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CP-59 REVISED

PROJECT 9536

D4 H- 7840

## Route List

1. ~~\_\_\_\_\_~~  
2. ~~7/11/45~~  
3. ~~10/2/45~~  
4. ~~CNS~~  
5. ~~1/1/45~~  
~~to 1/1/45~~

File 100-101010-101010

Date 3-2-46

Subject Shipment of four Lithium Fluoride  
Slug Assemblies

To Hood Worthington

From H.L. Anderson

Copy No.  D.A. Miller

**BEFORE READING THIS DOCUMENT, SIGN AND DATE BELOW:**

~~This document consists of two pages of text, three pages of unclassified drawings, one page of classified drawings - doc. #3018 c.4 2/1~~

|             |         |
|-------------|---------|
| W. H. H. H. | 1/21    |
| W. H. H. H. | 3/22    |
| W. H. H. H. | 1/22    |
| W. H. H. H. | 4/2     |
| W. H. H. H. | 4/4     |
| W. H. H. H. | 4/10    |
| W. H. H. H. | 4-18-46 |

DECLAS

~~APPROVED FOR~~  
~~PUBLIC RELEASE~~

DJ Brown  
4-22-02

INV.  
9-47

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**INDEXED**

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DOCUMENT AND  
INVENTORY UNIT

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# INTRODUCTION

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N.A. Miller-7846

This document consists of  
6 pages

METALLURGICAL LABORATORY

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BEST AVAILABLE  
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March 1, 1946

METALLURGICAL LABORATORY

P. O. Box 5207, Chicago 90, Ill.

OFFICE OF THE DIRECTOR

MAR 5 - 1946

Mr. Hood Worthington  
TMX Division

E. I. duPont de Nemours & Co.,  
Wilmington, Delaware

42 Savely 424-03

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0-144/17 P.M.  
7 8 9 10 11 12 1 2 3 4 5 6

3-31-56

Dear Hood:

I have shipped today through the Area Engineer, four lithium fluoride slug assemblies. The drawings included herewith show the design of this slug. These slugs were outgassed under vacuum at 400°C for 24 hours. The closure was made using a heliarc weld and in order to do this successfully we had to change the design of the end cap as indicated by the pencil correction on the drawings.

We carried out three tests on these slugs; a test of radioactivity, a test of internal hydraulic pressure and a leak test.

Test of Radioactivity

One slug was inserted in the central thimble of the Argonne pile for half a day and we observed the decay for 12 days so as to ascertain the magnitude of the long-lived activity. The initial activity was equivalent to 3000 millicuries of Ra which decayed with a 14.8 hour half-life (Cu activity) until after 7 days this had decayed to 0.22 millicuries. After 11 days the Cu activity was negligible and the long-lived activity remaining amounted to 0.026 millicuries. These activities correspond to the bare slug and include beta activities. When protected with 1/16 inches of lead, which would cut out all soft radiations, the long-lived activity after 12 days amounted to 0.007 millicuries. In estimating the activities to be expected at Hanford, we assumed that the flux would be 20 times as great as for the Argonne pile. Under these circumstances the initial activity of the Cu after a time long compared to the half-life would be 120,000 millicuries. After 7 days cooling this will have decayed to 9 millicuries, a value which is smaller than the activity which would be due to the long-lived material. After a 50 day irradiation, the long-lived activity would contribute 26 millicuries for the bare slug or 7 millicuries with 1/16 inches of lead protection. These values check quite closely the estimates made in our original report, "Proposal for the Production of Tritium Using the Hanford Piles", September 1, 1945. If a 7 day cooling period is provided, the maximum precaution which need be taken in the handling of these slugs would be to handle them with tongs

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D44-7840

Mr. Hood Worthington

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March 1, 1946

one foot long and to ship them in lead or even iron containers having a thickness equal to 1" on all sides. We would be glad to furnish such containers if you indicated that it would be desirable to do so.

Internal Hydraulic Pressure Test

Hydraulic pressure was applied internally in two cans until failure occurred. In both cases the failure occurred in a longitudinal crack on the cylindrical surface of the can near the welded end. The failures occurred at 750 #/in<sup>2</sup> and 800 #/in<sup>2</sup> in the two trials, respectively. In the neighborhood of the crack the diameter had bulged to 14% greater than its original dimension. The computed tensile stress of the material at failure was 13,300 #/in<sup>2</sup> in close agreement with the value 13,000 #/in<sup>2</sup> given in the Aluminum Company specifications for 2S-0 aluminum. It is apparent that the heat due to the weld reduced the temper of the aluminum to dead soft. The bulge was much smaller near the machined end of the can than near the welded end.

It is recommended that the outer (Standard Hanford can) be placed so that its closure is at an end opposite from that of the inner can. This will minimize the loss of strength due to heating by the weld. Under these circumstances, using Aluminum Company values for the yield strength at 0.2% elongation, 5000 #/in<sup>2</sup> for 2S-0 aluminum and 13000 #/in<sup>2</sup> for 2S-1/4H aluminum the increase in diameter will be less than 0.004" if the internal pressure does not exceed 460 #/in<sup>2</sup>. For a 16 day irradiation this corresponds to a factor of safety of 10. // RRL

Leak Test

We carried out an elementary leak test by immersing the slugs in hot water and looking for bubbles due to the emergence of the heated air in the slug. No bubbles were observed in any of the four slugs which were sent.

We would like to have these slugs irradiated for between 10 to 20 days whichever is most suitable from the point of view of the normal operation schedule.

We are grateful for your cooperation in these matters.

Very truly yours,

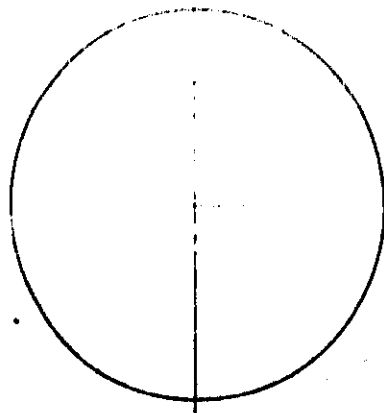
*H. L. Anderson*

Herbert L. Anderson

HLA:jfp

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1.208" ± .005

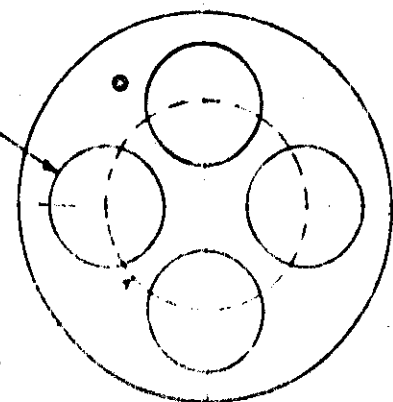
0.185" ± .002

LIF DISK

①

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.55C DIAM  
3/8 NOMINAL DRILL SIZE



1.2985" ± .0005

0.363" ± .001

COPPER DISK

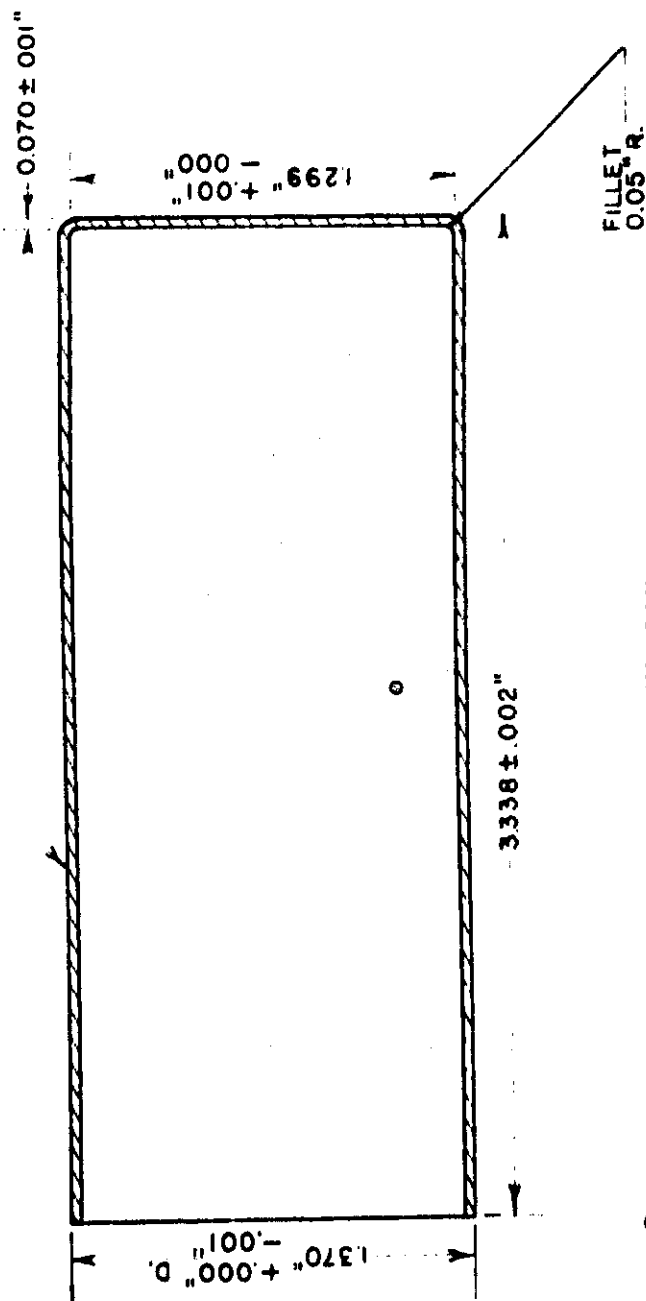
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2S ALUMINUM

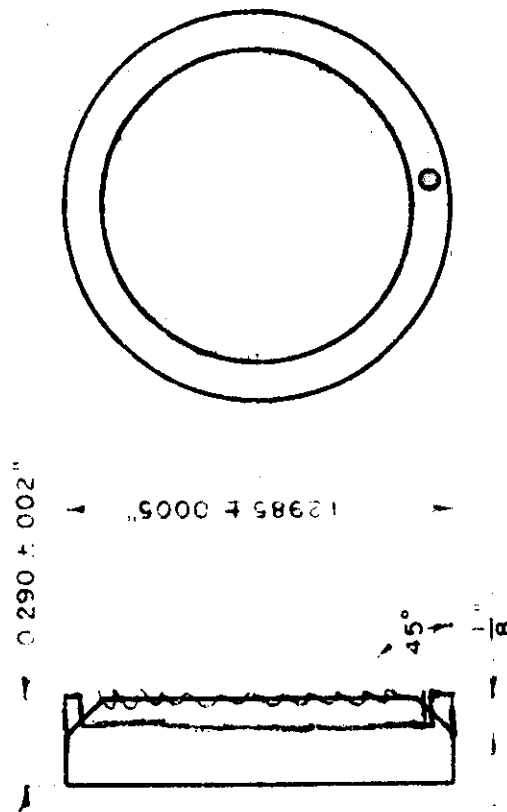


2S ALUMINUM CAN

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25 ALUMINUM END PLUG

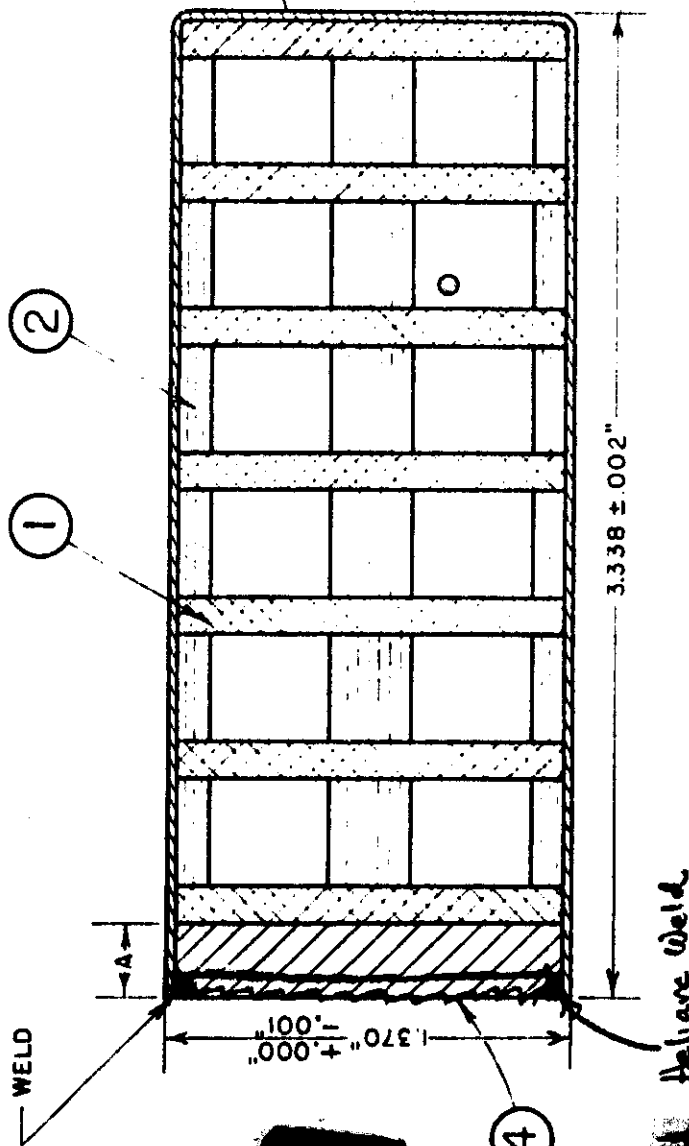
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LIF SLUG ASSEMBLY



POSITION ALUMINUM END PLUG SNUGLY AND WELD. THEN MACHINE PLUG FLUSH WITH END OF CAN. DIMENSION "A" WILL VARY SLIGHTLY DUE TO THE VARYING SUMS OF LIF AND COPPER DISK THICKNESSES.

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Classification and markings per the C. Ray 6-6-86