This document contains ~~restricted~~ data as defined in the Atomic Energy Act of 1946.

~~SECRET~~

~~CAUTION~~

This document contains information affecting the National Defense of the United States. Its transmission or the ~~revelation~~ of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal laws.

2

2 11

a

UNITED STATES
ATOMIC ENERGY COMMISSION

In Reply Refer To:
RMRP:JS

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-1-72

Oak Ridge, Tennessee
January 7, 1949

Classification Cancelled ~~or Changed~~
TO
By Authority of
ATG AUG 27 1971
Name Title Date

Carbide and Carbon Chemicals Corporation
Post Office Box "P"
Oak Ridge, Tennessee

Attention: C. N. Rucker, Jr., Executive Director
Oak Ridge National Laboratory

Gentlemen:

Dr. N. E. Bradbury, Director of Los Alamos Scientific Laboratory, has asked the following questions, in anticipation of the increase in the size of Rala sources:

1. What will be the source of the slugs for the large Rala shipments - Hanford or Clinton piles?

2. To what extent can specifications be set up to control the length of irradiation of these slugs to produce the maximum ratio of active to inactive barium?

3. What is the maximum ratio of active to inactive barium (kilo-curies per gram) which can be successfully and dependably attained?

4. Can the production facilities for large shipments be ready for operation by February 1, 1950?

5. Will the new facilities be capable of processing 20,000 curies at once, and shipping in one package?

6. Do you anticipate any difficulties in adapting the new facilities to a product container, shipping shield, and special trailer for carrying same, which will be designed to fit our facilities?

7. Would it be possible to ship the product as nitrate instead of chloride?

8. What maximum limits of impurities can be specified, and successfully met, as compared to the present shipments? Recent shipments have not been good with respect to purity.

CLASSIFICATION CANCELLED
Ted Lauro 3/8/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 19[illegible]

C. N. Rucker
January 7, 1949

We have sent Dr. Bradbury a letter, copy of which is attached, answering those questions which could be answered immediately. Apparently Los Alamos believed that additional production facilities would be provided for the larger sources and they are concerned with the ability of the Laboratory to meet the commitments as to total activity.

The two copies of document CF 48-12-192 could not have been received before December 21, 1948, the date of Dr. Bradbury's letter to Mr. J. C. Franklin.

After the next Rala run, we would appreciate receiving your comments on those questions upon which you have not previously submitted information.

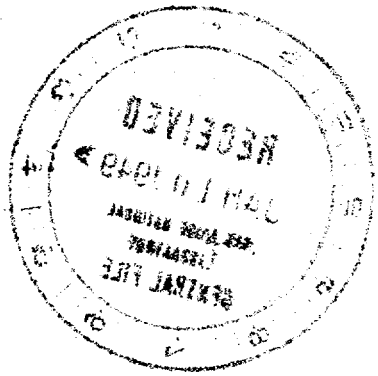
Sincerely yours,

Albert H. Holland, Jr., M.D.
Director of Research and Medicine

Encl:
Ltr to NEB fm RWC, dtd 1/7/49

CC: C. E. Center, K-25
R. W. Cook, AEC

Shilling:mw



~~SECRET~~ B-137

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-1-172

B-137

C.7.

Date January 26, 1949

File

Subject Rala Run #29, Shipment #37

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 2 A

To J. A. Leary

L. B. Emlet

Before reading this document, sign and date below:

INV. 64

93

NSMITTAL DATED 1-19-49

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

CAUTION

This document contains information affecting the National Defense of the United States. ... in ... prohibited ... criminal penalties under

RESTRICTED

This document contains restri... efined in the ... Energy Act of 1946.

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

January 15, 1949

This document consists of 1 pages and 0 figures
No. 3 of 5 copies, Series A

Mr. A. H. Emery
Los Alamos Scientific Laboratory
P.O. Box 1663
Los Alamos, New Mexico

Dear Sir:

This shipment contained 1945 curies at 10:00 EST on [illegible]

As I mentioned to you over the telephone yesterday, we had considerable difficulty with product valve at the time of our attempt to transmit the shipment of product for shipment. Although I personally did not see the actual explosion, I was told that it did not completely close. The product after the first evaporation, however, did appear cloudy and we had sent you in the pails.

Into the new tank through equipment which did not contain any type of oil. We hope you find an organic material which will interfere with your process.

We are scheduling your next shipment to reach you on February 15, 1949. We will assume this schedule meets with your approval unless you tell us otherwise.

Very truly,

E. J. Witkowski

E. J. Witkowski

EJW:lh

cc: A. H. Emery
[illegible]
[illegible]
[illegible]
Central Files

[redacted]

B-137

Date January 24, 1949

File

Subject TELETYPE: Discharge of Slugs

Those Eligible To Read The Attached

By L. W. Fox

Copy # 1C

To D. G. Reid

D. G. Reid

Before reading this document, sign and date below:

TRANSMITTAL DATED 1-25-46

[redacted]

[redacted]

[redacted]

CENTRAL FILES

49 1. 230

FM FOX US AEC RICHLAND WASH

TO US AEC OAK RIDGE TENN

ATTN REID

TIME [illegible] / PAGES

NO. / 2 SERIES C

MSG NR 159 JANUARY 49242054Z GR 23 COPIES NUMBERED

Classification Cancelled [redacted]
TO
by Authority of
AG AUG 27 1971
Name Title Date

DO YOU WISH DISCHARGED SR 52 SLUGS SHIPPED AS PREVIOUSLY SCHEDULED QUERY PAREN D G REID OAK RIDGE NATIONAL LAB FROM L W FOX PAREN

[redacted]

Rec'd 49 220
Declassified 49 1/31/95

CLASSIFICATION CANCELLED
Ted Davis 1/30/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

[redacted]

FILE RECORD SHEET

49-1-230

DATE: Jan. 24, 1949

CLASSIFICATION: [redacted]

SUBJECT: Teletype: Discharge fo Slugs.

TO: D.G. Reid

FROM: L.W. Fox

NO. OF COPIES: 1 SERIES: C

DISTRIBUTION:

1C: D.G. Reid

REMARKS:

~~SECRET~~

B-137

Date March 16, 1949

File

Subject TELETYPE: Rala Process

Those Eligible To Read The Attached

By Patterson

Copy # 10

To F. Western

INV. 65

F. Western

Before reading this document, sign and date below:

INV. 64

[redacted] RESTRICTED DATA [redacted] SECRET

This document contains information affecting the N[redacted] Its transmittal [redacted] any manner to an unauthorized [redacted]

T

THIS DOCUMENT CONSISTS OF 1 PAGES
NO 1 OF 2 SERIES C

Classification Cancelled
Or Changed To
By Authority Of
By
Date AUG 20 1971

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-3-191

Discussed with Patterson by telephone, 3/16/49,

FM PATTERSON US AEC RICHLAND WASH

TO US AEC OAK RIDGE TENN

ATTN WESTERN

MSG NR 486 MARCH 49162202Z GR 32

PLEASE SENT AT ONCE YOUR CALCULATIONS AND ASSUMPTIONS MADE IN REQUIRED DILUTION OF XENON ASSOCIATED IN RALA PROCESS PAREN FORREST WESTERN FROM C M PATTERSON CMA HEALTH INSTRUMENT DIVISIONS GENERAL ELECTRIC PAREN

CCC SECOND WD FIRST LINE SHLD RD SEND RPT SEND

G

49 MARCH 17/1549Z

AN

This document has been approved for release to the public by:

David R Hamm 3/9/95
Technical Information Officer, ORNL Site — Date

CLASSIFICATION CANCELLED
Jed Davis 3/8/95
ADD signature — Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994

All provisions of GM-74 Part II Par. 10d are followed, paraphrase not required. Handle as [illegible] correspondence.

Recd by GG at 1549Z

Decoded by GG at 1555Z

CAUTION

This document contains [illegible] affecting the [illegible] United States. [illegible] contents in [illegible] prohibited by the Federal laws.

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-3-264

Material Gen. "A"

B-137

3-25

Date March 28, 1949

File

Subject Rala Shipment #39, Run #31

Those Eligible To Read The Attached

INV. 6

By E. J. Witkowski

Copy # 24

To J. A. Leary

Before reading this document, sign and date below:

INT. 94

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

[redacted]

~~SECRET~~

This document consists of 1 pages and 0 figures. Copy No. 2 of 4 copies, Series A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-3-264

March 28, 1949

Classification Cancelled
~~Or Changed To~~
By Authority Of
By
Date AUG 30 1971

Mr. J. A. Leary
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico

Dear Joe:

Rala Shipment #39, Run #31

This shipment left here on March 25, 1949, at 0500 EST. Approximately 3,240 curies were present at LST 0645 EST on March 24, 1949. The product was in the nitrate form as you had requested.

The product appeared dirtier than any we had ever shipped. We have no explanation for this other than the possibility of the instability of the nitrate under intense radiation; the product purification operation gave us no difficulty and we feel quite certain that there was no possibility of the presence of oil or any other unusual impurities in the product. We hope that the appearance of the product is no indication of the difficulties you may encounter in your process.

CLASSIFICATION CANCELLED
CS Smist 1/19/95
ADD signature Date

Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

Very truly yours,

E. J. Witkowski

E. J. Witkowski

EJW:hg

cc: L.B.Emlet
Central Files
E.J.Witkowski

[redacted]

This document contains information defined in the Atomic Energy Act of 1946, affecting the National Defense of the United States. Its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal laws.

[redacted]

(has Clearance)

[redacted]

OAK RIDGE NATIONAL LABORATORY

CENTRAL FILES NUMBER

49-4-38

ORNL

"This document consists of 47 pages. No. 11 of 18 copies, Series A."

Date April 6, 1949

Subject RaLa Process Study

Preliminary Report No. 1

To L. B. Emlet

By F. L. Culler, H. E. Goeller

W. E. Unger

("W")

File

Those Eligible To Read the Attached

INV. 64

Copy # 11A

Before reading his document, sign and date below:

Name	Date	Name	Date

Classification Cancelled Or Changed To [redacted] By Authority Of [redacted] By [redacted] Date 8/26/71

DISTRIBUTION

1. C. N. Rucker
2. M. D. Peterson
3. J. A. Lane
4. W. R. Gall
5. L. B. Emlet
6. L. B. Emlet
7. E. J. Witkowski
8. F. L. Steahly
9. W. K. Eister
10. W. E. Unger
11. H. E. Goeller
12. F. L. Culler
13. F. L. Culler
14. F. L. Culler
15. W. M. Hardy (Hanford)
16. R. P. Hammond (Los Alamos)
17. O. H. Holland, Jr. (AEC)
18. Central Files

This document contains restricted data [redacted]

[redacted]

SPECIAL REREVIEW FINAL DETERMINATION

CLASS. ____ AUTH. ____

REVIEWERS/VERIFIERS	CLASS.	DATE
(1) [redacted]	4	8/6/8
(2) [redacted]	4	8/15/80

[redacted]

This document [redacted] Its transmiss[redacted] and may [redacted] applicable Fed[redacted]

Publicly Releasable

This document has received the necessary patent and technical information reviews [redacted] and can be distributed without limitation.

[redacted]

[redacted]

April 6, 1949

RaLa Process Study

Preliminary Report #1

1.0 Introduction

The production of Ba^{140}, parent of La^{140}, for the use in weapons production at Los Alamos, is now being carried out at the Oak Ridge National Laboratories under extremely difficult and hazardous conditions. Existing processing facilities have the following disadvantages:

1. A consistently good yield cannot be obtained because of the unreliability of the processing equipment.
2. The time cycle is unnecessarily long causing loss of product through decay. (Approximately 6% of current inventory decays per day.)
3. Chemical efficiency of recovery ranges between 20% and 85%, averaging about 65%. This average efficiency can be improved by at least 20%.
4. Operation of the process provides one of the greatest sources of particulate and gaseous air borne activity in ORNL.

[redacted]ATA

This document contains restricted data as [redacted]946.

[redacted]

This document contains information affecting the Na[redacted]
Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited and[redacted]
applicable Federal laws.

[redacted]

[redacted] April 6, 1949

5. Many phases of operation provide sources of possible over-exposure to operating personnel unless extreme care is exercised.
6. Certain equipment in the process must be replaced because of excessive contamination (i.e. final product processing cubicles).
7. Product does not consistently meet purity requirements.

The existing processing equipment has a production capacity of 2200 plus curies of Ba^{140}. It has been proposed by Los Alamos that 10,000 curie batches be available on approximately February 1, 1950. In order to accomplish this, a new plant duplicating the process now used at ORNL is being designed at Hanford.

It is the opinion of personnel at ORNL that interim production of Ba^{140} at ORNL will be necessary for approximately two years in spite of plans for the rapid completion of the Hanford plant. For this reason a survey of the existing ORNL process is being made to evaluate 1) continued production of 2200 plus curies and 2) for the possible production of 10,000 curies of Ba^{140}.

Four plans for the future processing of Ba^{140} at ORNL have been roughly evaluated:

Plan I. Improvement of the existing processing facilities for the production of 2200 plus curies under condition of greater safety and reliability. Erection of new final product cubicles.

[redacted]

[redacted] April 6, 1949

Plan II. Alteration and expansion of the existing facilities to produce 10,000 curies under conditions of greater safety, reliability, and efficiency using existing cells and equipment. Erection of new final product cubicles.

Plan III. Alteration to Cell "A" equipment and the erection of a new Cell "B" and final product cubicles.

Plan IV. Erection of a new facility for processing irradiated 95% U^{235} slugs with recovery facilities for U^{235} and precautions for criticality.

The first three plans are proposed for the interim production of Ba^{140}, the fourth, which will require rather extensive development, approaches a long range study for an entirely new plant. A fifth proposal is to develop a new Ba^{140} recovery process possibly utilizing ion exchange resins. Therefore:

Plan V. Development of a new Ba^{140} process for use in a new processing facility at Hanford or the site of the research reactor.

Plan V can be carried out during the interim production period so that a new process could be incorporated in the design of new Ba^{140} facilities. It is possible that the development of a new separations process for Ba^{140} can be developed using irradiated U^{235} as a feed material.

[redacted]

[redacted] April 6, 1949

2.0 Summary of Studies

The four interim plans have been reviewed to determine the following:

1. The scope of changes required and the advantages of making necessary changes.
2. The length of time required to complete the effort and the time required for shutdown of existing process facilities. It should be noted that a maximum shutdown of only two months can be permitted, and this only if three successful consecutive 2200 curie runs can be made at three week intervals previous to the shutdown.
3. The development work required and the manpower and costs entailed.
4. The overall construction costs of each proposal.
5. The design effort required, included time and costs.
6. The effect of each proposal on the program at ORNL. Additional manpower and physical facilities have been estimated.

Table I summarizes these factors for Plans I through V.

Table II outlines possible schedules for Plans I through V.

[redacted]

[redacted]

April 6, 1949

The following estimates have been made for additional manpower necessary within the Technical Division to undertake development and design for this process:

TABLE III

TECHNICAL DIVISION MANPOWER

REQUIREMENTS
(New Personnel Required)

	Development		Design	
	Technical	Non-Technical	Engineers	Draftsmen
Plan I	0	0	2	3
Plan II	1	1	2	3
Plan III	2	2	4	9
Plan IV	4	4	4	9
Plan V	4	4	4	9

All estimates of time and manpower requirements have been based on the supposition that the development, design, and construction of new RaLa facilities will receive top priority with respect to all other work now in progress at ORNL. If this does not occur, the time required to satisfactorily complete any plan would be at least twice that indicated. It should be noted that the engineering and drafting requirements are those necessary to supplement the personnel of the Technical Division Design Section and could be transferred from other engineering groups.

[redacted]

[redacted] April 6, 1949

3.0 Conclusions and Recommendations

The following conclusions have been drawn from this study of the five plans outlined in Section 3.0:

1. For increased production of RaLa, the following conclusions apply:
   a. Plan II entails a shutdown time of approximately 100 days, which is excessive. Alterations to existing cell equipment will be difficult and hazardous, and satisfactory results cannot be guaranted.
   b. Plan III offers the most easily accomplished and the most reliable means of increasing the RaLa plant capacity. Down time is not excessive.
   c. Plan IV offers possibilities as an increased RaLa production process only if the U^{235} can be stored for fission product decay for some period of time. The size of a U^{235} recovery plant would approach that required for the research reactor, so a separations plant would be expensive. Much development work would be required for this process. Recovery a Ba^{140} would be best accomplished from green assemblies from the research reactor.
   d. The development of a new RaLa process as suggested in Plan V is a somewhat long range problem. An improved or entirely new RaLa process should be developed for installation in any new RaLa plant. Plans IV and V could well proceed together.

[redacted]

[redacted]

April 6, 1949

e. Any expansion of the RaLa process at ORNL will require additional manpower and funds for development and design.

From these conclusions the following recommendations can be made:

1. For continued production of 2200 curies, Plan I should be adopted.
2. For increased production to 10,000 curies, Plan III should be adopted.
3. The development of a new RaLa process should be undertaken before the construction of a new RaLa facility.
4. Interim RaLa production and new process development should proceed simultaneously.

ORNL is willing to undertake any phase of interim RaLa production and to develop a new Rala process provided sufficient additional funds and manpower are supplied.

4.0 General Process Considerations

4.1 Barium Production in Hanford Pile

The type of feed slug for the use in Ba^{140} production contains 1800 grams of natural uranium that has been irradiated in the Hanford piles. Since it is necessary to produce a product of high specific activity for consumption at Los Alamos, the irradiation time of a Ba^{140} producing slug is limited by the growth of inactive Ba^{138} during radiation. The irradiation in the Hanford pile is normally limited to 80 days, at which time 4.65 grams of Ba^{138} are present for each gram of active Ba^{140}.

[redacted]

[redacted] April 6, 1949

Figure I shows the relationship of Ba^{138} to Ba^{140} at various cooling periods for different periods of irradiation. For 80 day irradiation, 9.85×10^{-2} curies of Ba^{140} are produced per gram of natural uranium as shown by Figure 2. Thus for an 1800 gram slug:

$Ba^{140} = 2.4 \times 10^{-3}$ grams (theoretical) or 178 curies

$Ba^{138} = 1.08 \times 10^{-2}$ grams

During the progress of three runs using Hanford slugs at ORNL, it has been found that an 1800 gm natural uranium slug from the Hanford pile contains approximately 135 curies when discharged in selected lots of less than 100. When more than 100 slugs are discharged simultaneously, it is estimated that a total of approximately 100 curies per 1800 gram slug are obtained at time of discharge.

The following summarizes data on a Hanford slug used for feed to the Ba^{140} process.

Hanford 4" slug

Irradiation: 80 days (approximately)

Wgt. of U: 1800 grams natural uranium

Curies of Ba^{140}: Discharged in lots less than 100 : 135 slug ATD

Discharged lots greater than : 100 c per slug, ATD

Theoretical ATD : 178 c

Shipping time, Hanford to ORNL: 5 days

Curies Ba^{140} after 5 days: 76-97 curies/slug

5.4d X ^{133} after 5 days: 93 to 120 curies/slug

[redacted]

[redacted] April 6, 1949

4.2 Discharge of Radioactivity from the Dissolver

The following gaseous fission products will be present in an 1800 gram natural uranium slug irradiated for approximately 80 days and cooled for five days: (See Figures 4 and 5)

Assumed production of Ba^{140} = 100 curies per slug

Curies 5.4 d Xe^{133} = 93 curies

Curies 9.2 hr Xe^{135} = negligible

Curies 8.0 d I^{131} = 68 curies

TOTAL 151 curies

Of this quantity the I^{131} will be held in the dissolver or caught in the dissolver off-gas scrubber. Therefore, approximately 93 curies per slug of gaseous 5.4 d Xe^{133} is discharged for each slug dissolved. If we assume that the maximum number of slugs dissolved per hour is approximately 40, then the total curies of activity released will equal 3700 curies per hour.

These 3700 curies per hour of 5.4 d X^{133} will radiate the following energy per hour:

$$3700 \times (3.7 \times 10^{10} \text{ d/sec curies})(3.6 \times 10^{3} \text{ sec/hr})(0.44 \text{ mev/d}) =$$

$$2.17 \times 10^{17} \text{ Mev/hr.}$$

Assume that a sphere of a radius of 290 ft. in diameter (the effective height of the gas discharge stack) contains this total quantity of activity. The radiation per cubic foot of air in the hypothelical sphere is:

$$\frac{2.17 \times 10^{17}}{\frac{4}{3} r^3} \text{ Mev} = \frac{2.17 \times 10^{17} \text{ Mev}}{1.01 \times 10^{8} \text{ cf}} = 2.17 \times 10^{9} \text{ mev/cubic foot}$$

[redacted]

[redacted]

April 6, 1949

The tolerance level for 5.4 d Xe^{133} has been established by Forrest Western in a memorandum to E. J. Witkowski, dated March 28, 1949, He states that a person in an atmosphere containing 5.4 d Xe^{133} will receive a tolerance radiation dose of 0.1 rep/8 hrs if the radiation intensity is 3.8×10^{8} mev/cubic foot of air.

By comparing the radiation per cubic foot of air estimated and the tolerance radiation, it can be seen that under the worst atmospheric conditions, assuming no air velocity, and uniform dispersion of all activity to ground level, the tolerance is exceeded by a factor of 10. However, controlled operation of the dissolver to reduce the overall evolutions rate of radioactive gases will make safe production of 10,000 curie batches of B^{140} possible at ORNL.

[redacted]T

[redacted] April 6, 1949

5.0 Plan I. Continued Production of 2200 Curies in Improved Existing Facilities

5.1 Purpose

Plan I proposes the most economical changes in the plant equipment to insure continued production of at least 2200 curies. Alterations proposed require the minimum construction time during which the plant must be unproductive.

Under present operating conditions, process efficiencies vary widely, making production and product quality difficult to anticipate. Most of the losses, both chemical and decay, are readily attributable to the decantation method of separating the precipitated product from the slug solution and the metathesizing carbonate solution. Much of the product is usually lost in decantering the supernatant from $PbSO_4$ carrier precipitation of $BaSO_4$. The long settling times required contribute to the loss of product through radioactive decay. It is proposed to install equipment to effect the separation by either filtration or centrifugation to reduce chemical and decay losses.

Final purification of the product is carried out in small scale glass vessels housed in small stainless-lined, lead-shielded cubicles. Intense radiation darkens the glassware, and the glass vessels eventually plug with insoluable material, so that periodically the cubicles must be decontaminated and the glassware replaced. Repeated decontamination of the cubicles with corrosive reagents has developed leaks in the stainless liner, permitting active solutions to filter down among the lead shielding bricks, making decontamination virtually impossible. The radiation hazard has been deferred by piling lead

[redacted] April 6, 1949

shielding around the contaminated areas, but this expedient was only temporarily effective, and it now becomes necessary to dismantle the cubicle to replace the defective stainless liner. It is proposed that new cubicles be constructed of concrete and that they be somewhat larger to facilitate the replacement of the glassware.

5.2 Capacity and Feed

The capacity of the plant as altered under Plan I is limited to 2200 curies because the equipment is not designed to protect personnel from higher levels of radiation, and from larger quantities of gaseous fission products.

Approximately 38 Hanford-irradiated four inch slugs will be required for the production of 2200 curies. The following table compares the present process yields with those anticipated after improvements:

	Present Process	Plan I. Improved Process
38 W Slugs		
Time Cycle	5 days	4 days
Losses, %		
Chemical	35	15
Decay	18	15
Yield		
Chemical, %	65	85
Total, Curies	1800	2500
76 Slugs		
Time Cycle	6	4-1/2
Losses, %		
Chemical	35	15
Decay	21	17
Yield		
Chemical, %	65	85
Total, Curies	3500	4900

[redacted]

[redacted] April 6, 1949

Average time cycles for the present process and for the proposed Plan I improved process for charges of 38 and 76 Hanford Slugs are presented in chart form, Figures 6 through 9 inclusive.

5.3 New Facilities and Alterations

The following facilities and alterations are already in progress of being installed:

1. Facilities to exhaust off-gas to new 250 foot stack.
2. Concrete off-gas duct.
3. Improved laboratory ventilation.

The following new facilities are proposed:

1. Process Equipment

   Replace A-9 (Decant Tank) with filter tank or supplement A9 with a centrifuge and small dilution tank in a small cell to be constructed on top of the present cell, with all piping and instrumentation required.

2. Cubicle

   Replace present lead cubicle with concrete cubicle of large size with larger doors to facilitate replacement of glassware and reduce exposure to personnel. (see sketch of proposed cubicle, Figure 10.)

[redacted] April 6, 1949

4.4 Development Work Required

The choice between the two altermatives, a filter replacing A-9 (decant tank), or a centrifuge supplementing it, and the design of the equipment must depend upon Semi-works experimental evaluation. Present ORNL facilities will be adequate for this work without expansion. The development costs are estimated to be:

Time Required	Man Months	Equipment	Total
4 months	16 @ $750	$20,000	$32,000

5.5 Estimated Construction Costs

The following estimate of construction costs does not include overhead or contractor's fees:

	Filter	Centrifuge
Cell A Decontamination	$ 5000	$ 5000
Cell A Alterations	5500	21800
Cubicles Alteration	25000	25000
	35500	51800
Contingencies, 20%	7100	10300
	42600	62100
Time for construction	4 months	

5.6 Estimated Design Cost

Past experience has indicated that design cost average about 15% of the total. On this basis the design costs for Plan 1 will be as follows:

	Filter	Centrifuge
Total design cost	$10,900	$13,700
Drafting man months	12	14
Engineering man months	6	7
TOTAL	18	21

3 Engineers and 6 Draftsman will require two months

[redacted]

[redacted] April 6, 1949

5.7 RaLa Process Downtime Required

The principle advantage of the centrifuge over the filter lies in the shorter downtime required for its installation. Assuming a reasonable activity level within the cell (100 mr/hour) permitting each workman of a crew of 20 to spend at least one hour per day of productive working time, it is estimated that the plant will have to be inoperative for, from twenty three to forty days.

The importance of a continuous supply of RaLa is great enough that the interruption of the supply for a period longer than two months is impossible, and this only if a "stockpile" can be created. It is estimated that three "good" runs in succession will permit a two months shutdown. However, so variable are the process efficiencies that the probability that three "good" runs in succession can be made is rather slim.

5.8 Total Cost Summary

	Filter	Centrifuge
Decontamination	5000	5000
Construction, Alteration & Installation	42600	62100
Experimental & Development	32000	32000
Design	10900	13700
	90500	112800
Contingencies 20%	18000	23000
Total	$108,500	$135,800

[redacted]

[redacted] April 6, 1949

6.0 Plan II. Production of 10,000 Curies in Improved Existing Facilities.

6.1 Purpose

Plan II would provide the same process changes outlined for Plan I, and in addition would reduce radiation hazards to permit 10,000 curie production. Non-productive downtime of approximately three months would be required.

Radiation hazards not corrected in Plan I which became intolerable under the higher activity levels of Plan II evolve principelly from air-borne activity contributed by ungasketed pipe flanges and tank covers, open transfer pipettes, and evaporators. Inadequate sampling and isotope draw-off facilities, radiation (sky-shine) measurements, and the replacement of cubicle glassware, all require seriously high levels of exposure to operating personnel. Under Plan II, all tank covers and pipe flanges will be gasketed, open transfer pipettes will be replaced with closed transfer pots, and improved sampler and isotope-draw-off facilities will be developed and installed. Radiation instruments to eliminate the need for "sky-shine" measurements, will be provided.

The removal of unused equipment, tanks, and transfer lines to simplify and streamline the process, is also anticipated.

The purification of the product in glassware housed in the lead cubicles requires visual observation. Higher levels of activity may darken the glassware as to render it essentially opaque. The fragility of the glassware also presents the possibility of the loss of a complete run, resulting in a serious radiation hazard in addition to the loss of valuable product. Present cubicle equipments will be redesigned, probably replaced with tantalum equipment properly instrumented for process control.

[redacted]

[redacted] April 6, 1949

Product impurities have not been qualitatively identified, but house dust falling into open transfer vessels and corrosion of some Hasteloy equipment are suspected as possible sources of vitiation. Since Hasteloy is known to have poor resistance to corrosion by nitric acid, all Hasteloy process vessels will be replaced with tantalum or some other resistant material.

Volume reduction by evaporation is carried out in unnecessarily large tanks, with the probable hold-up of product solution an awkward operation. These evaporators will be replaced with equipment of suitable design.

6.2 Capacity and Feed Material

Approximately two hundred Hanford slugs will be required to produce 10,000 curies of Ba^{140} per batch.

6.3 The following New Facilities and Alterations are Proposed:

1. Off-gas system

   Same as for Plan I

2. Process equipment

   a. Replace A-9 with centrifuge or filter (same as for Plan I)

   b. Replace all pipettes with closed transfer pots.

   c. Remove unused equipment and pipes.

   d. Gasket all tank covers and pipe flanges.

   e. Redesign and replace cubicle equipment and instruments.

   f. Replace Cell B evaporators.

   g. Replace Hasteloy equipment.

3. Replace present cubicle (Same as Plan I)

4. Provide improved samplers

5. Provide improved isotope-drawoff facilities.

6. Provide instrumentation to eliminate "sky-shine" readings.

[redacted]

[redacted] April 6, 1949

6.4 Development Work Required

In addition to the experimental work required under Plan I to determine the design of the centrifuge and the filter, experimental development of improved samplers and cubicle equipment is required.

	Time Required	Man Months	Equipment	Total
Filter and Centrifuge	2 Months	16 @ $750.	20,000	32,000
Samplers	2 Months	4 @ 750.	1,000	4,000
Cubicle Equipment	3 Months	6 @ 750.	4,000	9,000
		TOTAL.....		$45,000

6.5 Estimated Construction Costs

The following estimate of construction costs does not include overhead or contractor's fees:

Decontamination	5,000
Cell A Alteration	21,800
Pipette Replacement	3,800
Obsolete Equipment and Piping Changes	3,000
Gasketing	5,500
Cubicle Equipment	13,000
Cell B Evaporators and Hasteloy Equipment	6,000
New Cubicle	25,000
Improved Samplers and Isotope-drawoff facilities	19,000
Radiation Instrumentation	8,000
	110,100
Contingencies	22,000
TOTAL	$132,000

The time required for construction is estimated to be five months.

[redacted]

[redacted] April 6, 1949

6.6 Design Costs

Design costs are estimated to be about 15% of the total, and on this basis, design cost for Plan II will be:

$19,400

Drafting	Man Months	20
Engineering	Man Months	10
	TOTAL.....	30

Three engineers and six draftsmen will require three months.

6.7 RaLa Down Time Required

Assuming that decontamination of the cells permits productive work time of one hour per day for each man of an available crew of 20, the RaLa Plant will have to be totally shutdown for a period of about three months.

6.8 Total Cost Summary

Decontamination	5,000
Construction Cost, Alterations, and Installations	132,000
Experimental and Development	45,000
Design	19,400
	181,000
Contingencies (20%)	36,000
TOTAL.....	$217,000

[redacted]

April 6, 1949

7.0 Plan III. Construction of New Cell B and Cubicles for 10000 Curies Batches

7.1 Purpose

The third plan would provide for the construction of a new Cell B and Cell B equipment, using some equipment in the existing Cell A such as the dissolver and waste handling facilities. As outlined under Plan II., the handling of quantities of activity greater than for 2200 curie batches in the existing equipment presents a great hazard to operating personnel. It should be noted the Cell B equipment has sufficient capacity to produce 10,000 curie batches, but samplers, open pipette transfers, etc., make alterations necessary in this cell.

As shown in Section 5.0, expansion to 10,000 curie production would require an excessive shutdown for making necessary changes in the existing cells and that the cost would be quite high because of limited working time within the cell. In addition to this, workman would have to be continuously exposed to tolerance doses of activity in order to make the installation.

The construction of a new Cell B as proposed in Plan III. on the east side of Bldg. 706-D would make it possible to provide a new production facility with a minimum shutdown of the existing process. The dissolver, neutralizer, and other waste handling tanks in Cell A would be used in such a manner as to provide an obsolute minimum of changes in Cell A. A new barium precipitator, filter and or centrifuge with catch tank would be

[redacted]

[redacted]

April 6, 1949

installed in the new Cell B and connected to Cell A via a buried pipe trech.

After the completion of the new facilities, the use of the old Cell B could be discontinued and the cell decontaminated and made available for development on a new long range RaLa process or other pressing experimental work.

7.2 Capacity and Feed Material

The capacity for the plant proposed in Plan III would be 10,000 curies per batch. The feed material would be the same as described for Plan II.

The problems of radioactive gas disposal and shielding would be of the same magnitude as outlined for Plan II, but a satisfactory solution of these problems can be more easily provided in the design and construction of a new Cell B and final processing cubicles.

A new precipitator and barium sulphate separator (filter of centrifuge) would be installed as in previous plans to improve the chemical processing efficiency approximately 20% and to decrease the overall time cycle. A new electrolytic cell of a more efficient design would be installed in order to reduce the fourteen hour electrolysis time cycle.

7.3 New Facilities and Equipment

The following alterations to Cell A would be made for Plan III.

1. Dissolver (Tank A-1)

[redacted]

[redacted]

April 6, 1949

a. Two new jet lines from the dissolver to the precipitator in the new Cell B would be installed.

b. A new or revised sampler supplied.

c. The off-gas line from the neutralizer A-6 would be removed from the disolver off-gas line thus providing the dissolver with an individual exhaust line.

2. A-11 Hold-up Tank

a. A-11 would be maintained as a hold-up tank. Two new jets and lines to the precipitator in Cell B would be installed.

b. Jet line to A-8 would be removed and blanked.

3. A-6 New Neutralizer

a. A-6 would be used as the new neutralizer because of its greater capacity as compared to neutralizer A-5.

b. A new vent line from A-6 to the A-16 off-gas system would be installed.

c. Six lines would be rerouted from A-5 to A-6.

d. A new or revised sampler would be provided.

4. Tanks A-5, A-8, A-9 and pipette A-13 would be blanked off.

5. All tanks in Cell A to be used with the new installation would be properly gasketed and sealed to prevent the escape of gaseous and particulate activity into the cell.

The following new facilities would be provided in the new Cell B and cubicles:

[redacted]

[redacted]

April 6, 1949

1. New cell block with five foot thick walls, approximately 20' x 15' high inside dimensions.
2. A pipe trench from Cell A to Cell B.
3. Duplicate concrete final product cubicles.
4. An aluminum siding, structural steel framed building 50' x 40' x 35' high with all necessary services from Bldg. 706-D would be provided. A monorail and switch to utilize the existing Bldg. 706-D crane would be provided.
5. The following new equipment with all necessary instruments and services would be installed in new Cell B.
   a. A-9 precipitator with filter
   b. Centrifuge (possible)
   c. A-8 catch tank
   d. A-13 vacuum tank
   e. B-1 evaporator
   f. B-6 evaporator
   g. Five vacuum transfer tanks
   h. New waste lines to existing Bldg. 706-D waste system.
   i. Tanks B-3, B-10, and B-22 if necessary.
   j. All necessary piping and instrument lines.
   k. Vessel off-gas lines would be connected via vent header through pipe trench to A-6 scrubber in Cell A.
   l. All new necessary samplers would be provided.

[redacted]

[redacted]

April 6, 1949

6. New equipment, possibly of tantalum, would be designed and installed in the final product cubicles.

7. Cell and cubicle ventilation would be connected to the cell vent system discharging to the new 250' Radioisotope Area stack.

7.4 Development Work Required for Plan III

The following development work will be required for Plan III.

		Time Elapsed	Man Months	Materials Dollars	Total Cost
1.	New filter or centrifuge	4 mo.	16 @$750	$20,000	$32,000
2.	New samplers	1 mo.	4	1,000	4,000
3.	New electrolytic cell	3 mo.	4	2,000	5,000
4.	New instrumentation B-1, B-6	1 mo.	4	2,000	5,000
5.	New cubicle equipment	3 mo.	6	2,250	6,800
			34 man months		$52,800

8 men required for 4 months

7.5 Estimated Construction Cost

The following rough estimate does not include overhead or contractor's fees.

Cell A Decontamination	5,000
Cell A Alterations	14,000
New Cell, Cubicles & Bldg.	95,000
New B Cell Equipment	41,000

[redacted]

[redacted]

April 6, 1949

New Cubicle Equipment	38,000
Construction Facilities	8,000
	$200,000
Contingencies 20%	40,000
	$240,000

Estimated time required for construction 6 months.

7.6 Estimated Design Time and Cost

Assume that design will cost 15% of total construction.

Total design cost	$36,000
Man months @ 650 / man month	55
Assume 1/3 engineering, man months	18.3
6 engineers would require	3 months
2/3 drafting, man months	36.7
12 draftsmen would require	3 months

7.7 RaLa Process Shutdown Required

For alterations in Cell A, approximately 100 man hrs will be required. Assuming that the working time in the decontaminated cell is approximately one hour, and that twenty qualified craftsmen are available, the approximately 13 days would be required for actual work in the cell.

Assuming that two weeks are required for cell decontamination to a permissable working time of one hour, the total down time will then be 27 days, or one month.

[redacted]

[redacted]

April 6, 1949

7.8 Cost Summary

Development Costs	52,800
Design Costs	36,000
Construction Costs	240,000
	$328,800
Contingencies 20%	65,760
	$394,600

8.0 Plan IV. Processing Irradiated 95% Uranium

8.1 Description

Plan IV proposes that enriched 25 be used as a feed material for Ba^{140} production. First pointed out by personnel at Los Alamos as alterative in RaLa production, it has certain inherent advantages, plus a number of disadvantages as compared with the use of natural uranium.

The ultimate advantage of Plan IV would be most apparent if it utilized the facilities of the proposed high flux pile with its high neutron flux. In such a case it is quite reasonable to assume that RaLa production could become an auxilliary or by-product facility to the proposed "25" process. The advantages of RaLa production from enriched 25 irradiated at Hanford are somewhat less apparent because of the lower neutron flux available, and because of cooling water limitations in the Hanford piles. However, enriched "25" wafers or rods could feasibly be irradiated at Hanford.

[redacted]

[redacted]

April 6, 1949

The main advantage of using enriched 25 stems from the fact that the entire RaLa process becomes essentially a laboratory scale process. At present, the operations in Cell A (coating removal, metal solution, extraction, and to come extent, metathesis), are plant scale operations while the remaining steps are nearly laboratory scale. Use of enriched 25 reduces these first steps and the scale of the latter is that the whole process becomes small in scale. This reduction of scale in process equipment also reduces the scale of waste handling and reagent make-up facilities. Consequently waste storage requirements are considerably reduced, reagent make-up is relegated to the position of being adequately handled in a cold laboratory, and the addition of reagents could be done with very simple equipment.

Another advantage in using enriched 25 is that the quantity of plutonium in the feed, which is a major health hazard, is reduced about ten to twenty fold because of the reduced amount of 28 present during irradiation.

In using the Hanford pile facilities, five types of slugs might be utilized. First, U-Al alloy slugs, in Al jackets, such as those irradiated for the ORNL "25" Hot Pilot Plant, could be used, in which case the coating removal, metal solution, and extraction steps of the present RaLa process would necessitate modification. An alternative would be the use of U metal or

[redacted]

[redacted]

April 6, 1949

oxide wafers or pencils in specially constructed aluminum cooling shells. In the latter case, the existing RaLa could be used to recover Ba^{140}. Some development work would be required to permit mass production of such specalized slugs, to devise operations, and to eliminate as much Al as possible from the U pencils or wafers prior to processing. Such sawing or punching operations would have to be done rapidly and remotely. In addition to recovering the Ba^{140}, facilities for storing large quantities of 25 would have to be provided. The 25 could most easily be recovered in the 1200 area for the proposed high flux pile.

The use of enriched 25 introduces two problems which are not present in using natural uranium for RaLa production. First, the use of highly enriched 25 requires that all equipment and procedures be studied from the standpoint of criticality and precludes the processing of batches in excess of 500 grams of 25. Secondly, the value and limited existence of 25 makes the "dead" storage of rather large quantities of contaminated 25 a very questionable procedure. An extraction plant for 25 might have to be constructed as a part of the new RaLa plant: The cost of such a facility has not been included in the cost estimate.

A possible chemical processing scheme for handling irradiated 25 is shown in Figure 11. This schematic flowsheet shows a process for the recovery of both Ba^{140} and U^{235}.

[redacted]

[redacted] April 6, 1949

8.2 Capacity and Feed Material

The capacity of the plant proposed in Plan IV would be 10,000 curies of Ba^{140} per batch. The Ba^{140} should be approximately one-hundred times as concentrated as in natural uranium. Assuming that natural uranium slugs in the Hanford pile contain 130 curies per 1800 grams of U for 30 day irradiation, then 1000 grams of 95% U^{235} would contain 13,000 curies at time of discharge. Assuming one half life decay from time of discharge to shipment of the final product to Los Alamos and an overall chemical recovery of 85%, each 1000 grams of 25 would yield 5,500 curies of B^{140}. Thus, 10,000 curies could be produced by irradiating 3600 grams of enriched uranium. The volume of the chemical processing equipment would be quite small since a maximum batch size of approximately 500 grams of U would probably be established because of criticality considerations.

8.3 New Facilities for Plan IV

All new facilities and equipment would be required for a new enriched 25 barium production plant. A proposed cell arrangement and building layout is shown in Figure 12 .

8.4 Development Required for Plan IV

The following major development must be done before Plan IV is feasible:

[redacted]

[redacted]

April 6, 1949

	Elapsed Time	Man Months	Material Cost	Total Cost
1. New type 25 slug for Hanford irradiations	3	18	10,000	23,500
2. Handling facilities for new slugs	3	12	5,500	14,500
3. Adaption of 25 extraction 18 process for use with sulphates or a new "green slug" extraction process.	18	54	35,000	75,500
		84		$112,500

Four men would require approximately 18 months to complete development.

8.5 Cost of Design for New Facility

It is estimated that six engineers and six draftsmen would require approximately six months to design a new building and new process equipment. Therefore design cost is estimated at:

72 man months @ 650 $47,000

8.6 Estimated Construction Cost

The estimated construction cost for Plan IV is as follows:

1. New building, cells, and cubicles	$250,000
2. Ba^{140} process equipment	20,000
3. 25 storage equipment	13,500
4. Piping	20,000
5. Instruments	30,000
6. Samplers	16,000
7. Cold make-up laboratory	10,000
	349,500
Contingencies 20%	70,500
Total	420,000

[redacted]

[redacted] April 6, 1949

It is estimated that nine months would be required for the construction of this facility.

8.7 Shutdown Time Required

Since this is an entirely new facility, no shutdown in the existing RaLa process would be required.

8.8 Cost Summary

Development	112,500
Designs	47,000
Construction	420,000
Total	$579,500
Contingencies 20%	115,900
	$695,400

9.0 Plan V. Development of a New RaLa Process

9.1 Purpose

Plan V. would provide a new, more efficient process with the production of RaLa and possibly of fission products, for a plant presumably to be constructed at another site.

All the foregoing plans are based on the sulphate precipitation method of barium separation, developed under the pressure of war-time urgency. Plan V. proposes the development of a new process, possibly resin adsorption, that would separate Ba^{140} and possibly other valuable fission products. The final plant might be designed to use 25 enriched slugs to permit a plant small and compact in scale but with high barium capacity. Thus Plans IV, & V. could be persued together.

[redacted]

[redacted] April 6, 1949

ORNL, with its background of work on separation processes, is willing to assume the development of a new separation process. Additional research facilities will have to be constructed and additional personnel provided. Additional personnel required should be from the organization which later will operate the plant. The ORNL operating budget is not adequate to accommodate the cost of the program and new funds for this purpose must be allocated.

9.2 Development Required:

The develop time is estimated to be:

Total time required	18 months
Number of men required	8
Man months required	150
Total estimated cost, exclusive of construction of final plant	$1,000,000.

TABLE

Summary of P

Plan	Plant Capacity	Changes	New Facilities	Required Shutdown Time	DEVELOPM Elapsed Time Mo.	Man Months
I.	2200 c	1. New separator for precipitate, vessel A-9.	1. New cubicles for final product.	20 to 40 days	2	16
II.	10000 c	1. New separator for precipitate, vessel A-9. 2. Closing all tanks. 3. Removal of obsolete equipment. Permanent vacuum tanks. 4. New Samplers. 5. Radiation instrumention.	1. New cubicles for final product. 2. New final product equipment.	80 to 100 days	3 to 4	26
III.	10000 c	1. Alterations to Cell A to utilize dissolver & waste system. 2. Samplers in Cell A altered.	1. New Cell B and equipment. 2. New separator for precipitate. 3. Pipe trench from Cell A to new Cell B. 4. New cubicles & equipment. 5. Building extension to house new cells.	30 days max.	3 to 4	34
IV.	10000 c	1. Use Hanford irradiated 95% U^{235} as source. 2. All new equipment necessary.	1. New building. 2. New cells. 3. All equipment (small capacity) 4. U^{235} recovery. 5. New process must be tested.	None	18	84
V.	10000 c	1. New process development.	1. New experimental facility required.		18	160

Dwg. 7020

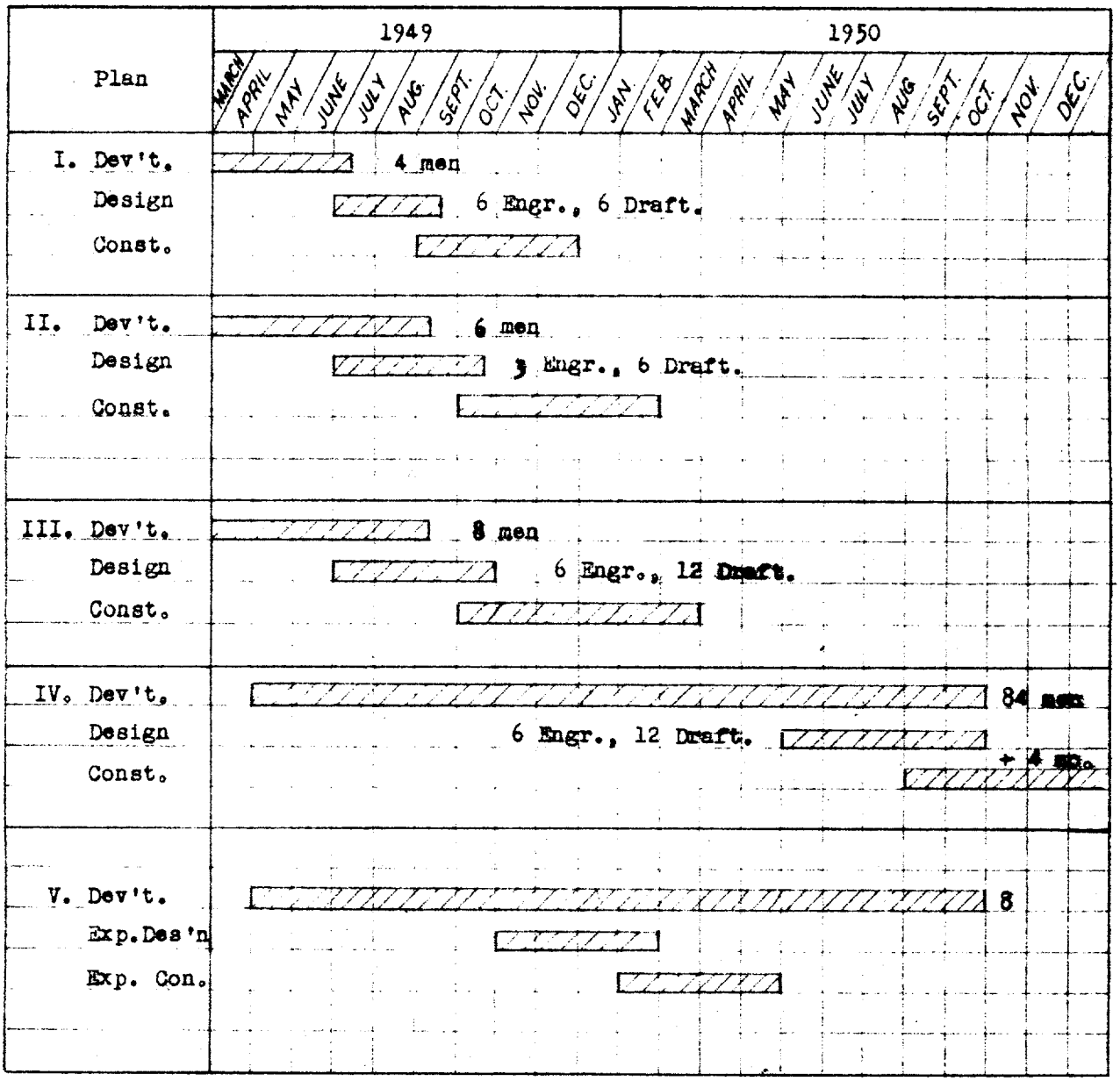
I

ans I - V

NT Men	Cost	DESIGN Elapsed Time Mo.	Man Months	Men	Cost	CONSTRUCTION Elapsed Time Mo.	Cost	Total Elapsed Time	Total Cost	Remarks
8	$32,000	2	20	8 engr. 6 draft.	$12,000	3-4	$62,000	6-8 Mo.	$127,000	Process efficiency improved 20% Time cycle reduced 20 hrs. Changes only in Cell A. Ventilation changes now in progress will reduce hazard.
6	$45,000	3	27	3 engr. 6 draft.	$19,400	4-5	$132,000	10-14 Mo.	$217,000	Process efficiency improved 20% Time cycle reduced 20 hrs. Changes in Cell A, Cell B, and Cubicles. Changes necessary to reduce hazard in handling 10000 c. Shutdown time excessive; estimate dependent upon decontaminate. Reliability of process improved. Exposure of workmen rather excessive during alterations.
8	$52,000	3	55	6 engr. 12 draft.	$36,000	6	$240,000	8-14 Mo.	$394,000	Process efficiency improved 20% Time cycle reduced 30 hrs. Changes in Cell A, New Cell B & Cubicles. Reliability of process improved Cell B available for future development work. Radioactivity hazard greatly reduced.
5	$112,800	4	72	6 engr. 12 draft.	$47,000	6-8	$420,000	2 yrs.	$695,000	Criticality problems must be designed against. Development on slug irradiation and handling needed. Time elapsed could be reduced. Volume of process solution very small. Almost all 4 recycled. Good source of other radioisotopes because of small volume.
8	$1,000,000	--	--	-------	-------	---	-------	---	--------	For construction at another site.

Drawing # 7021

TABLE II. SCHEDULES



Note: These estimates assume adequate manpower and facilities. Only Technical men are listed.

Drawing # 7022

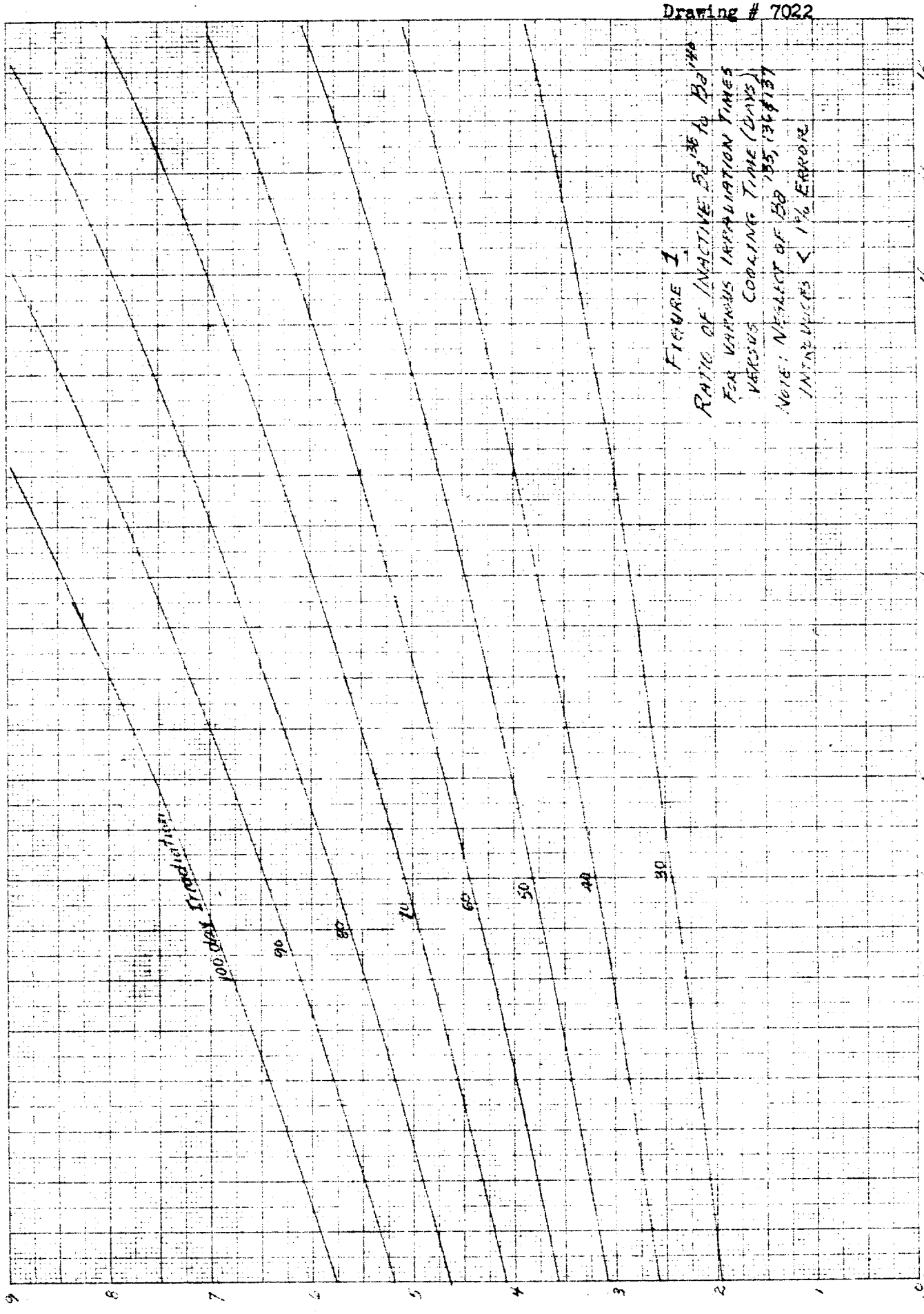


FIGURE 1

RATIO OF INACTIVE Ra^{226} TO Ba^{140} FOR VARIOUS IRRADIATION TIMES VARIOUS COOLING TIMES (DAYS)

NOTE: NEGLECT OF Ba^{135}, Ba^{137} INTRODUCES < 1% ERROR

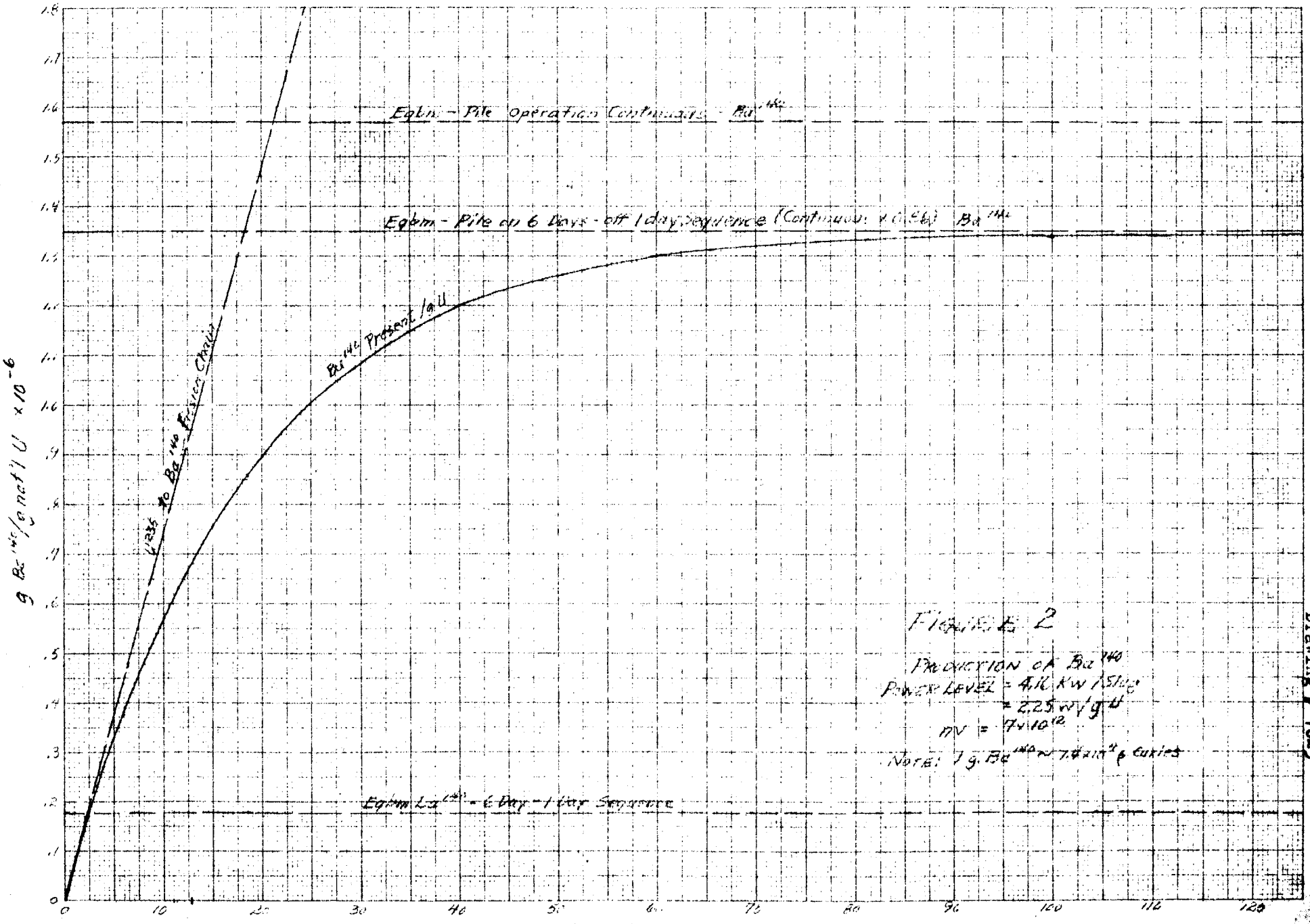


Figure 2

Production of Ba^{140}

Power level = 4.6 KW / 150 gU

= 2.25 w/g U

nv = 4×10^{12}

Note: 1 g. Ba^{140} ~ 7.4×10^{2} curies

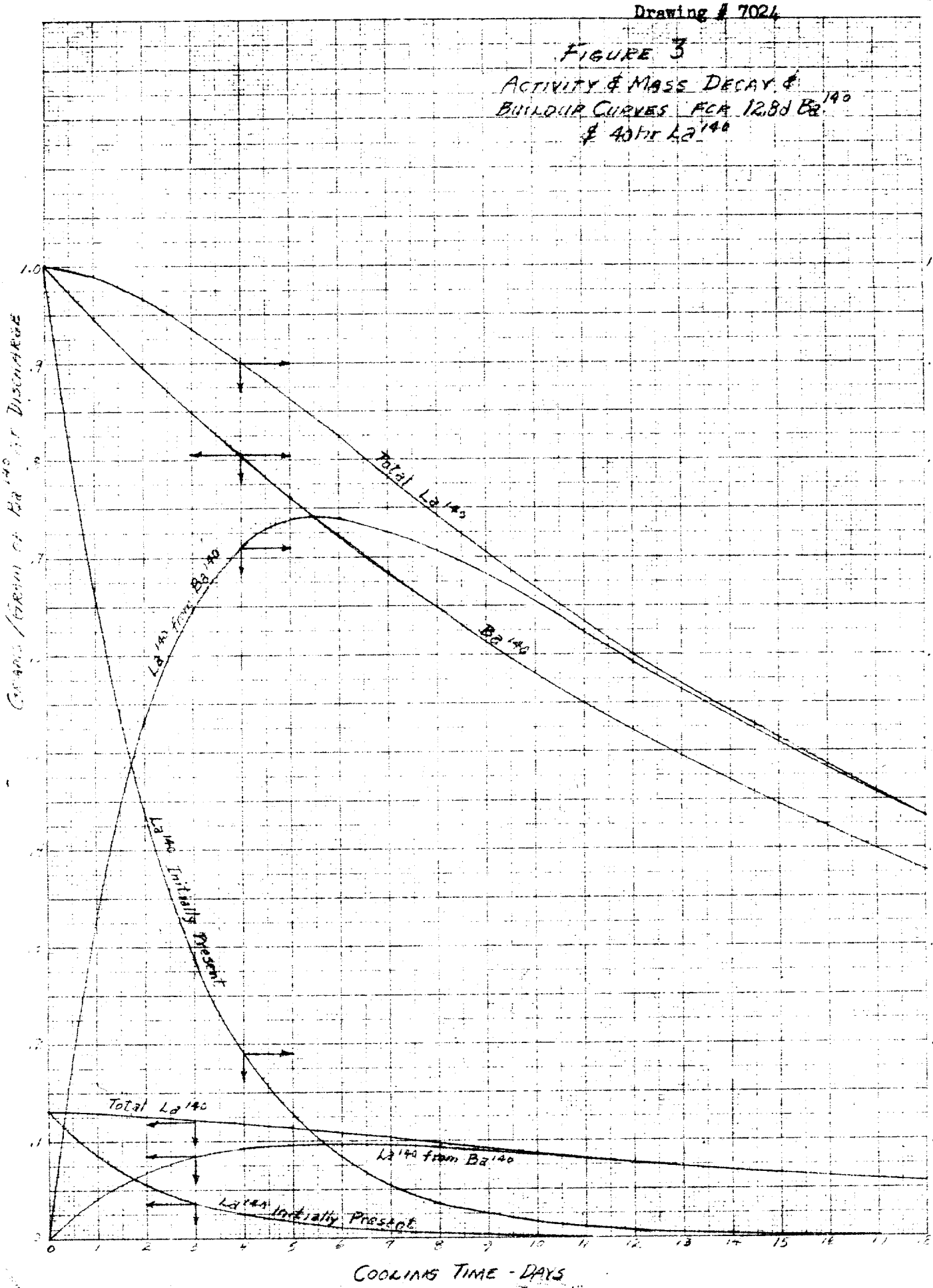
-37-

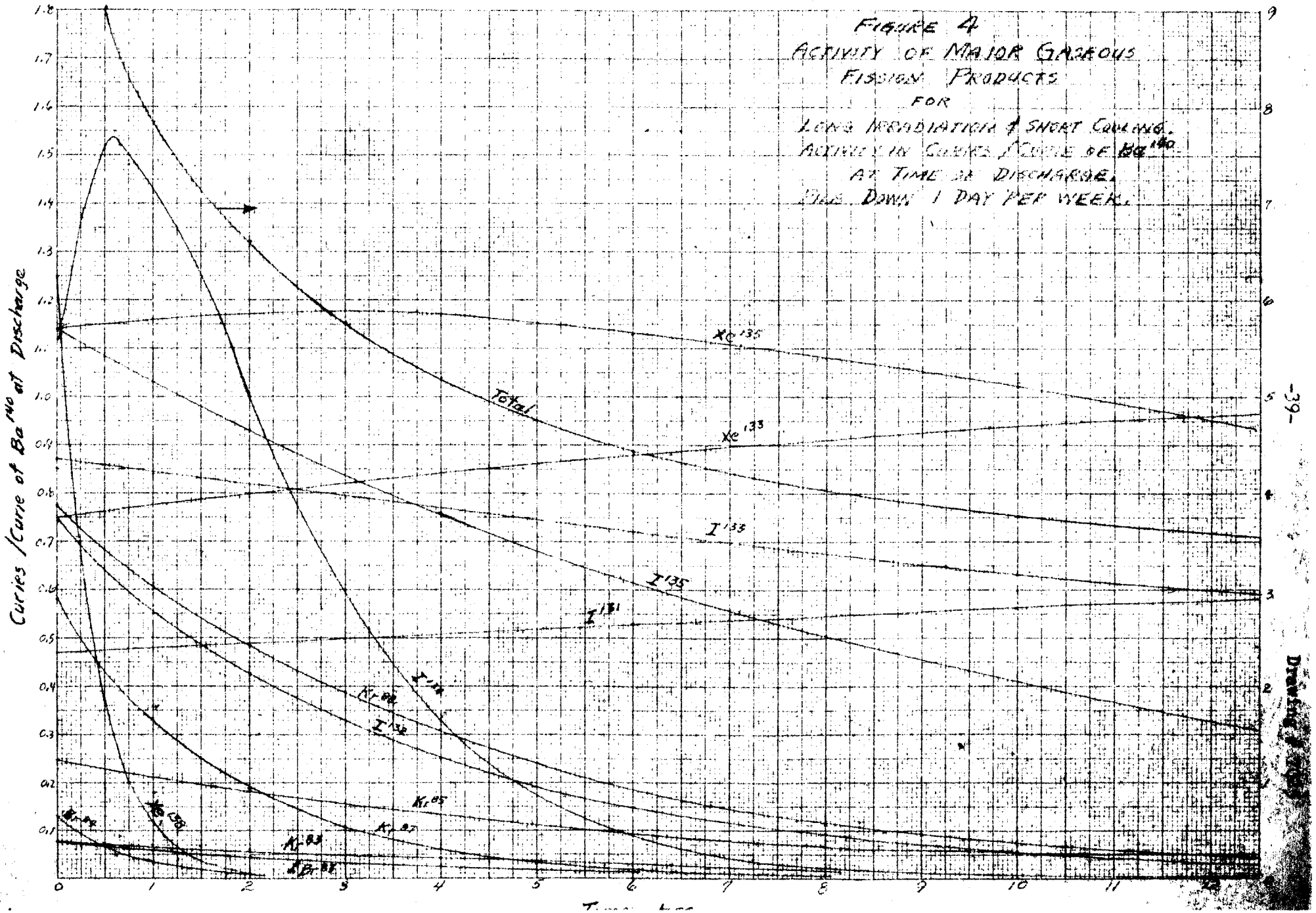
Drawing # 7023

Drawing # 7024

FIGURE 3

ACTIVITY & MASS DECAY & BUILDUP CURVES FOR 12.8d Ba^{140} & 40hr La^{140}





NO. 319-CR. MILLIMETERS. 180 BY 250 DIVISIONS.

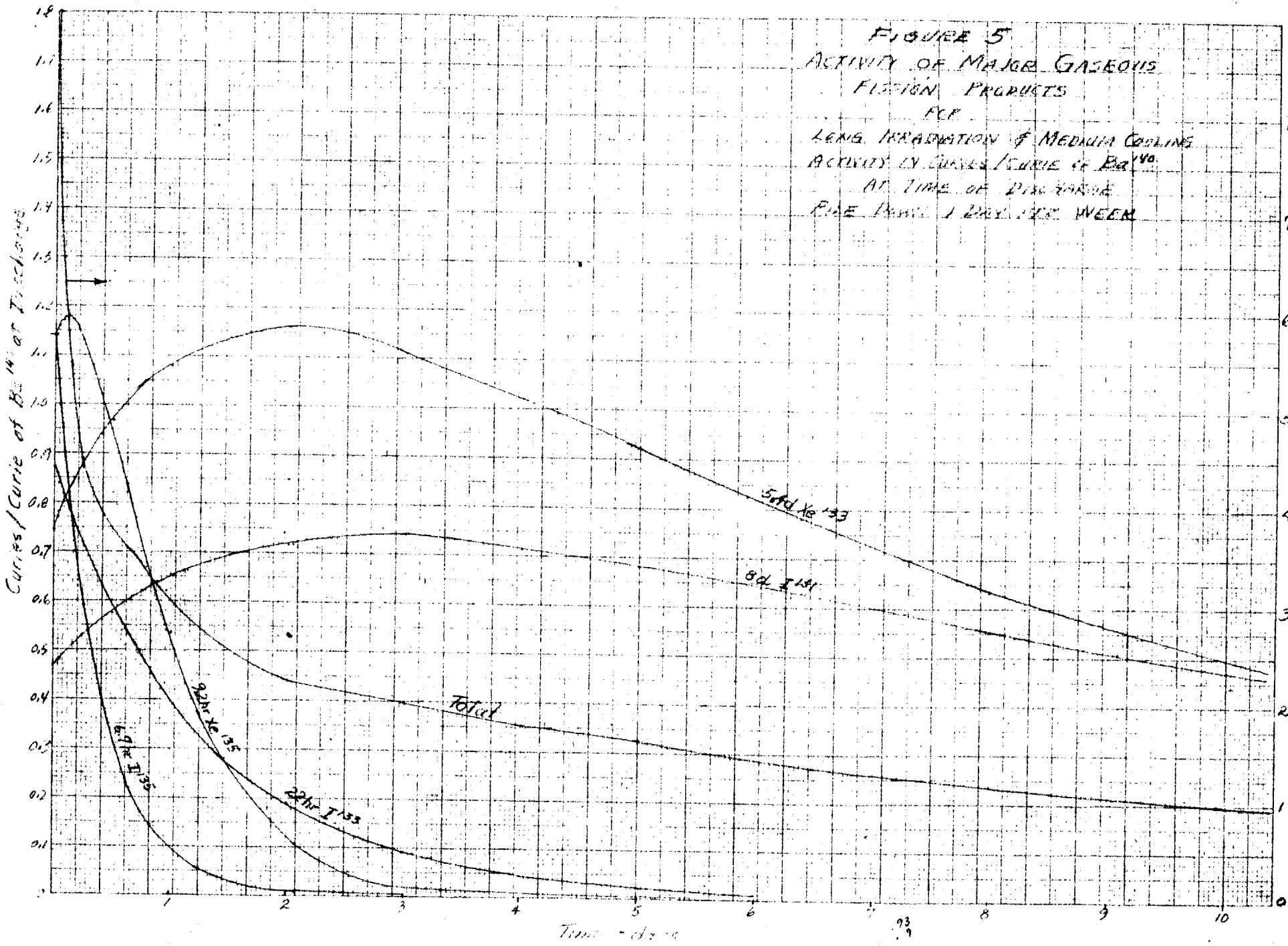
CODEX BOOK COMPANY, INC. NORWOOD, MASSACHUSETTS.
PRINTED IN U.S.A.

FIGURE 5

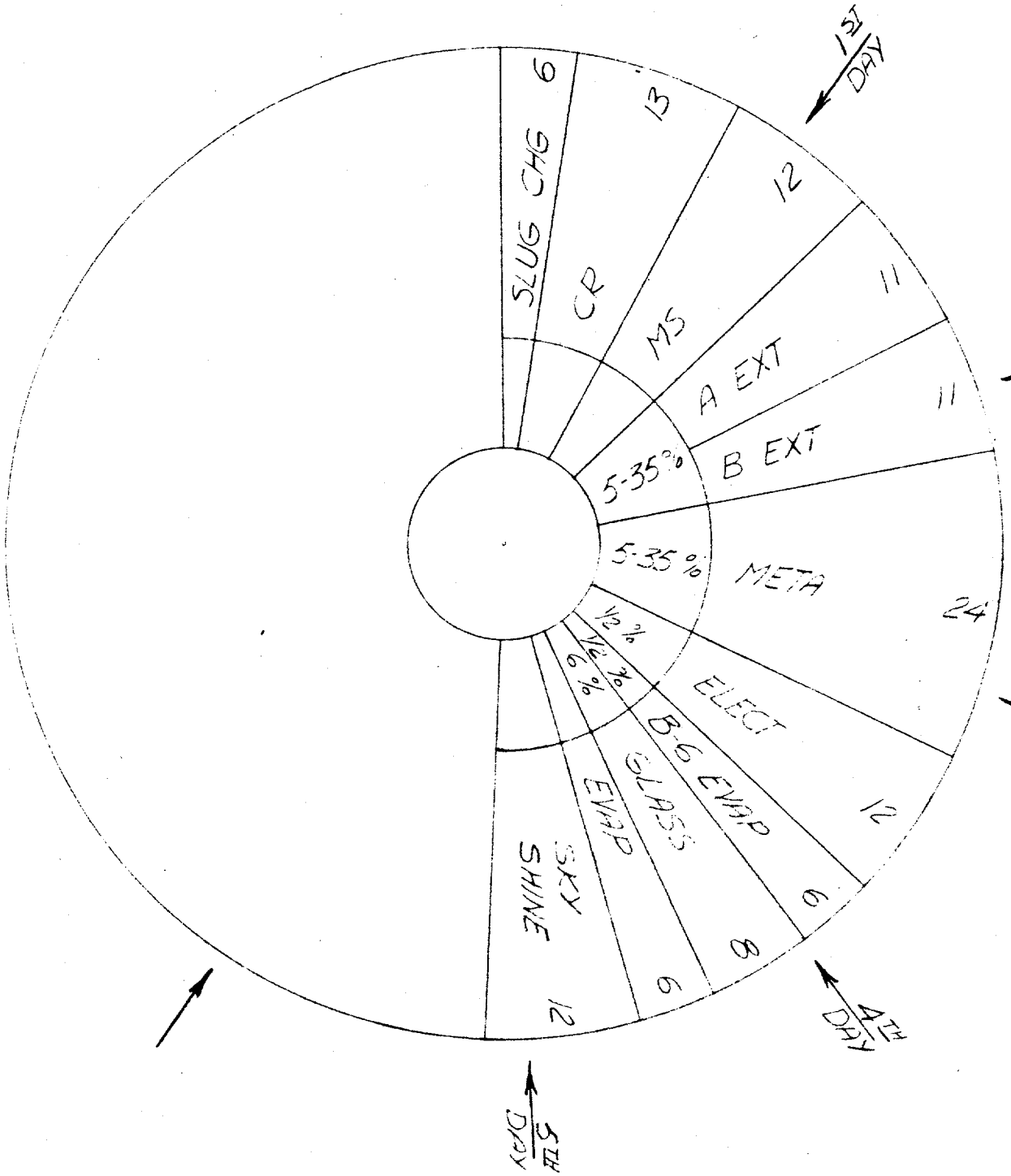
ACTIVITY OF MAJOR GASEOUS FISSION PRODUCTS FOR LONG IRRADIATION & MEDIUM COOLING

ACTIVITY IN CURIES / CURIE OF Ba^{140} AT TIME OF DISCHARGE

FUEL FROM 1 DAY AFTER WEEK



Drawing # 7026



AT DISCHARGE 4950
AS RECEIVED 3760
AFTER PROCESS
35% CHEM LOSS
18% DECAY LOSS 1850

CURRENT CYCLE (65%)
38 W SLUGS
1950 CURIES

FIGURE 6

Drawing # 7028

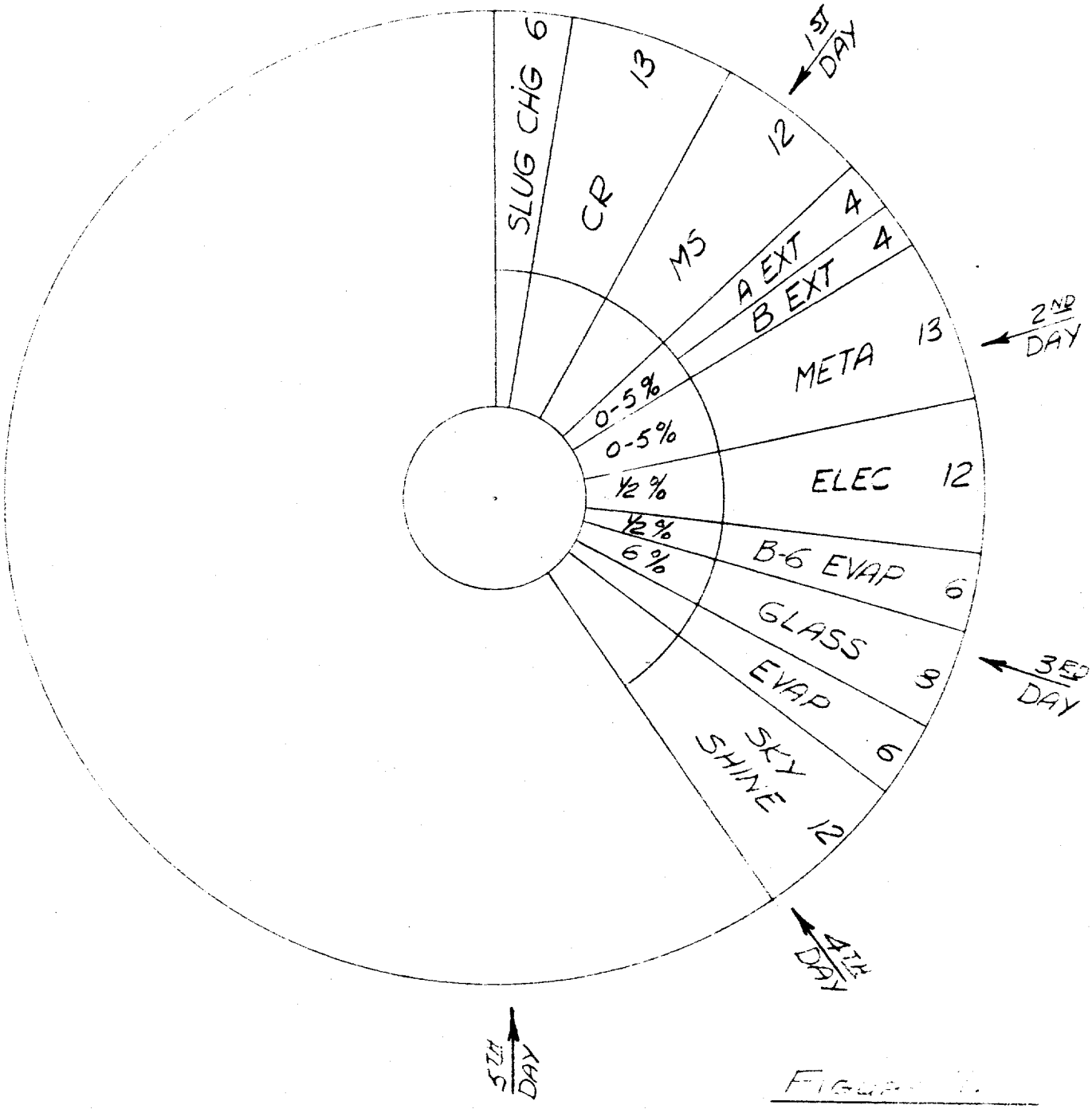


FIGURE 1.

AT DISCHARGE 4950
AS RECEIVED (5 Days) 3760
AFTER PROCESS
15% CHEM LOSS
15% DECAY (4 Days) 2560

IMP CYCLE (85%)
38 W SLUGS
2560 CURIES

NOT CLASSIFIED

Drawing # 7029

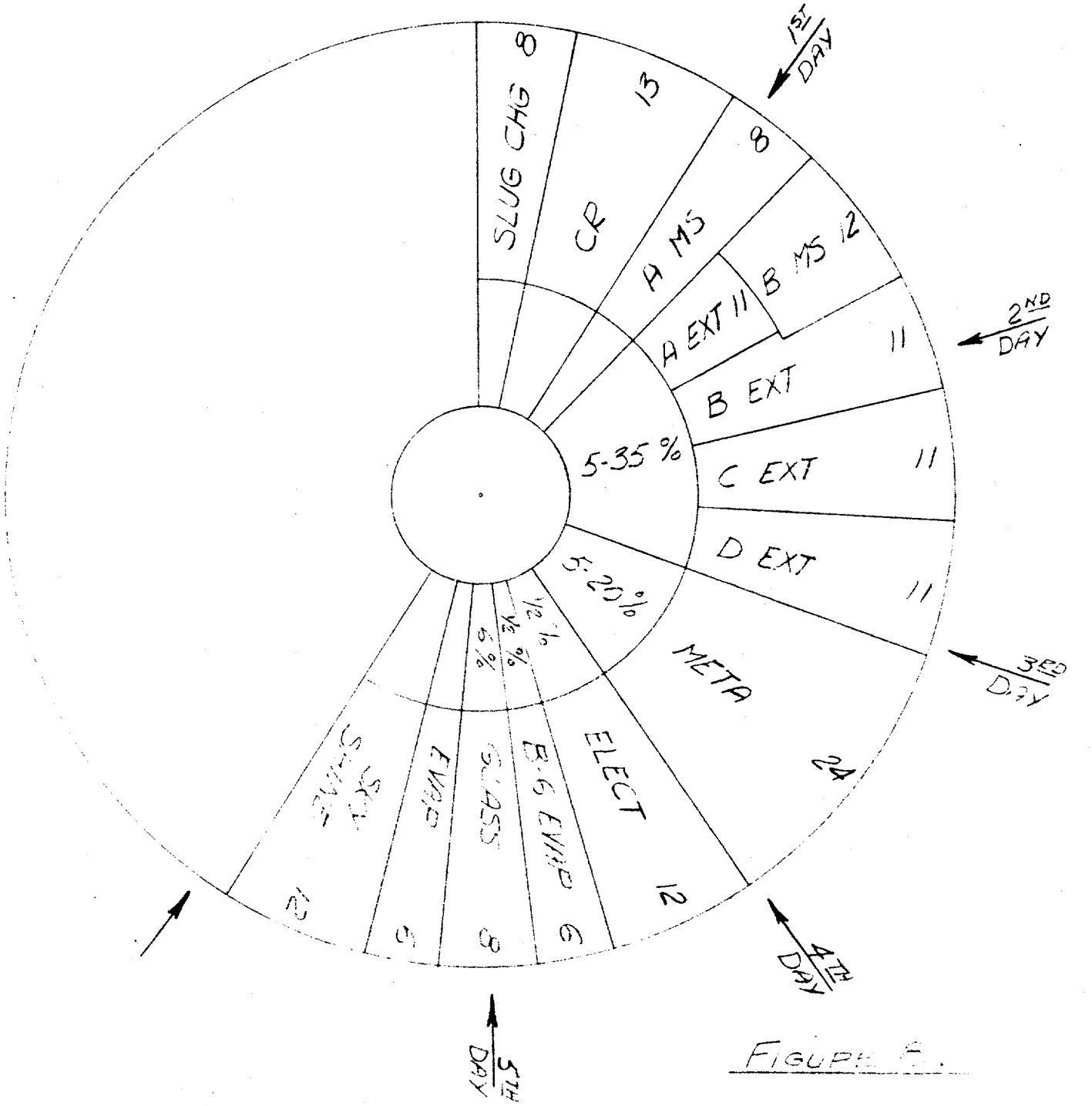


FIGURE F.

AT DISCHARGE 9900
AS RECEIVED 7530
AFTER PROCESS
35% CHEM LOSS
2% DECAY LOSS 3530

CURRENT CYCLE 165%
76 W SLUGS
3530 CURIES

NOT CLASSIFIED

Drawing # 7030

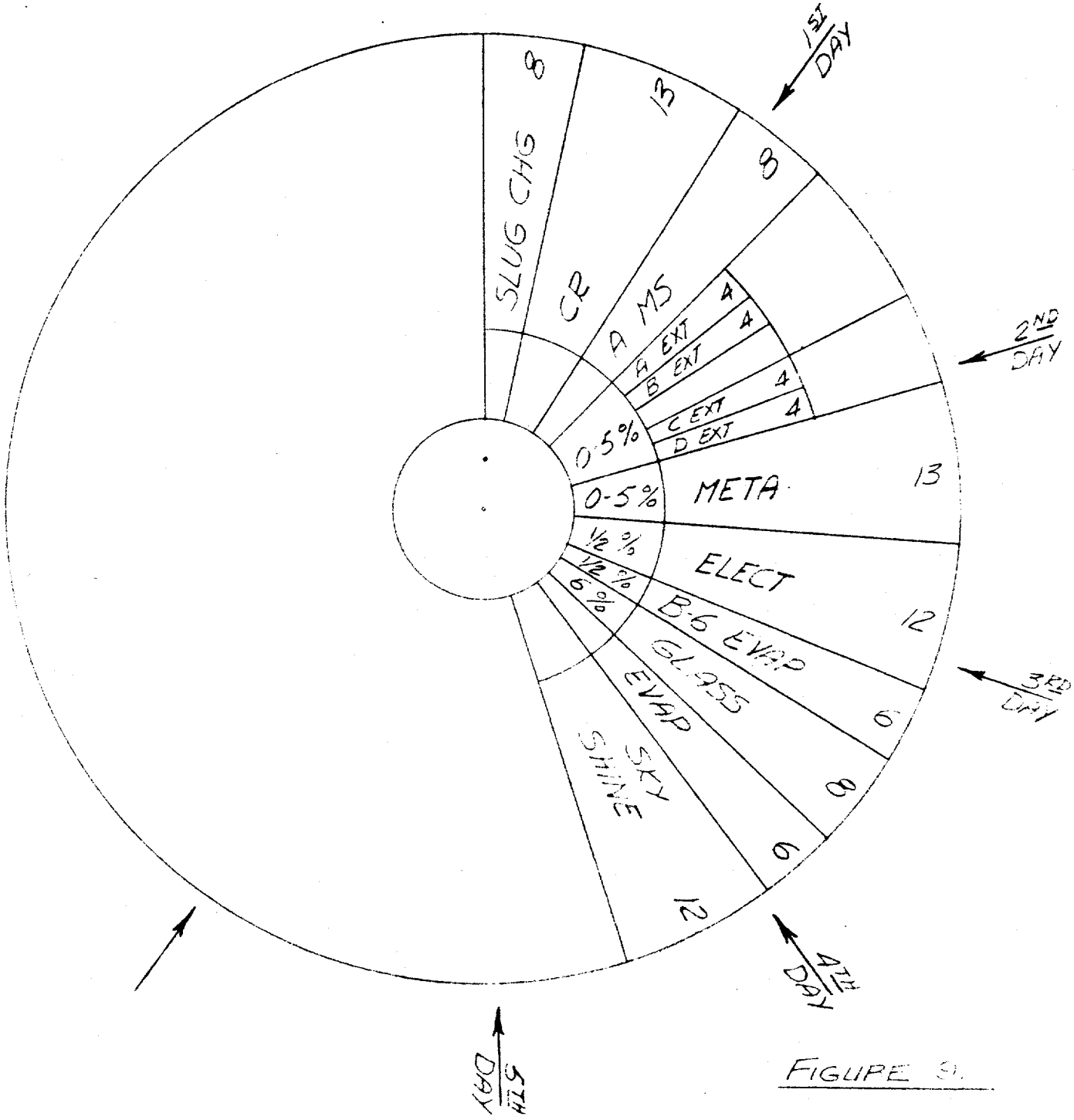


FIGURE 3.

AT DISCHARGE	9900
AS RECEIVED	7530
AFTER PROCESS	
15% CHEM LOSS	
17% DECAY LOSS	4970

IMP CYCLE (85%)
76 W SLUGS
4970 CURIES

NOT CLASSIFIED

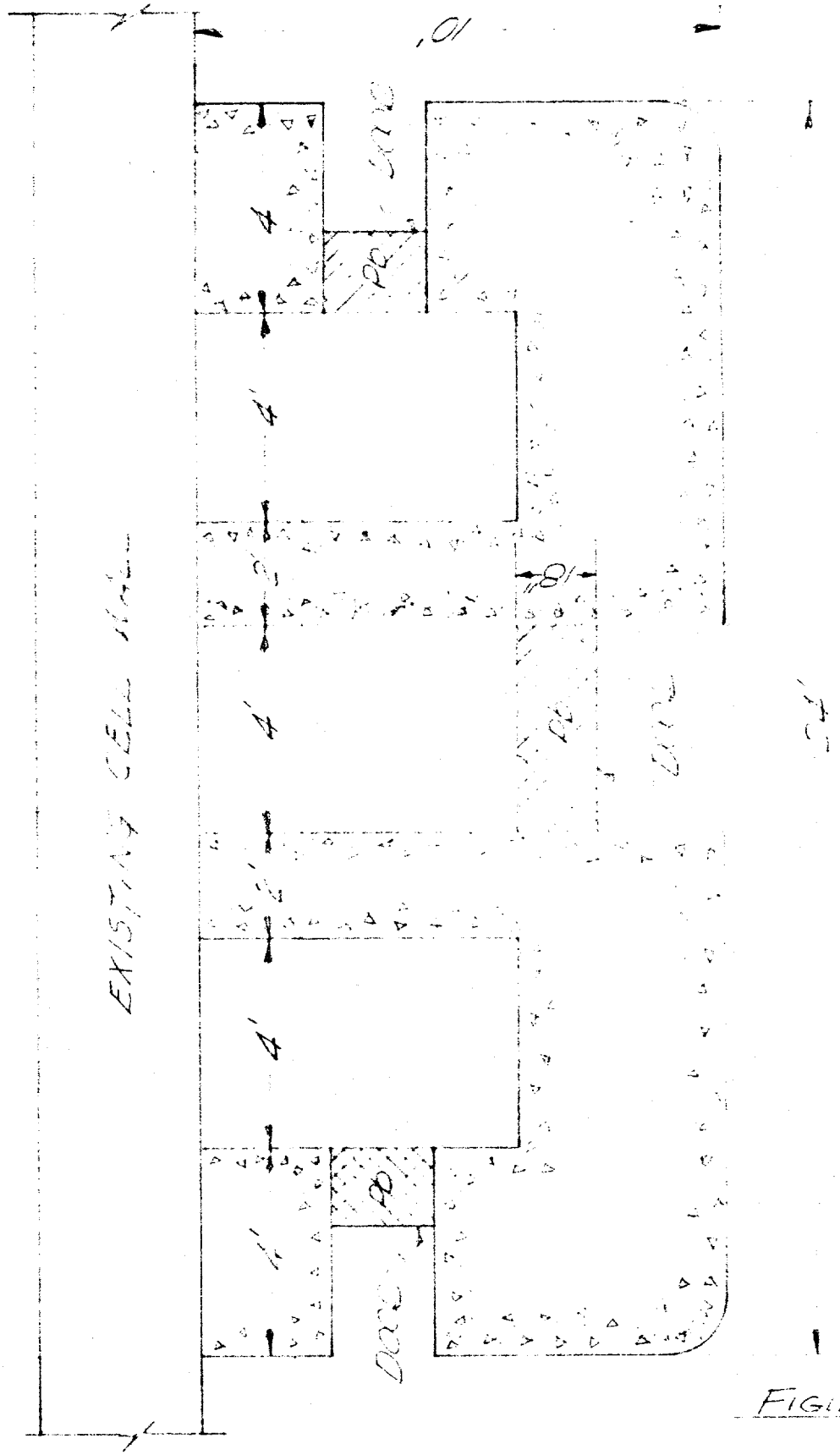


FIGURE 10.

NOT CLASSIFIED

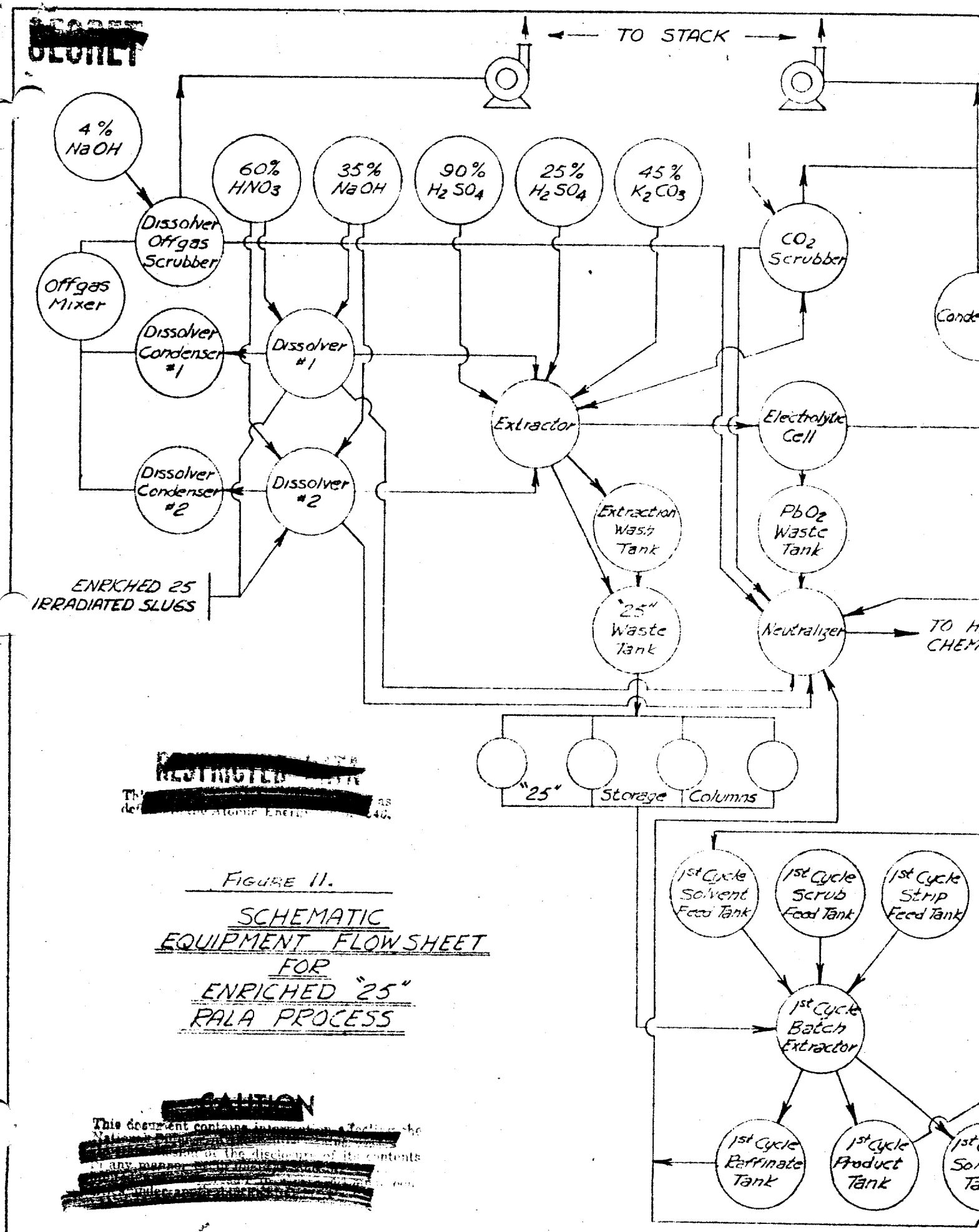
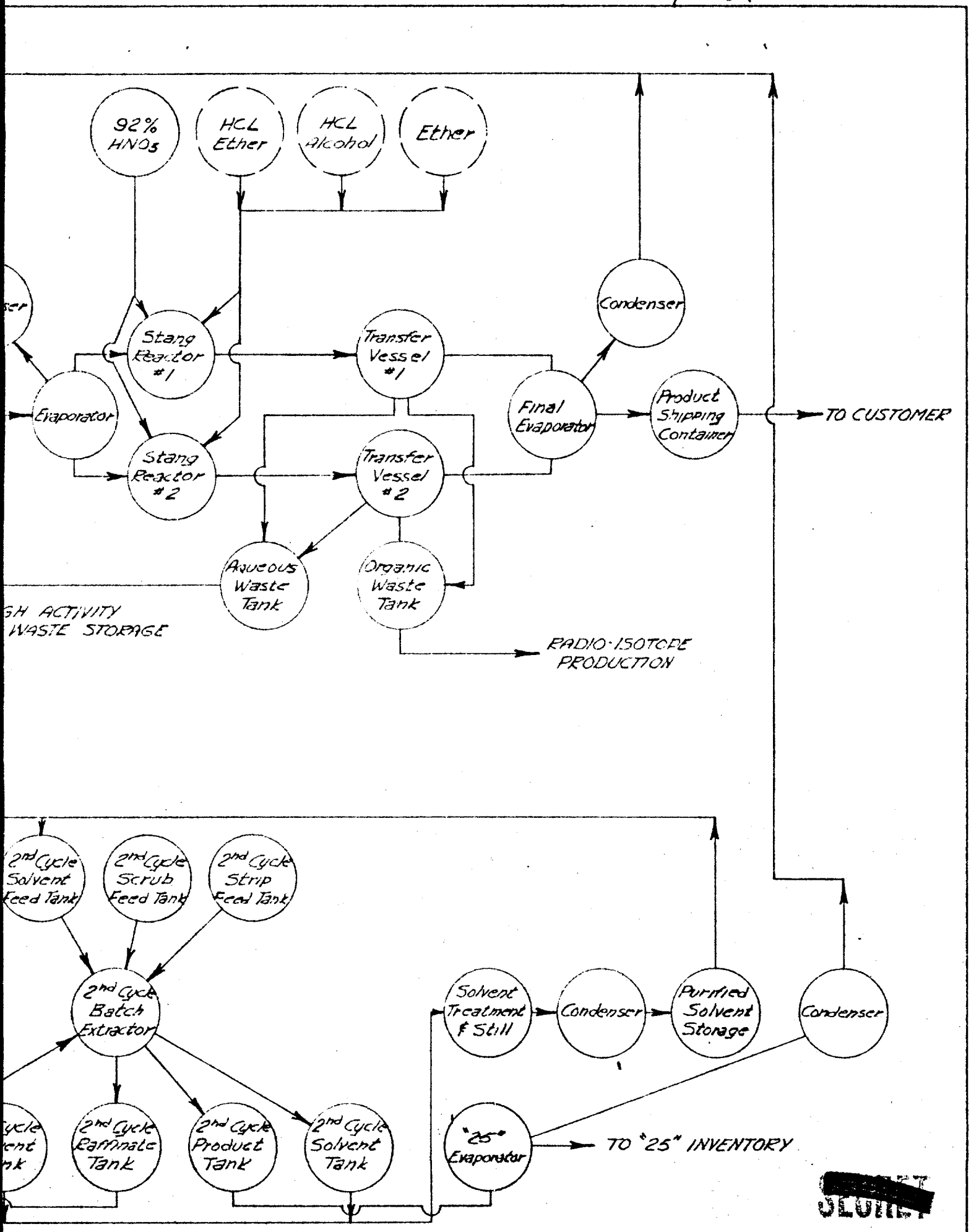


FIGURE 11.

SCHEMATIC EQUIPMENT FLOWSHEET FOR ENRICHED "25" RALA PROCESS

Dwg. 7032



Classification Cancelled
Or Changed To [redacted]
By Authority Of
By
Date

This document consists of 6 pages. Copy 2 of 11 copies. Series A.

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-4-209

Date April 19, 1949

Subject REPORT ON LOS ALAMOS RAIA MEETING, APRIL 13 AND 14, 1949

To C. N. Rucker

Copy No.

From L. B. Emlet

Before reading this document, please sign and date below:

CLASSIFICATION CANCELLED
1/19/95
Date
ADD signature
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

DISTRIBUTION

1. C. N. Rucker
2. C. E. Center
3. A. M. Weinberg
4. M. D. Peterson
5. F. L. Culler, Jr.
6. E. J. Witkowski
7. J. A. Lane
8. J. A. Swartout
9. F. L. Steahly
10. L. B. Emlet
11. Central Files

This document contains in[redacted] States. Its transmissio[n] an unauthorized [redacted] per[redacted]

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

[redacted] defense of the United [redacted] in any manner to [redacted]

This document contains restricted [redacted] of 19[redacted]

4-22-49

[redacted]

OAK RIDGE NATIONAL LABORATORY

April 19, 1949

TO: Mr. C. N. Rucker

FROM: Mr. L. B. Emlet

SUBJECT: Report on Los Alamos RaLa Meeting, April 13 and 14, 1949

A series of three meetings were held on Wednesday and Thursday, April 13 and 14, 1949, at Los Alamos to discuss the future of the RaLa program. The various installations were represented by the following persons:

Hanford Engineer Works - C. N. Gross, H. M. Parker, W. M. Harty, B. Widenbaum, L. Staepler, R. Smitser, John Carleton.

Hanford AEC - Don Sturgess.

Los Alamos Laboratory - John Manley, E. Jette, Don Mueller, R. P. Hammond, J. A. Leary, D. P. McDougal, N. H. Smith, J. R. Lilienthal.

Washington AEC - A. V. Peterson.

Oak Ridge AEC - H. M. Roth.

Oak Ridge Nat'l Lab. - F. L. Culler, Jr., L. B. Emlet.

The following items were discussed:

I. OVERALL RALA REQUIREMENTS

The following RaLa requirements were set up by A. V. Peterson and agreed to by the Los Alamos people:

1. 4/25/49 to 6/30/49

Four - 2500-curie shipments at three-week intervals.

2. 7/1/49 to 6/30/50

Ten - 2500-curie shipments. It is possible that in some cases two of these shipments will need be combined to supply a 5000-curie source.

3. 7/1/50 for indefinite period

Eight - 10,000-curie shipments.

II. STATUS OF RALA PROGRAM AT HANFORD, LOS ALAMOS, AND ORNL

1. Messrs. Gross and Harty reviewed the present status of the RaLa program at Hanford. The following points were mentioned:

   a. Hanford completed a feasibility report early in January on the construction of a new RaLa production unit. They estimated a total cost of $4,000,000 to install a plant based on the present ORNL process. They believe that this plant can be in operation by July, 1950, if the project is given sufficient priority.

   b. The AEC in a letter to General Electric expressed the opinion that $4,000,000 was too high and suggested that consideration be given to using the two pilot plant cells in the end of the "T" Canyon for a RaLa production facility. They further pointed out that only $750,000 had been budgeted for RaLa production during 1950 and suggested that the development and construction program be held within this limit.

   c. Hanford is at present studying the feasibility of using the "T" Canyon and they expect to have a report, including estimated costs, time schedule, etc., completed by late June, 1949.

   d. Hanford is basing their process on the current obsolete ORNL procedure. They plan to use a 26" centrifuge for the initial Ba-Pb sulphate separation. All equipment will be designed for remote control maintenance. A minimum of development work is planned in an attempt to increase the purity and the yield of the process.

   e. Mr. Gross stated that, although the report is not complete on the use of the existing cells in the "T" Canyon, they were of the opinion that neither the time schedule nor the money limitation would be met if the acid purification step (fuming HNO_3 and ether-HCl steps in the glassware) were included in the Hanford operation. He suggested that this step be combined with the Los Alamos La^{140} separation step.

2. Mr. Hammond and later Dr. Jette reviewed the status of the RaLa program at Los Alamos.

   a. A new La^{140} separation unit is being constructed at Los Alamos. It should be completed and ready for operation some time after February, 1950. At that time they will want to gradually increase the size of the batches processed from 2,500 to 10,000 curies. They expect the new

2. a. Continued

equipment to be more tolerant of inactive contaminants (Fe, Ni, Cr, Pb, etc.).

b. The greatest difficulty in present RaLa shipments appears to be the organic and metallic contaminants. The last shipment (Run 31) did not show any evidence of the organic contaminants but there were relatively large amounts of iron present. It is believed that if a NaOH purification step is incorporated with the present acid purification that most of the interfering contaminants will be removed.

c. Mr. Hammond and Dr. Jette stated that they did not believe it possible to transfer the acid purification step to Los Alamos without drastically changing the design of their new facilities and adding a liquid waste disposal problem.

3. Messrs. F. L. Culler, Jr., and L. B. Emlet reviewed the RaLa program at ORNL using the recent report as a guide (CF #49-4-38; RaLa Process Study - Preliminary Report No. 1; F. L. Culler, et als, to L. B. Emlet; 4/6/49).

a. The RaLa production unit is one of the major contributors to the Laboratory particle problem and, therefore, immediate process modifications are required. It is also planned to alter the Ba-Pb sulfate separation step and attempt to develope an improved purification method to insure a better quality product. A cost of $127,000 (exclusive of overhead) is estimated for these modifications. These changes do not provide for increased batch sizes, but will make the production of 2500-curie batches more reliable. The Laboratory management is of the opinion that this work must proceed at once so long as ORNL is expected to continue producing 2500-curie batches.

b. It was proposed that the AEC approve a more drastic modification of the ORNL RaLa facilities to provide for 10,000-curie batches. This would entail eight to fourteen months elapsed time and an expenditure of $394,000(exclusive of overhead).

c. In conjunction with the above it was suggested that work start immediately on the development of a new process. This new process should be aimed at providing the design of a permanent Ba^{140} separation unit at the site of the Hi-flux reactor or at Hanford.

d. The ORNL group further suggested that RaLa construction work at Hanford be curtailed until a better process, expected to result from the proposed development work, was available.

III. PRODUCT SPECIFICATIONS

Mr. Hammond of Los Alamos admitted that although product specifications had been written, very few, if any, shipments had ever been within these specifications yet some of the shipments had yielded a satisfactory La^{140} source. In short, the existing specifications do not mean anything. Accurate specifications and a method of determining the contaminants is a phase of the development work. Los Alamos agreed that their new processing equipment could stand a scale up of inactive contaminants with an increase in the Ba^{140} batch size. It was suggested that until better specifications are available that the following be used where possible:

	2200-curie Batch	10,000-curie Batch
Inactive Lead	Less than 50 mg	Less than 225 mg.
Inactive Iron	Less than 10 mg	Less than 45 mg.
Inactive Chromium	Less than 5 mg	Less than 25 mg.
Inactive Strontium	Less than 50 mg	Less than 225 mg.
Inactive Nickel	Less than 5 mg	Less than 25 mg.
Inactive Barium	Less than 1300 mg	Less than 6 gm.

Mr. Mueller listed the quantity of radioactive contaminants that could be tolerated in the completed La^{140} source. This La^{140} source is supplied by the Los Alamos process; therefore, the quantity of contaminants in the material as it leaves Oak Ridge (or Hanford) can be considerably greater than those listed below. Los Alamos will supply the maximum radioactive contaminants for the Ba^{140} product.

$T_{\frac{1}{2}}$ - Radioactive Contaminants:	0-10d	10-100d	100-1,000d	1000-10,000d	10,000 to 100,000d
Curies of Contaminants	100 C.	0.01	0.001	0.0001	<0.0001

Ce / Pr - $T_{\frac{1}{2}}$ =	1/5 of above
Ru / Rh - $T_{\frac{1}{2}}$ =	1/5 of above
Sr - Y - $T_{\frac{1}{2}}$ =	1/30 of above
Pu -	4/10,000 of above.

The above figures were arrived at by calculation assuming each test site is used every six weeks and that only 1/6 of the above contaminants are deposited in the testing area.

IV. RESULTS OF MEETING

1. A. V. Peterson requested that ORNL submit to the Oak Ridge AEC as soon as possible (tentatively by 4/25/49) a detailed proposal for modifying the existing equipment to produce 10,000-curie batches. This proposal should indicate what portion of the total cost is included in the present Laboratory budget and how much additional money will be required.

2. This same letter to the AEC, if possible, should include the ORNL proposal for a development program on a new process. Time schedules, interfering programs, manpower requirements, etc., should be mentioned.

3. Hanford was requested to study the feasibility of exposing U^{235} foil in the "W" piles.

4. Los Alamos was requested to investigate the separation of Ba^{140} from irradiated U^{235} foil and the decontamination of the U^{235} for recovery. (A decontamination factor of 10^9 to 10^{10} was believed to be necessary.)

5. ORNL agreed to study the inert and radioactive contaminants of the present product.

L. B. Emlet

LBE:wp

B-137

5-7

Date April 22, 1949

File 4260

Subject Proposal for RALA Program at Oak Ridge National Laboratory

Those Eligible To Read The Attached

By C. N. Rucker

Copy # 6A

To A. H. Holland, Jr.

M. D. Peterson

Before reading this document, sign and date below:

4-25-49

This document consists of 11 pages.
No. 6 of 78 copies. Series A.

[redacted]

Classification Cancelled
Or Changed To
By Authority Of
By
Date

OAK RIDGE NATIONAL LABORATORY

OPERATED BY
CARBIDE AND CARBON CHEMICALS CORPORATION
FOR THE
ATOMIC ENERGY COMMISSION
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

April 22, 1949

CLASSIFICATION CANCELLED
ADD signature 1/19/95 Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Dr. A. H. Holland, Jr.

Subject: PROPOSAL FOR RALA PROGRAM AT OAK RIDGE NATIONAL LABORATORY

Gentlemen:

At a meeting in Los Alamos on April 13 and 14, 1949, Mr. A. V. Peterson requested that the Laboratory submit a detailed plan for increasing the RaLa batch size from 2,500 curies to 10,000 curies. Information was also requested on the Laboratory's proposal for a long-range development program aimed at providing a new efficient and reliable process for the separation of Ba^{140}. The attached report - "Proposal for Interim RaLa Production and Long-Range Development Program", 4/22/49 - provides the details of our proposal.

The present RaLa process for the separation of 2500-curie batches is hazardous, inefficient, and unreliable. If Ba^{140} production is to continue at Oak Ridge National Laboratory, an estimated expenditure of $190,000 (overhead included) will be necessary immediately to reduce the radiation hazards. Since Los Alamos has stated that 10,000-curie batches will be required by the spring of 1950, we propose that the present Oak Ridge National Laboratory facilities be modified to safely and efficiently handle these larger-sized batches. An estimated cost of $660,000 (overhead included) will be required for the completion of this part of the program. Of this total amount, $43,000 can be considered as included in the present ORNL budget, while the Atomic Energy Commission will be expected to supply the additional $617,000.

[redacted]

This document contains information affecting the National Defense of the Uni[redacted]in
[redacted]
severe criminal penalties under applicable Federal laws.

[redacted]

[redacted]

Details of these cost estimates are included in the attached report. In general, they can be divided as follows:

	ORNL Budget	To Be Provided by AEC	TOTAL
Development	$17,000.00	$97,000.00	$114,000.00
Design	21,000.00	75,000.00	96,000.00
Construction	5,000.00	445,000.00	450,000.00
TOTAL	$43,000.00	$617,000.00	$660,000.00.

An estimated seventeen (17) people will have to be employed to adequately handle the design and development phases of this program. Approximately half of this number will be technical personnel.

It is planned to have some of these same people continue from this RaLa improvement study to the long-range RaLa research program aimed at providing a new efficient process for the production of Ba^{140}. An estimated $500,000 over a period of two years will be required to carry this new process study through the semi-works stage. We recommend that any pilot plant facilities, as well as the production plant based on this new process, be located at the site chosen for the irradiation of the uranium raw material (site of MTR or Hanford).

Our proposal for the solution of the present RaLa problem can be summarized as follows:

1. By employing seventeen (17) additional people and being allocated $617,000 above our 1950 fiscal budget, the present ORNL RaLa facilities can be expanded to produce 10,000-curie batches until a new plant, based on a more efficient process, is built (four years).

2. An estimated $500,000 will be required over a two-year period to develop a new RaLa process.

The elapsed time, to complete phase 1 of the above proposal, is estimated at ten to fourteen months. If Los Alamos is to be insured a continuing supply of RaLa, we must have a directive and the requested money by May 1, 1949.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY

C. N. Rucker

C. N. Rucker
Executive Director

LBEmlet:wp

1-3. A. H. Holland, Jr.
4. C. E. Center
5. A. M. Weinberg
6. M. D. Peterson
7. F. L. Culler, Jr.
8. E. J. Witkowski
9. F. L. Steahly
10. L. B. Emlet
11-12. C. N. Rucker
13. Central Files

[redacted]N

This document [redacted] ion or the [redacted] an [redacted] person is prohibited and may result in [redacted] laws.

S E C R E T

[redacted]T

Proposal for Interim RaLa Production and Long Range Process Development Oak Ridge National Laboratory

April 22, 1949

1.0 Introduction

The production of Ba^{140}, parent of La^{140}, for the use in weapons production at Los Alamos, is now being carried out at the Oak Ridge National Laboratories under extremely difficult and hazardous conditions. Existing processing facilities have the following disadvantages:

1. A consistently good yield cannot be obtained because of the unreliability of the processing equipment.
2. The time cycle is unnecessarily long, causing loss of product through decay. (Approximately 6% of current inventory decays per day.)
3. Chemical efficiency of recovery ranges between 20% and 85%, averaging about 65%. This average efficiency can be improved by at least 20%.
4. Operation of the process provides one of the greatest sources of particulate and gaseous air-borne activity in ORNL.
5. Many phases of operation provide sources of possible over-exposure to operating personnel.
6. Certain equipment in the process must be replaced because of excessive contamination (i.e. product processing cubicles).
7. Product does not consistently meet purity requirements.

The existing processing equipment has a production capacity of 2200 plus curies of Ba^{140}. It has been proposed by Los Alamos that 10,000 curie batches be available on approximately July 1, 1950.

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946.

[redacted]N

This document contains information affecting the National [redacted] the disclosure of its contents in any manner to an unauthorized person is [redacted] under applicable Federal laws.

[redacted]

To produced this quantity of Ba^{140}, a new plant at Hanford or an expanded plant at Oak Ridge is under consideration. The 10,000 curie plant under consideration for Hanford would utilize the same process as now employed at ORNL with some equipment modification.

Personnel at ORNL are of the opinion that the construction of a new RaLa production facility at any site should be deferred until a more efficient and economical process can be developed, and that interim production of 10,000 curie RaLa batches should be continued at ORNL during the progress of this process development. This report presents the ORNL proposals for the production of 10,000 curie sources for an interim period and for a long range RaLa process development program.

The proposal for interim RaLa production at ORNL has been developed in consideration of the following demand schedule for RaLa production:

PERIOD	REQUIREMENTS
Present to June 30, 1949	Four 2500 curie batches
July 1, 1949, to July 1, 1950	Ten 2500 curie batches, two of these possibly being 5000 curie batches.
July 31, 1950 on for an indefinite period.	10,000 curie batches at rate of eight per year.

The expansion of the ORNL plant will occur with a maximum of one month shutdown in the production of RaLa.

2.0 Plan for Interim Production of 10,000 Curie Batches

The production of 10,000 curie batches of RaLa can be safely undertaken at ORNL provided a new cell, new equipment following the dissolver, new purification cubicles and equipment, and an extension to Building 706-D are provided. From an evaluation of the health hazard created by the discharge of gaseous Xe^{133}, it has been concluded that controlled operation of the slug dissolver will prevent air contamination from exceeding tolerance for this gaseous fission product. In order to reduce the hazard from particulate activity discharge from the RaLa plant, all off-gas and cell ventilation lines will be connected to air cleaning facilities (electrostatic precipitators, scrubbers, filters) already planned and being installed.

[redacted]

2.1 Plant Capacity and Feed Material

The interim plant at ORNL would separate 10,000 curie batches of Ba^{140} from Hanford irradiated slugs, each containing approximately 1800 gms of natural uranium. Assuming an overall chemical processing efficiency of 85% and a decay period of twelve days from pile discharge to product shipment from ORNL, a maximum of 200 4" Hanford slugs will be required per 10,000 curie batch.

2.2 Development Work Required

Preliminary to the design and construction of an expanded RaLa plant, development work on the following major items must be undertaken:

1. New separator for lead suphate-barium sulphate precipitate. Both centrifuges and filters will be investigated. This will replace the present A-9 decantation tank.

2. Improved samplers. Existing samplers provide a radiation hazard to operating personnel.

3. A new electrolylic cell for lead removal should be built and tested. The time required for the electrolysis step is now excessive.

4. Chemical investigation of product contamination from inactive and radioactive contaminants. Ba^{140} produced in the existing ORNL process is unsatisfactory because of the presence of large quantities of inactive contaminants such as iron and organic material. New chemical purification steps must be developed to produce a product satisfactory for use at Los Alamos.

5. Final purification equipment for installation in final product cubicles. New purification techniques will require new equipment. Tantalum or some other corrosion resistant material may be necessary because of the embrittlement and darkening effect of intense radiation on glass.

6. Instrumentation development.

The development work will extend through semi-scale active demonstration runs for the entire process from slug dissolving to final product purification.

[redacted]

The follwoing is an estimate of the time and money required for this development work:

	Time Elapsed	Man Months	Labor Cost	Material Cost
1. New filter or centrifuge	4	16 @ $700	11,200	20,000
2. New samplers	1	4	2,800	2,000
3. New electrolytic cell	3	4	2,800	1,000
4. Product purity investigation	3	4	2,800	2,000
5. New cubicle equipment	3	4	2,800	5,000
6. Instrumentation	2	4	2,800	3,000
		36	$25,200	$33,000
Maintenance		10	3,500	5,000
TOTAL			$28,700	$38,000

The development work cannot be completed in the necessary four to six months without the acquisition of new personnel for ORNL. These new personnel will be absorbed into the long range development program for RaLa after short term investigations have been completed. The following new people will be required:

Chemistry Division

Research	1
Analytical	2

Technical Division

Laboratory Development	2
Semi-Works	2
Design	2
	9 Technical
	2 Non-Technical
	11 Total
	6 Maintenance
	17 People

2.3 Proposal for New RaLa Production Plant

For the new RaLa plant the following general proposals are made:

1. Alterations of a minor nature will be made in Cell A so as to incur a minimum shut down in RaLa production. The existing dissolver, scrubbers, and waste handling facilities will be utilized in the new plant. The following tanks will be used in Cell A:

    a. Dissolver A-1 and associated equipment. New jet lines to a new precipitator will be required. A new sampler will be installed.

    b. A-11 Hold-up Tank New jets to new cell will be installed.

    c. A-5 Neutralizer and A-16 Scrubber

    d. Tanks A-6, A-8, A-9, and A-13 will be disconnected and blanked.

    e. All tanks to be usedin the new installation will be gasketed to prevent the escape of gaseous and particulate activity into the cell.

2. The following new facilities will be provided:

    a. A new Cell B, with five foot concrete walls, approximately 20' x 15' x 15' high, located on the east side of Bldg. 706-D.

    b. A pipe trench from Cell A to the new Cell B.

    c. Duplicate concrete final product cubicles.

    d. An aluminum siding, steel-framed building, approximately 50' x 40' x 35' high, with all necessary services extended from Building 706-D.

    e. The following new processing equipment will be placed in the new Cell B and final product cubicles:

        1. A-9 precipitator and filter or centrifuge.

        2. A-8 Catch tank.

        3. Evaporators

        4. Electrolytic Cell

        5. Six vacuum transfer tanks

[redacted]

6. New waste lines from new Cell B to Cell A.

7. Tanks B-3, B-10, and B-22, if necessary

8. All piping and instrumentation

9. All necessary samplers

10. Off-gas lines and cell ventilation lines to the air decontamination area and Radioisotope area stack.

11. New final purification and packaging equipment, possibly of tantalum, for the product cubicles.

f. The following construction, already in progress, will aid in the control of the gaseous and liquid waste disposal problems incurred in the new plant:

1. New Radioisotope Area Stack.

2. Electrostatic precipitators and filters for the hot off-gas lines and cell exhaust air systems.

3. Hot chemical waste evaporator of non-uranium bearing liquid wastes.

4. Installation of new exhaust ducts to Cell A, and sealing of old underfloor concrete duct.

2.4 Estimated Construction Cost

Cell A Equipment Alterations	14,000
New Cell, Cubicles, and Building	100,000
New Cell B Equipment	55,000
New Cubicle Equipment	50,000
Construction Facilities	8,000
	$227,000
Contingencies 20%	43,000
	$270,000

Of this total, approximately 70% will be labor cost. Therefore:

Material	$ 90,000
Labor	180,000

The construction of the new facility should require approximately 6 months.

2.5 Estimated Design Time and Cost

Assume that design will cost 15% of total construction.

Total design cost	$36,000
Man months @ 650/man month	55
Assume 1/3 engineering, man months	18.3
6 engineers would require	3 months
2/3 drafting, man months	36.7
12 draftsmen would require	3 months

2.6 Process Shutdown Required

For alterations in Cell A, approximately 100 man-hours will be required. Assuming that the working time in the decontaminated cell is approximately one hour, and that twenty qualified craftsmen are available, then approximately 13 days will be required for actual work in the cell.

Assuming that two weeks are required for cell decontamination to a permissable working time of one hour, the total down time will then be 27 days, or one month.

2.7 Cost Summary for Interim RaLa Program

The overhead on development and design time at ORNL is 135% of actual labor cost. The overhead and contractors fees for construction has been assumed to be 100% of the labor cost. The total estimated cost for development and construction necessary for an interim RaLa process for construction at ORNL, corrected for overhead, can be summarized as follows:

	Labor	Material	Overhead	Total
Development	$ 29,000	$ 38,000	$ 47,000	$114,000
Design	36,000	------	60,000	96,000
Construction	180,000	90,000	180,000	450,000
	$245,000	$128,000	$287,000	$660,000

A portion of the above total cost is already covered in the ORNL budget. The division between money already available at ORNL, and that required from the AEC as a new appropriation is shown below:

	ORNL	AEC	TOTAL
Development	$ 17,000	$ 97,000	$114,000
Design	21,000	75,000	96,000
Construction	5,000	445,000	450,000
TOTAL	$ 43,000	$617,000	$660,000

The completion date for the required development, design, and construction of a 10,000 curie RaLa plant will be ten to fourteen months from the time that money and personnel are approved by the A. E. C.

3.0 Long Range Development for RaLa Production

It is the opinion of ORNL personnel that a more economical and simpler process for the production of RaLa can be developed. The new process might be installed at another site, either Hanford or at the location of a new reactor of greater neutron flux than now available. In order to assure economical production of RaLa, a new process should be developed.

ORNL, with its background of work on separation processes, is willing to assume the development of a new separation process. Additional research facilities will have to be constructed and additional personnel provided. Additional personnel obtained for the interim RaLa process development should be from the organization which later will operate the plant. The ORNL operating budget is not adequate to accommodate the cost of the program and new funds for this purpose must be allocated.

3.1 Development Required:

The develop time is estimated to be:

Total time required	2 years
Number of men required	8
Man months required	150
Total estimated cost, exclusive of construction of final plant	$500,000

The development at Oak Ridge would be carried through the semi-works stage. A pilot plant and final processing plant could better be built at the site where irradiation of the uranium occurs. The pilot plant and processing plant will require an additional expenditure.

[redacted]

B-137

Product Shipment

Date April 22, 1949

File

Subject Shipment #40, Run #32

Those Eligible To Read The Attached

By E. J. Witkowski

Copy # 2 A

To J. A. Leary

Before reading this document, sign and date below:

4-22-49

[redacted]

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-4-220

OAK RIDGE NATIONAL LABORATORY

OPERATED BY
CARBIDE AND CARBON CHEMICALS CORPORATION
FOR THE
ATOMIC ENERGY COMMISSION
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

April 22, 1949

This document consists of 1 pages and 0 figures.
No. 2 of 4 copies, Series A

Mr. J. A. Leary
Los Alamos Scientific Laboratory
Post Office Box 1663
Los Alamos, New Mexico

Subject: SHIPMENT #40, RUN #52

Dear Mr. Leary:

The Atomic Energy Commission picked up this shipment at 1100 EST today. There were 3800 curies of product present at LST 1700 EST on April 21, 1949.

The color of the product was almost black; it is undoubtedly the darkest one we ever shipped to you. We are sure, however, that this was not caused by impurities since from the standpoint of operation, this was the most trouble-free run we have ever experienced. The color can undoubtedly be attributed to the instability of the nitrate form of the product.

Very truly yours,

C. J. Witkowski by H.B

E. J. Witkowski

EJW:esMc

1. J. A. Leary
2. L. B. Emlet
3. E. J. Witkowski
4. Central Files

[redacted]

[redacted]

[redacted]

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-5-44

B-137

Date May 4, 1949

File

Subject Postponement of Bala Run No. 33

Those Eligible To Read The Attached

By A. H. Holland

Copy # 24

To C. N. Rucker

COPY
Forwarded By
C. N. RUCKER

~~C. N. Rucker~~
E. B. Emlet

Before reading this document, sign and date below:

19 ANP

This document has been approved for release to the public by:

David R Hamrin 1/20/95
Technical Information Officer, ORNL Site — Date

5-6-49

[redacted]

SECRET

[redacted]

[redacted]

UNITED STATES
ATOMIC ENERGY COMMISSION

In Reply Refer To:
RMR:JS

[boilerplate]

Oak Ridge, Tennessee
May 4, 1949

[boilerplate]

Carbide and Carbon Chemicals Corporation
Post Office Box "P"
Oak Ridge, Tennessee

Attention: C. E. Rucker, Jr., Executive Director
Oak Ridge National Laboratory

Subject: POSTPONEMENT OF RALA RUN NO. 33

Gentlemen:

Through information given by your Mr. Witkowski to our Mr. Shilling on April 29, 1949, we understand that Mr. Leary of Los Alamos has requested that the production and shipping of the next Rala source (#33) be postponed by two weeks. In accordance with this request, we have advised the Office of Hanford Operations that the slugs, previously scheduled for arrival at Oak Ridge on May 8, 1949, should arrive May 22, 1949.

Unless we hear from you to the contrary we will assume that the above arrangements for Hanford slugs are satisfactory.

Sincerely yours,

Albert H. Holland, Jr., M.D.
Director of Research and Medicine
Oak Ridge Operations

CC: C. E. Center
R. W. Cook

Shilling:mw

[redacted]

~~SECRET~~

R. C.

'59 INI

RALA RUN PROCEDURE

- I. R. Higgins -

This sheet is actually a form for RALA Runs M/C

May 26, 1949

Distribution: 1 - 25. I. R. Higgins
26. Reading Files
27. Central Files

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946.

C A U T I O N

This document contains information affecting the National Defense of the United States. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal laws.

~~SECRET~~

Only when Completed

This document consists of 5 pages. No. 26 of 27 copies Series A.

Date: May 26, 1949

RA-LA RUN PROCEDURE

A. Slug Dissolving

1. Add one slug to dissolver.
2. Turn on dissolver vacuum to 25 cm.
3. Turn on reflux column water.
4. Add 1100 ml 35% $NaNO_3$.
5. Add 850 ml 35% NaOH.
6. Heat to 105°C for one hour.
7. Cool to below 50°C.
8. Jet to Hot Drain.
9. Add 3 liter of 70% HNO_3.
10. Add 3 gr. of $Hg.(NO_3)_2$ in 100 ml water.
11. Heat to 105°C for _____ hours.

B_____
C_____

Take L. L. and Sp. Gr. readings every hour.

Time	L. L. Man.	Sp. Gr. Man.

[redacted]

This document contains restricted data as defined in the Atomic Energy Act of 1946.

[redacted]

This document contains information affecting the National Defense of the United States. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal laws.

[redacted]

B. Precipitation

1. Dissolve 75 Kg. UNH in water to Sp. Gr. 1.55. Sp. Gr._____
2. Add to Precipitator. L.L.Man._____
3. Jet spike from dissolver to precipitator. Sp. Gr. _____ L.L. Man._____
4. Add 90 gr. $Pb(NO_3)_2$ as 20% solution. Sp. Gr. _____
5. Take sample of feed. Volume_____
6. Heat to 80°-90°C. Temp._____
7. Add 26 liter of 90% H_2SO_4 over 1/2 hour. Time Start_____
8. Digest one hour at 80°-90°C. Time End _____

Time	Temp.	L. L. Man.	Sp. Gr. Man.
_____	_____	_____	_____
_____	_____	_____	_____

9. With agitator still on, cool to 25°C.

C. Filtration

1. Leave agitator on in precipitator. L. L. Man. _____ Sp. Gr. Man._____

[redacted]

This [redacted] contains restricted data as defined in the Atomic [redacted] 1946.

[redacted]

This document contains information affecting the National Defense of the United States. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited and may result in severe criminal penalties under applicable Federal Law.

[redacted]

2. Turn on Waste Tank Vacuum.

Vacuum	Prec. L. L. Man.

3. Sparge Waste Tank 5 Minutes.

4. Sample Ext. Eff. with sparger on Waste Tank. L.L. _____ Sp. Gr. _____

5. Jet to Hot Drain after contacting P. B. Orr at 6102.

6. Follow with about 300 of 35% Na_2CO_3 solution.

7. Add 10 liter 25% H_2SO_4 to precipitator.

8. Agitate 5 minutes.

9. Vacuum to Waste Tank. Waste Tank L. L._____ Sp. Gr. _____

10. Sample Waste Tank after 5 minutes sparging. Ist Wash.

11. Jet waste to Hot Drain.

12. Add 10 liter water to precipitator.

13. Agitate 5 minutes.

14. Vacuum to waste tank and sparge 5 minutes. L. L._____ Sp. Gr. _____

15. Sample 2nd wash with sparger on.

16. Jet wash to Hot Drain.

17. Add 10 liter water to precipitator.

18. Agitate 5 minutes.

19. Vacuum to Waste Tank and sparge 5 minutes. L. L. _____ Sp. Gr._____

20. Sample 3rd wash with sparger on.

21. Jet wash to Hot Drain.

22. Add 10 liter water to precipitator.

23. Agitate 5 minutes.

24. Vacuum to Waste Tank and sparge 5 minutes. L. L. _____ Sp. Gr. _____

25. Sample 4th wash with sparger on.

26. Jet wash to Hot Drain.

27. Add 10 liter water to precipitator.

28. Agitate 5 minutes.

29. Vacuum to Waste Tank and sparge 5 minutes. L. L. _____ Sp. Gr. _____

30. Sample 5th wash with sparger on.

31. Jet wash to Hot Drain.

D. Metathesis

1. Add 1500 ml of 40% K_2CO_3 to precipitator.

2. Agitate 15 minutes at 85°-90° C. Start _____ End _____.

3. Add 10 liter water over 30 minutes. Maintain temperature.

4. Agitate at 85°-90°C for 30 minutes. Start _____ End _____.

5. Cool to 30°C.

6. Vacuum to Catch Tank. Catch Tank L. L._____ Sp. Gr. _____

7. Sparge 5 minutes. Sample 1st Met. Eff. with sparger on.

8. Jet Met. Eff. to Hot Drain.

9. Add 1500 ml of 40% K_2CO_3 to precipitator.

10. Agitate 15 minutes at 85°-90°C. Start _____ End _____.
11. Add 10 liter water over 30 minutes. Maintain temperature.
12. Agitate at 85°-90°C for 30 minutes. Start _____ End _____.
13. Cool to 30°C.
14. Vacuum to Catch Tank. L. L. _____ Sp. Gr. _____.
15. Sparge 5 minutes. Sample 2nd Met. Eff. with sparger on.
16. Jet Met. Eff. to Hot Drain.
17. Add 15 liter water to precipitator with agitator on. Agitate 5 minutes.
18. Vacuum to Catch Tank. L. L. _____ Sp. Gr. _____.
19. Sparge 5 minutes. Sample 1st. Met. Wash with sparger on.
20. Jet wash to Hot Drain.
21. Add 15 liter water to precipitator.
22. Agitate 5 minutes.
23. Vacuum to Catch Tank . L. L. _____ Sp. Gr. _____.
24. Sparge 5 minutes. Sample 2nd Met. Wash with sparger on.
25. Jet wash to Hot Drain.
26. Add 15 liter water to precipitator.
27. Agitate 5 minutes.
28. Vacuum to Catch Tank. L. L. _____ Sp. Gr. _____.
29. Sparge 5 minutes. Sample 3rd Met. Wash with sparger on.
30. Jet wash to Hot Drain.

E. Carbonate Solution

1. Add 15 liter 3 M HNO_3 to precipitator. Agitate 10 minutes.
2. Sample Prod. Solution. L. L. _____ Sp. Gr. _____.

SECRET

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-6-239

B-137

Date June 21, 1949

File

Subject New Subject Headings on Rāla Process

Those Eligible To Read The Attached

By

Copy # #1

To

R. E. Blanco

Before reading this document, sign and date below:

INV. 64

INV. 65

INV. 50

This document has been approved for release to the public by:

Technical Information Officer
ORNL Site

7/10/95
Date

6-23-19

RESTRICTED DATA

This document contains restricted data as defined in the Atomic Energy Act of 1946.

CAUTION

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Laws, Title 18, U.S.C., Sections 793 and 794. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law. Violators are subject to severe criminal penalties under Federal laws.

SECRET

JUN 21 1949 #1

NEW SUBHECT HEADINGS ON RALA PROCESS

RALA PROCESS
see also BARIUM ISOTOPES - Ba-140
SEPARATION PROCESSES (General)

-- ADSORPTION (Ion Exchange)
(Hanford: an X-10 suggestion to take care of their development program.)

-- ANALYTICAL CONTROL (instead of ANALYSIS)

-- COATING REMOVAL

-- CONTROL
(Hanford: or INSTRUMENTATION? This might be made more specific as was done for various control headings headings under SLUG CANNING.)
see also RALA PROCESS - ANALYTICAL CONTROL

-- CHLORIDE PRECIPITATION (HCl-Ether)

-- COPRECIPITATION ($BaSO_4$-$PbSO_4$)

-- ELECTROLYSIS
(Removal of lead from barium.)

-- EQUIPMENT
see also REMOTE CONTROL EQUIPMENT
SAMPLING

-- EQUIPMENT, REMOTE CONTROL
see also REMOTE CONTROL EQUIPMENT

-- EVAPORATION

-- EXTRACTION
see RALA PROCESS - COPRECIPITATION ($BaSO_4$-$PbSO_4$)
RALA PROCESS - CHLORIDE PRECIPITATION (HCl-Ether)

-- FISSION PRODUCTS, DECAY OF
(Hanford: What intended use under Rala? Why not treat under FISSION PRODUCTS (General)?/ or by specific isotopes concerned?)

-- FLOW SHEETS

-- IODINE TREATMENT
(Hanford: "Treatment" is not good. What treatment - scrubbing, filtering, neutralization, removal? Here or under IODINE ISOTOPES - I-131?)

RALA PROCESS (Continued)

-- MATERIALS (Essential requirements)
(Hanford: "Materials" not clear; reagent specifications, construction materials for equipment, shielding?)

-- METAL SOLUTION

-- METATHESIS
(Conversion of sulfates to carbonates.)

-- NITRATE PRECIPITATION ($Ba(NO_3)_2$)

-- PLANT DESIGN
(Including location, shielding, etc.)

-- PRECIPITATION
see RALA PROCESS - COPRECIPTATION
RALA PROCESS - CHLORIDE PRECIPITATION
RALA PROCESS - NITRATE PRECIPITATION

-- RECOVERY OF PLUTONIUM

-- SAMPLING
(Hanford: What goes here that could not be put under -- EQUIPMENT, or -- ANALYTICAL CONTROL?)
see also SAMPLING (General)

-- SHIELDING
see plant design

-- SLUG IRRADIATION
(Location in the pile, irradiation time, etc.)

-- SOLUTIONS (Preparation and Handling)

-- SPECIAL HAZARDS
(Hanford: this means critical limits at K-25 and Y-12; AM-3679. Do you mean critical limits; radiation hazards; chemical hazards, e.g. ether?)

-- STACK DISPOSAL
(Hanford: Combine with -- IODINE TREATMENT?)

-- SULFATE PRECIPITATION
see RALA PROCESS - COPRECIPITATION

-- WASTE DISPOSAL (Liquid)
(Hanford: Is it necessary to limit this to Liquid?)
How about dissolver gases?)

RALA PROCESS (Continued)

-- WASTE NEUTRALIZATION
(Hanford: X-10 could not understand the need for this heading.)

-- XENON TREATMENT
(Hanford: X-10 does not understand the meaning of this heading.)

This document consists of 6 pages.
Copy of 7, Series A.

[redacted]

CF-49-7-256
L. Western

Logan B. Emlet, Operations Division—

Karl Z. Morgan, Health Physics Division

July 28, 1949

Inhalation of Radioactive Dust During the Last Rala Run Ending July 15, 1949.

CENTRAL [illegible]

49-7-256

During the past three Rala runs persons engaged in the final step of removing the product carrier from the well of Cell B have been wearing filter masks. It has been our procedure to make autophotographs of the filters from these masks and occasionally, we have found a few particles on them. Our procedure has been to place films against these filters for twenty-four hours and count the specks on the films after they are developed. During the first two runs following this procedure the number of particles found seemed to warrant the continuance of such a procedure, and it was felt that such a procedure was sufficient and consistent with the few particles found. However, during the last run when the product was removed from Cell B on July 14th, an alarming amount of radioactive material was deposited on the filters worn in the masks by persons engaged in this operation. I am enclosing photographs indicating the results.

The case of R. W. Schaich, #8767, seems to be by far the worst. In fact, the blackening of the spots was so great that there was a reversal in the film blackening. His filter with the large spots still read 18 mr at 2" on July 18th. This would correspond to approximately 100 microcuries contained on this filter. The maximum permissible amount in the bone calculated to give an exposure of 0.3 r/week is 21 microcuries. A recent report of J. G. Hamilton's indicates that probably 60% of ingested or inhaled barium is retained and most of this goes to the bone. In other words, if Mr. Schaich had inhaled all of the material contained on both of his filters it is likely that he would have had deposited in his bones a sufficient amount of barium to produce an exposure rate of 0.9 r/week and this would have had a decay period of approximately 12.7 days. My concern in this case is, as I have pointed out in previous communications, that if one has what is considered to be a tolerance amount of a radioisotope fixed in the bone, it has never been proven whether it is the insult of the continued irradiation to the bone by this radioactive material for many years, or whether it is the initial irradiation to the bone that causes a cancer after a long time lapse. In view of this uncertainty, regardless of the fact that we attempt to maintain our exposures at present to less than .3 r/week instead of 0.9 r/week, I believe it is expedient that we take further measures to reduce the hazard from inhalation of radioactive material during this phase of the Rala run.

I would like therefore, in view of the deficiencies of the C. W. S. type filter mask, to recommend that hereafter persons engaged in this part of the Rala run and persons in the building during this part of the run wear pressure-type masks, either the self-contained mask or the attached hose type. These masks should be in use before the final plug is removed from the top of Cell B and should be continued in use thereafter so long as the air hazard exists, and preferably until all of the contaminated papers and other contaminated equipment is removed from the area.

RELEASE APPROVED BY [redacted] SIGNATURE 4-16-59 DATE

[redacted] RESTRICTED DATA

[redacted] CAUTION

I would like at this time to commend you, and especially Messrs. Witkowski and Blauer for their excellent cooperation in the past in cleaning up the "D" Building. I will be most grateful if you will give this matter immediate attention before the next Rala run.

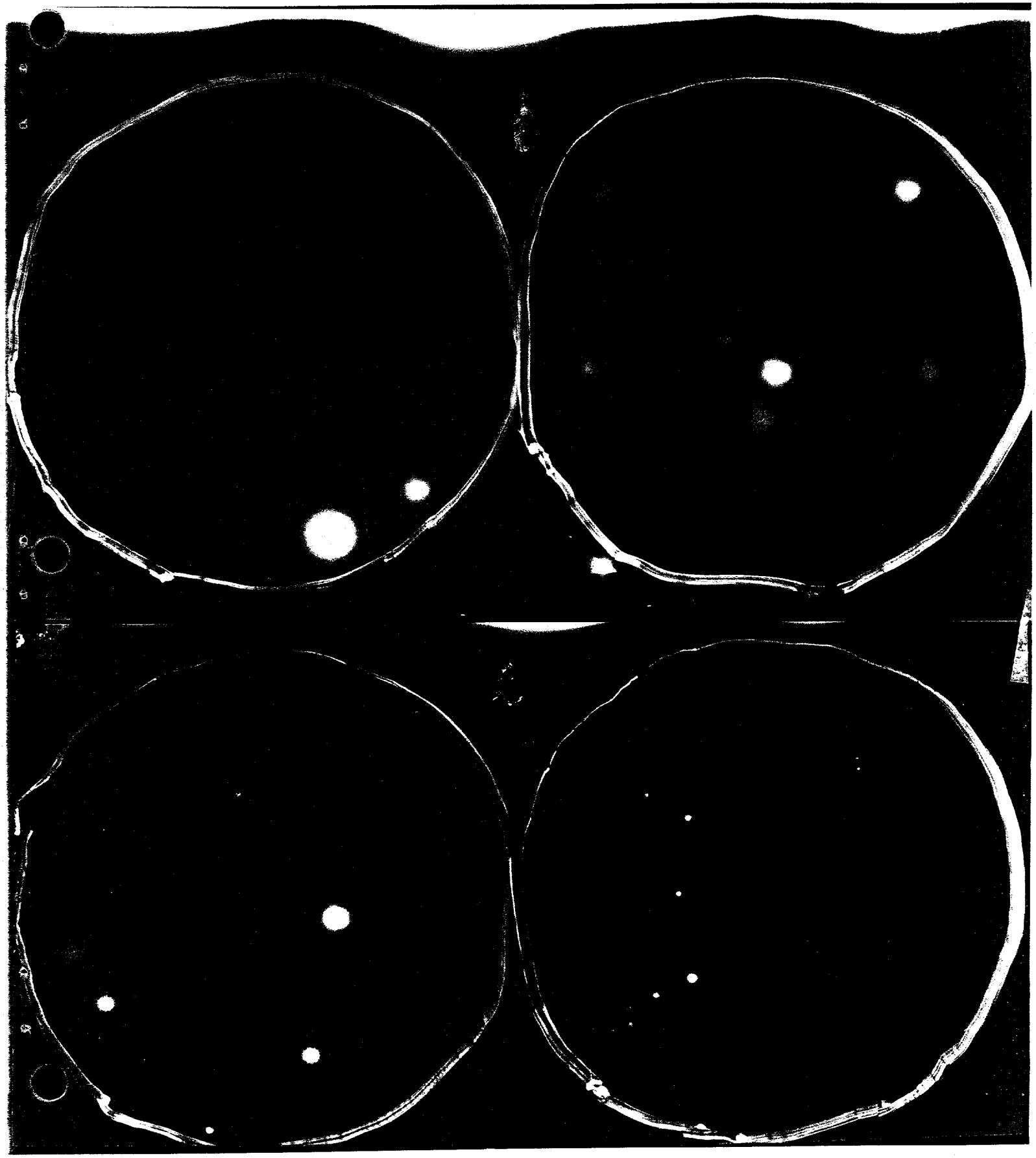
Original Signed By
K. Z. MORGAN

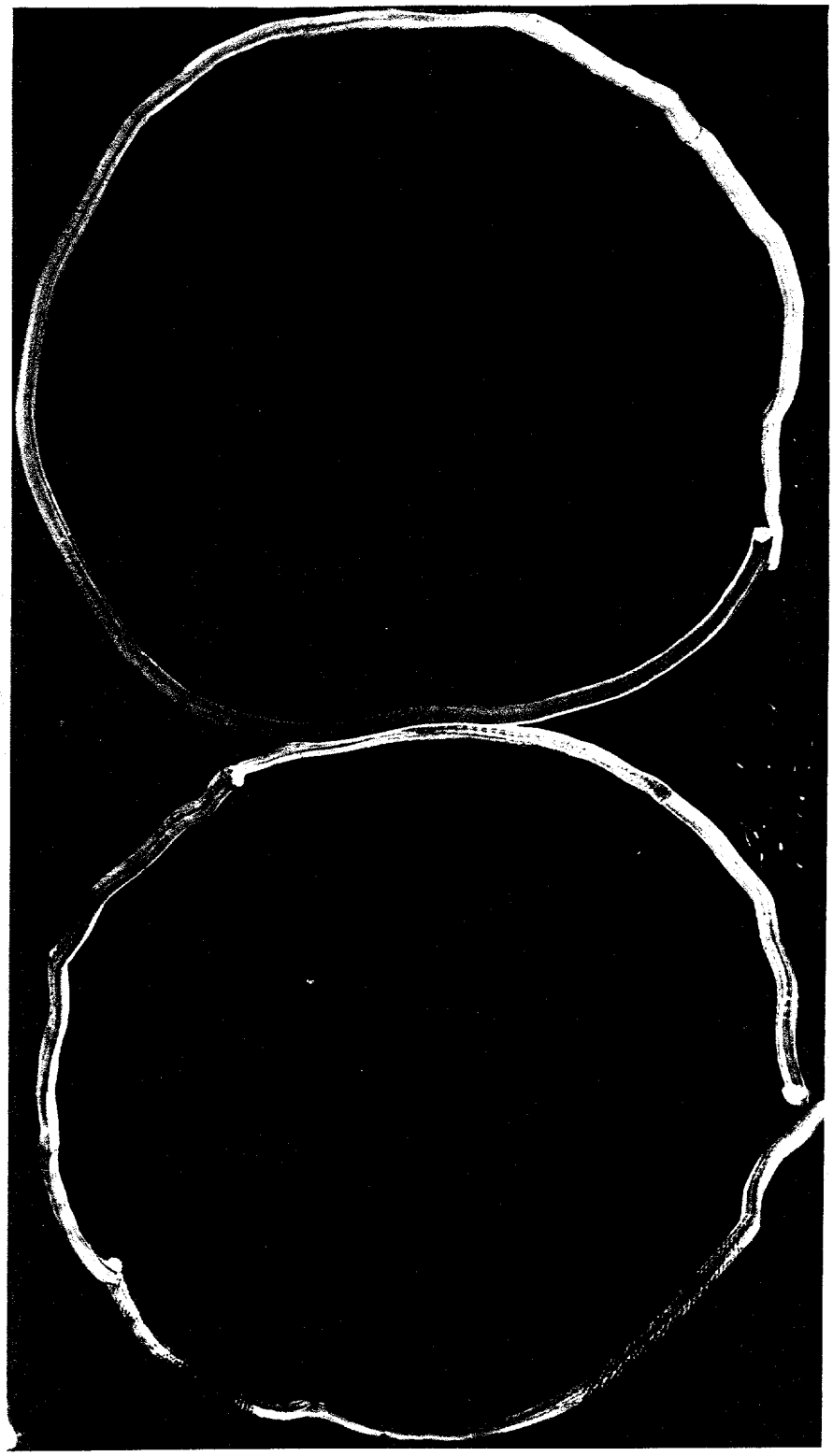
Karl Z. Morgan, Director
Health Physics Division

Encl. 4

cc: C. N. Rucker (2)
A. M. Weinberg (3)
F. Western (4)
E. J. Witkowski (5)
K. Z. Morgan Files (6 & 7)

KZM:kd





SECRET

49-8-281

Date August 24, 1949

Copy # 8

Subject Oak Ridge National Laboratory -
RALA Program

By C. N. Rucker

To A. H. Holland

Before reading this document, sign and date below:

WKC.	
[illegible]	
[illegible]	
[illegible]	
[illegible] PLS	

DISTRIBUTION:
1. A. H. Holland, AEC
2. A. H. Holland, AEC
3. A. H. Holland, AEC
4. C. E. Center, K-25
5. A. M. Weinberg
6. E. J. Witkowski
7. F. L. Culler
8. F. L. Steahly
9. ~~M. D. Peterson~~ C E Winters
10. L. B. Emlet
11. C. N. Rucker
12. C. N. Rucker

SECRET

Th.s document consists of 8 pages
No. 8 of 12 copies, Series A

OAK RIDGE NATIONAL LABORATORY

OPERATED BY
CARBIDE AND CARBON CHEMICALS CORPORATION
FOR THE
ATOMIC ENERGY COMMISSION
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

Classification Cancelled
By Authority Of
By
Date AUG 27 1971

August 24, 1949

CLASSIFICATION CANCELLED
ADD signature 1/19/95 Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Attention: Dr. A. H. Holland, Jr.

Subject: OAK RIDGE NATIONAL LABORATORY - RALA PROGRAM

Reference: Letter to C. N. Rucker from A. H. Holland dated June 20, 1949; subj: Proposal for RaLa Program at ORNL; C.F. No. 49-6-242.

Gentlemen:

In reply to the reference letter we are submitting the costs of the Laboratory RaLa Program for fiscal year 1950.

1. Production - $93,000 Direct Costs - $269,000 Program Cost

   This is the estimated cost to prepare approximately ten, 2500-curie RaLa batches during F.Y. 1950.

2. Process Modification - $149,100 Direct Costs-$258,700 Program Cost

   The present RaLa process contributes materially to the particulate and gaseous airborne activity at the Laboratory. This fact plus the hazardous condition of the equipment and the inefficiency of the operation demands that immediate steps be taken to improve the RaLa production procedure. The Technical Division is currently engaged in a process improvement study on this program and expect to complete their phase of the work by the first part of November, 1949.

SECRET

2. Process Modification - Continued

A breakdown of the estimated costs for the process modification is as follows:

Development Costs		
Labor	$25,600	$93,400
Materials	25,600	
Overhead	42,200	
	$93,400	
Design Costs		
Labor	$16,200	$42,900
Overhead	26,700	
	$42,900	
Construction Costs		
Labor	$40,700	$122,400
Materials	41,000	
Overhead	40,700	
	$122,400	
TOTAL		$258,700*

ORNL Costs - Included in 1950 Budget

Labor	$41,800
Materials	25,600
Direct Costs	$67,400
Overhead	68,900
TOTAL	$136,300

AEC Costs - For Construction

Labor	$40,700
Materials	41,000
Direct Costs	$81,700
Overhead	40,700
TOTAL	$122,400

TOTAL DIRECT COSTS	$149,100	
TOTAL OVERHEAD	109,600	
TOTAL		$258,700

* This estimate does not provide for modifications to the Cell B container handling equipment, which we understand Los Alamos may request when their new process area is completed.

2. Process Modification - Continued

The total Development and Design Costs estimated at $67,400 (Direct Costs) have been provided for in our F.Y. 1950 budget submission. Therefore, the Atomic Energy Commission is requested to supply the money needed for the construction phase of the work, an estimated $81,700, which with overhead will probably amount to $122,400.

We feel justified in spending the $258,700 for process modification because: -

a. The present equipment is hazardous and inefficient.

b. It is doubtful (in our minds) if the Hanford RaLa facility will be ready for operation until late in 1950.

c. It is our understanding that the Oak Ridge National Laboratory RaLa facility is to be maintained in stand-by condition after the Hanford Plant is in operation.

The tentative time schedule indicated below for the modification of our RaLa facility is based on the assumption that you will approve this program immediately:

a. November, 1949 - Complete testing and start installation of a more efficient and reliable extraction unit (filter stick assembly or centrifuge). Prior to this time, design and semi-works operation of the filter assembly must be completed.

b. January, 1950 - Start construction of new cubicles and installation of purification equipment. In October, 1949, a resin column will be given a full-scale test as a purification unit. If it works satisfactorily, this equipment will probably be installed in the new cubicles; otherwise, an improved glassware unit will be used.

In our letter to you of April 22, 1949, (Proposal for RaLa Program at ORNL - C. N. Rucker to A. H. Holland - C.F. No. 49-4-216) we strongly recommended that the Laboratory facilities for RaLa production be expanded to handle 10,000-curie batches and any new construction at Hanford or elsewhere be postponed until a more reliable process could be developed.

Below are listed our reasons for this April 22nd recommendation. The time between then and now has only strengthened our belief that it was a sound recommendation.

1. The location of the 10,000-curie production plant at Hanford is the most costly solution to interim RaLa production. The same results can be expected from ORNL for an expenditure of $660,000, as compared to an estimated expenditure of $1,700,000 at Hanford. Approximately $258,700 must be spent at Oak Ridge National Laboratory under any circumstances to provide a source of continuing supply and a stand-by plant. This $258,700 would be applied against the $660,000 needed for the interim RaLa plant at Oak Ridge National Laboratory. (See Attachment A for details.)

2. If 42-day, Hanford-irradiated slugs are used as feed for the ORNL process, only 256 grams of plutonium/year would be diverted from production channels. If the recovery of this quantity of plutonium is considered sufficiently important, it can be extracted with hexone in a first-cycle Redox column. The column would be installed in the unused "B" Cell of the 706-D Building. Results from the Redox development work at ORNL lead us to believe that 99% of the plutonium, with an overall decontamination from fission products of 10^3, would be recovered.

3. Recent development work at ORNL has shown that the basic process now being used for plant design at Hanford can be vastly simplified. (See Attachment B.) It seems fair to predict that a RaLa plant designed around a new process would be considerably cheaper to build and would be more efficient to operate.

4. The shipment of irradiated slugs or any radioactive product across the country does create a potential hazard. It is our feeling, however, that so long as Atomic Energy Commission plants are located in various sections, this practice must be continued. To do otherwise will mean costly duplication of facilities.

Although we cannot agree with the Commission's decision to build a new RaLa facility at Hanford, we will be happy to cooperate with General Electric in their RaLa program. It is suggested that Hanford be urged to take advantage of our recent development results and to keep their plant design open as long as possible.

At such time as the Director of Research desires to start a long-range RaLa development program, we will be glad to discuss the problem in more detail.

We wish to emphasize that immediate approval of the process modification is essential if we are to eliminate the hazards and inefficiencies of our RaLa operation.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY

C. N. Rucker

C. N. Rucker
Executive Director

LBEmlet:wp

1-3. A. H. Holland, Jr.
4. C. E. Center
5. A. M. Weinberg
6. E. J. Witkowski
7. F. L. Culler
8. F. L. Steahly
9. M. D. Peterson
10. L. B. Emlet
11-12. C. N. Rucker

SECRET

ATTACHMENT A

Economic Justification for Modifying ORNL-RaLa Plant to 10,000-Curie Batches

Assume that the following general costs are applicable:

	10,000-Curie Plant* at Hanford	10,000-Curie Plant* at Oak Ridge
Construction Costs for 10,000 C	$1,700,000	$660,000
Oak Ridge Stand-by Costs (2500 C)		258,700
Operating Costs	269,000/year	269,000/year
Shipping Charges	50,000/year	100,000/year

* Overhead included in costs.

If the interim 10,000-curie plant is located at Hanford, the following savings will be incurred by recovery of plutonium from RaLa waste metal solutions:

1. Assume that 100-day irradiated feed material is used and Pu production = 200 gm/ton:

No. Slugs for 10,000-C Ba^{140}	200
No. of Batches per Year	8
Pu Content/4" Hanford Slug	0.4 gm
Yearly Value of Pu @ 500/gm	$320,000
Yearly Value of Pu @ 200/gm	$128,000

Therefore, maximum savings/year:

Pu Production	$320,000
Shipping	$ 50,000
	$370,000

2. Assume that 42-day irradiated feed is used (current production procedure):

Pu Productions	80 gm/ton
Pu Content/4" Hanford Slug	0.16 gm
Yearly Value of Pu @ 500/gm	$128,000
Yearly Value of Pu @ 200/gm	$ 51,200

Therefore, -Maximum Savings/Year:

	$128,000
Shipping	$ 50,000
	$178,000

SECRET

ATTACHMENT A - Continued

3. From above yearly savings, the time required to make up the difference in cost between location at Oak Ridge and at Hanford would be:

a. 100-Day Irradiation

@ 500/gm	$1,298,700/370,000	= 3.5 years
@ 200/gm	$1,298,700/178,000	= 7.3 years

b. 42-Day Irradiation

@ 500/gm	$1,298,700/178,000	= 7.3 years
@ 200/gm	$1,298,700/101,200	= 12.9 years

Although the above economic analysis was made using assumptions most favorable to construction at Hanford, it can be seen that the Hanford Plant must be considered as a permanent Ba^{140} production facility to be economically justified. The plant now being designed at Hanford is based on an outmoded and inefficient process; essentially no development is being undertaken at Hanford and because of the urgency of the project, the new plant will not take advantage of development work now progressing at Oak Ridge National Laboratory. Because of the nature of the basic process, the new Hanford Plant cannot be considered a permanent Ba^{140} production facility.

ATTACHMENT B

Development on RaLa Process at ORNL

The results of development work at ORNL on the lead sulfate-barium sulfate precipitation process are summarized below:

1. Filtration of the initial lead-barium sulphate precipitate through a porosity "G" stainless steel filter located on the end of a decant line has yielded 99% recovery of Ba^{140}.

2. Metathesis of the sulfate precipitate has been performed in the precipitation vessel and filtration of the metathesized cake has yielded 95% Ba^{140} recovery as $Ba(NO_3)_2$.

3. Separation of barium and lead in a centrifuge bowl under 2,200 g. with 3 M KOH - 0.5 M K_2CO_3 has yielded 95% recovery of Ba with only small percentage of lead remaining.

4. Development work with ion exchange resins indicate that it is possible to separate barium from lead, iron, chromium, nickel, and all fission products including strontium to meet product specifications. The stability of a resin column on which large quantities of radioactivity are absorbed will be tested in the near future.

The development data indicate that it will be possible to greatly increase the reliability of the lead-barium sulfate process and that the complex final purification procedure may be greatly simplified by the use of ion exchange. This means that the conversion of the existing RaLa plant to 10,000-curie production can be as simply done at Oak Ridge National Laboratory as proposed in April of 1949.

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION
UCC
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

August 25, 1949

Mr. R. P. Hammond
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico

Subject: RALA SHIPMENT #43, RUN #35

Dear Phil:

This shipment was picked up by the Atomic Energy Commission this morning. There were approximately 1,750 curies of product present at 1ST 1550 EST on August 24, 1949. The product was again in the form of a nitrate.

We are sorry that this shipment will reach you about two days behind schedule and that the product content is so low. We were unable to do better, however, because of many difficulties experienced during this run.

After you had reported to us that you found some foreign material which appeared to be silica in Run #34, we reviewed the records of the last several runs. Unusual as it may seem for our operation, we found that the procedure used in that run and the three previous runs was identical. In addition to using the same procedure, the same cubicle equipment was also used;--there were no changes made between Runs #31 and #34. These facts, plus your favorable reports on Runs #31 through #34, make us seriously doubt that our equipment or process could have been the source of impurities which caused your difficulties.

This information, of course, does not help you with your recurrent process difficulties caused by impurities. We doubt, however, that with the information available at present this problem can be solved. It is still our opinion that just being certain of what the impurities are would help a great deal. Since you are the only one in a position to accomplish this, we would again like to suggest that the next time these impurities are found, they be saved, allowed to decay and analyzed.

[redacted]

[redacted]

The next shipment is now scheduled to leave Oak Ridge on September 16, 1949. We realize that you would like to have it sooner but, unfortunately, this cannot be done because of the equipment repairs which must be made before the next run is started.

Very truly yours,

E. J. Witkowski

E. J. Witkowski, Superintendent
Chemical Separations Department

EJW:wp

1. R. P. Hammond
2. L. B. Ralst
3. E. J. Witkowski
4. Central Files

[redacted]

[redacted]

CENTRAL FILES NUMBER
49-8253

Date August 25, 1949

Subject Hala Shipment #43, Run #35

Copy # 44
C. File

By E. J. Witkowski

To R. P. Hammond

Before reading this document, sign and date below:

[redacted]

[redacted] copies. Series [redacted]

SECRET

[redacted] 168

203.05

Date September 16, 1949

Subject Oak Ridge National Laboratory

Rala Program

Copy # 6 "CNR"

2 C Vandenkay

By R. W. Cook

To C. E. Center

64

Before reading this document, sign and date below:

#10368
JUL 12 1950

~~SECRET~~

UNITED STATES
ATOMIC ENERGY COMMISSION

This document consists of 1 pages and — figures.
No. 6 of 7 copies, Series "CNR"

CAUTION

...ument contains information affecting the ...l Defense of the United States. ...ission or disclosure of its contents in ...er to an unauthorized person is prohibited ... may result in severe criminal penalties under ...licable Federal laws.

Oak Ridge, Tennessee
September 16, 1949

CLINTON LABORATORIES
CENTRAL FILES NUMBER
49-9-168

Classification Cancelled
~~Or Changed To~~ _____
By Authority Of DOC
By EEB Date AUG 27 1971

Carbide and Carbon Chemicals Corporation
Post Office Box P
Oak Ridge, Tennessee

Attention: Mr. C. E. Center

Subject: OAK RIDGE NATIONAL LABORATORY - RALA PROGRAM

Gentlemen:

Please refer to Mr. C. N. Rucker's letter to Dr. Albert H. Holland, Jr. dated August 24, subject as above.

You are authorized to proceed with the development and engineering for the improvement of the Rala process facilities, as outlined in Mr. Rucker's letter. It is understood that a construction cost of approximately $122,400, in addition to the $136,300 included in your 1950 budget estimate for design and development, is required for this program.

In view of the necessity of these facilities for meeting the laboratory's continuing commitments until about January 1, 1951, and possibly for standby alternate facilities after production is carried on at another site, the construction as improvements to the plant is approved. As soon as your development work and engineering have progressed sufficiently to determine the actual details and a reasonably accurate engineering cost estimate, a request for a construction directive should be submitted.

Very truly yours,

R. W. Cook
Acting Manager
Oak Ridge Operations

Belsher:re

CLASSIFICATION CANCELLED
1/19/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

DISTRIBUTION - SERIES "CNR" (typed 9-27-49 by e.g.)

1-CNR. L. B. Emlet
2-CNR. L. B. Emlet
3-CNR. W. D. Lavers
4-CNR. A. M. Weinberg
5-CNR. Hess Stringfield
6-CNR. F. C. Vonderlage
7-CNR. C. N. Rucker

THIS COPY FOR

COPY
Forwarded By
C. N. RUCKER

~~SECRET~~

I4a(4)

~~SECRET~~

191

Date 10-28-49

Subject Letter Re: RALA PRODUCTION

Copy # 3A

F. L. Culler

By L. B. Emlet

To R. P. Hammond

INV 64

INV

Before reading this document, sign and date below:

Classification Cancelled
Or Changed To
By Authority Of
By
Date AUG 30 1971

CLASSIFICATION CANCELLED
ADD signature 1/19/95
Date
Single rereview of CCRP-declassified ...ents was authorized by DOE Office of ...sification memo of August 22, 1994.

Publicly Releasable

This document has received the necessary patent and technical information reviews and can be distributed without limitation.

RESTRICTED DATA
This document ... restricted data as defined ... Atomic Energy Act of 1946.

FRDN
...nformation affecting the United ... ...closure of its contents to ...ized person is prohibited ... criminal ...ties under

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

October 28, 1949

Dr. R. P. Hammond
Los Alamos Scientific Laboratory
P. O. Box 1663
Los Alamos, New Mexico

Subject: BALA PRODUCTION

Dear Phil:

I had hoped that you would be at the Information Meeting so that we could discuss in more detail some of the problems on the current BaLa program. As you will recall, at one of our meetings in Los Alamos early in the spring Don Mueller outlined the maximum quantities of radioactive contaminants that could be tolerated in the finished lanthanum source as he received it from you. We have completed some investigational work on a 1300-curie source prepared about July of 1948. Our results are included in a memorandum by R. S. Pressly, our Central Files #49-10-146. A copy of this memo has been sent to you. There remains some of both the suspended material and the supernate referred to in Pressly's memorandum. You may wish to further investigate this material in regards to your milking procedure to obtain preliminary information on what is carried through.

It is my understanding that the Atomic Energy Commission has decided to have Hanford proceed with their BaLa program. In the meantime we are doing some equipment improvement work in hopes of having a safer process. The Technical Division is at present working on the development of a filter unit which will replace the present extractor method of separating the barium from the uranium nitric solution. An ion exchange column will be installed in the 706-D Building prior to the next run (November 20, 1949). Whatever tailings can be recovered from the run will be used on this column to prove this method of purification.

You apparently are experiencing continued difficulties with the contaminants that are present in the product as we ship it to you. In most cases though, it is only an estimate as to what the contaminant is and how much is present. In order for us to have something concrete to work on, I believe it is essential that you isolate some of this material and determine both the contaminating elements and the quantity of each. Is it possible for you to allow whatever remains of the product to decay and then isolate the various contaminants? Unless we have something more factual to work on, I seriously doubt if you can expect much improvement in the quality of the products which we are now shipping.

[redacted]

[redacted]

[redacted]

The Information Meeting appeared to be quite successful. Frankly, I am very happy it is over because it wore everyone to a frazzle. I hope that we may get together for a discussion of the RaLa program within the next few months so that we will have a better understanding of each other's problems.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY

ORIGINAL SIGNED BY
L. B. EMLET

Logan B. Emlet, Director
Operations Division

LBE:wp

1. R. P. Hammond
2. C. E. Rucker
3. F. L. Culler
4. F. L. Steahly
5. E. J. Witkowski
6. A. H. Holland, Jr.
7. L. B. Emlet

[redacted]

[redacted]

[redacted]

This document contains information affecting the [redacted] its transmission or disclosure of its contents in any manner to an unauthorized person is prohibited [redacted] penalties under applicable Federal [redacted]

[redacted]

This document [redacted] restricted data as defined in the Atomic [redacted] of 1946.

FILE RECORD SHEET

49-13-191

DATE:

CLASSIFICATION: [redacted]

SUBJECT:

TO: Command

FROM:

NO. OF COPIES: 7 SERIES:

DISTRIBUTION:

REMARKS:

C-5

[redacted]

Date December 14, 1949

Subject Letter re RaLa Process Progress.

Copy # 2 A

E. J. Witkowski

By L. B. Emlet

To W. M. Harty

INV. 65

Before reading this document, sign and date below:

EJW 12/16/49

[redacted]

This document consists of 1 page
No. 2 of 3
Series A

OAK RIDGE NATIONAL LABORATORY

DIVISION OF
CARBIDE AND CARBON CHEMICALS CORPORATION

UCC

POST OFFICE BOX P
OAK RIDGE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY
CENTRAL FILES NUMBER
49-12-63

December 14, 1949

Classification Cancelled
~~Or Changed To~~ _____
By Authority Of _____
By _____ Date AUG 27 1971

Mr. W. M. Harty
Hanford Engineer Works
Richland, Washington

Dear Bill:

I realize that I have been rather lax in keeping you posted on the progress that is being made in the RaLa process here at the Laboratory. As you may know, the first large-scale (about 500 curies) column run was made early this month with remarkable success. Another such run is scheduled about January 9, 1950. You may be interested in spending a few days with us at that time to follow the progress.

During February, 1950, if everything works according to schedule, we may attempt a full-scale column run. This, of course, is dependent upon the outcome of the January work. We would be very happy to have you visit us during this period and discuss this problem of mutual interest.

CLASSIFICATION CANCELLED
Arvin S. Quist 1/19/95
ADD signature Date
Single rereview of CCRP-declassified documents was authorized by DOE Office of Declassification memo of August 22, 1994.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY
ORIGINAL SIGNED BY
L. B. EMLET

Logan B. Emlet, Director
Operations Division

LBE:wp

1. W. M. Harty
2. E. J. Witkowski
3. L. B. Emlet

[redacted]

SECRET

Date December 26, 1949

Subject Bale Development Work - Request for Hanford Slugs.

By C. N. Tucker

To R. E. Cook

Copy # 6A
F. L. Steahly

Before reading this document, sign and date below:

FLS Walk 1/3/50	
~~WRE~~ WJSE 3 Jan 50	
~~FRB~~	
~~REB~~	
~~LRA~~	

[redacted]

This document consists of 1 pages
No. 6 of 11 copies, Series A

OAK RIDGE NATIONAL LABORATORY

OPERATED BY
CARBIDE AND CARBON CHEMICALS CORPORATION
FOR THE
ATOMIC ENERGY COMMISSION
POST OFFICE BOX P
OAK RIDGE, TENNESSEE

December 28, 1949
Classification Cancelled
~~Or Changed~~ To
By Authority Of
By
Date AUG 27 1971

Mr. R. W. Cook, Manager
Oak Ridge Operations
U. S. Atomic Energy Commission
Post Office Box E
Oak Ridge, Tennessee

Subject: RALA DEVELOPMENT WORK - REQUEST FOR HANFORD SLUGS

Dear Mr. Cook:

The Development Program, designed to provide a more efficient and less hazardous RaLa process, is progressing extremely well. A number of small-scale (one-curie level) semi-works runs and one 600-curie run in the 706-D Building have resulted in chemical yields of 99%, as compared with an average of 67.3% for the production runs made during 1949.

Before proceeding further on the Development Program or recommending this resin column process for the production of kilocurie quantities of RaLa, the effects of radiation in large-activity-scale runs on the Dowex 50 resin must be determined. The best practical method to make this determination and at the same time examine the quality of the RaLa produced is an actual full-scale run. The experimental equipment is now set up in the 706-D Building and waiting for this final test. If this test is as successful as is anticipated, production equipment will be installed for operation in June, 1950.

We wish, therefore, to request that seventy-six, four-inch Hanford slugs, having at least forty days' irradiation at a high flux, be delivered to Oak Ridge National Laboratory by January 15, 1950. Based on previous shipments, these slugs would contain about 135 kilograms of uranium and 20 grams of Pu^{239}.

We will be happy to discuss this program in more detail at your earliest convenience.

Very truly yours,

OAK RIDGE NATIONAL LABORATORY

C. N. Rucker

C. N. Rucker
Director

LBEmlet:wp

1-3. R. W. Cook
4. A. H. Holland
5. C. E. Center
6. F. L. Steahly
7. F. L. Culler
8. E. J. Witkowski
9. L. B. Emlet
10. C. N. Rucker
11. C. N. Rucker

[redacted]

This document contains information affecting the National Defense of the United States within the meaning of the Espionage Act, 50 U.S.C. 31 and 32. Its transmission or the disclosure of its contents in any manner to an unauthorized person is prohibited by law. Information so classified may result in severe criminal penalties under applicable Federal laws.