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DATE: April 24, 1956
SUBJECT: APPR Meeting Held at Oak Ridge National Laboratory
on April 3, 4, and 5, 1956.
TO: J. H. Frye, Jr.
FROM: R. J. Beaver

COPY NO. *18***Distribution**

1. J. D. Anderson, ORNL
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6. J. H. Frye, Jr., ORNL
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S. Army)
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13. E. D. Robertson, ALCO
14. H. W. Roth, ORNL
15. L. D. Schaffer, ALCO (Y-12)
16. John Tully, ALCO
17. R. C. Vaughn
- 18-24. TTY, ORNL
21. ORNL-RC
- 22-23. Lab Records

CLASSIFICATION CANCELLEDDATE FEB 22 1957 *per*

For The Atomic Energy Commission

H. F. Canale
Chief, Declassification Branch

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INTRA-LABORATORY CORRESPONDENCE

OAK RIDGE NATIONAL LABORATORY

To: J. H. Frye, Jr.

Subject: APPR Meeting Held at ORNL
on April 3, 4 and 5.

Copies: Listed Distribution

The following were in attendance:

R. D. Robertson, ALCO
John Tully, ALCO
J. G. Gallagher, ALCO
E. C. Edgar, ALCO
N. A. Giambusso, APB
A. W. Larson, ORO
L. D. Schaffer, Y-12
F. H. Neill
R. J. Beaver
J. H. Erwin
R. C. Waugh
C. F. Leitten, Jr.

In the beginning of the meeting, the fabrication schedule was reviewed and the target dates are listed below:

Initiate plate fabrication	- 4-3-56
Complete plate fabrication	- 5-18-56
Initiate brazing	- 4-23-56
Complete brazing	- 6-22-56

Plate fabrication was initiated the first day of the meeting, but it was pointed out that the reason for the delay in initiating brazing of fuel elements was due to inability to attain a satisfactory atmosphere in the brazing furnace because of a defective muffle. It was expected that between April 10 and April 23 the little brazing development remaining could be accomplished, and that production of brazed units would start on schedule.

The status of the absorber section was discussed and it was pointed out that the latest experiments reveal that absorber plates containing

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3.4 w/o B-10 in an iron matrix clad with stainless steel could be fabricated with excellent and complete metallurgical bonding. The one obstacle remaining in fabricating these plates was the lack of the proper size die for production of powdered cores. Further work will be directed to the establishment of welding techniques for joining these plates into the specified boxes. ALCO drawings covering the specifications for the absorber plate and section were given to ORNL.

Considerable concern was exhibited with respect to the effect of radiation damage to the absorber section. It was proposed that C. Leitten and L. Schaffer contact WAPD and KAPL to obtain the latest results and information for the application of absorber material for the APPR application. It was suggested that pending the results of this trip, ORNL would initiate in July a backup effort with another selected absorber material in the event the present material combination was not satisfactory. ORNL was to investigate the possibility of substituting an APPR absorber section for the cadmium section in the MTR control rod. ORNL is also responsible for fabricating small specimens of the B-10 absorber material to be tested as soon as possible in the MTR. It was also suggested that ALCO investigate the feasibility of using gadolinium oxide instead of B-10. Europium oxide was also suggested and it was the consensus of opinion that ORNL should investigate the possibilities of securing 500 gms of the material.

The status of the end adapters was reviewed and ALCO Products felt that within two weeks the first samples would be available. It was suggested by ORNL that ALCO notify us when the samples would be available and ORNL would send a man to the Lebanon Steel Foundry to inspect the samples. The status of joining the end adapters to the fuel unit and final machining of the fuel assembly will remain unchanged until ORNL receives the first end adapters. At that time, a procedure will be established by working with exact models of the APPR fuel unit containing depleted uranium.

The preliminary format of the specifications was reviewed in great detail and all possible portions modified.

Page 1: Size of task was changed from 40 to 38 stationary fuel elements for July 15, and from 20 to 19 stationary fuel elements for October 15.

Fuel content per element in grams of U-235 was established as 515.16 grams $\pm 0.38\%$ -0.57% . These tolerances based on the following information:

a. Weighing $\pm 0.03\%$

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b. Assay of enrichment	$\pm 0.10\%$
c. Ratio of gms of total U to gms of uranium dioxide	$\pm 0.25\%$
d. Handling	-0.19%
Totaling	$\pm 0.38\%$ -0.57%

The enrichment was changed to read "product level".

Poison content in gms of B-10 per fuel element was established as 0.483 $\pm 1.75\%$
 -4.94%

These tolerances were derived at as follows:

a. Natural boron-boron carbide - 75.9 (This was based on approximately 8 results)	$\pm 0.53\%$ -0.92%
b. Weighing boron carbide	$\pm 0.22\%$ -0.32%
c. Possible losses during sintering (Deliberate addition due to uncertainty)	$\pm 1.0\%$ -3.5%
d. Handling losses	-0.20%
Totaling	$\pm 1.75\%$ -4.94%

It was pointed out by ALCO the importance of these tolerances in that 1 gm of B-10 is equivalent to 355 gms of U-235.

The fuel content in the control rod fuel element in gms of U-235 was established as 417.76 with the same tolerance as described above.

The poison content in the control rod fuel element in gms of B-10 were established as 0.392 with the same tolerances as described previously.

Page 2:

The total poison content in gms of B-10 for the control rod absorber section was established as 56.4 gms with a tentative tolerance of $\pm 2\%$.

Certified analyses have to be provided on all stainless steel.

Page 3:

The U-235 distribution per plate was established as 0.039 minimum and 0.042 maximum.

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The uranium homogeneity tolerances were established as $\pm 2\%$ and the boron tolerance as $\pm 20\%$. As a qualitative evaluation of homogeneity every 25th plate will be radio-graphed and filed.

Page 6: Each batch of brazed metal powder is to be analyzed quantitatively and supported with a qualitative spectrographic analysis.

Page 10: Clad-core-clad thickness in the enriched APPR plates will be supported by a statistical evaluation from numerous specimens sheared from an enriched plate.

Page 12: Tolerance on the inner plates in brazed assemblies are to be $\pm 10\%$ and on the top and bottom plates at the spacing at the top and bottom of the unit end to within $\pm 5\%$. This measurement will be made with a depth micrometer.

The cleaning method is to contain procedures for degreasing for fuel elements after final machining in a vapor degreaser, followed by blowing air through the fuel element and then sealing the opened ends with masking tape.

R. J. Beaver
Metallurgy Division

RJB:fwh

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