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HW--27331

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PRODUCTION TEST NO. 105-530-A, SUPPLEMENT B
NEW METHODS OF FABRICATING HORIZONTAL CONTROL RODS

Objective: To test new methods of bonding boron to aluminum tubing in the fabrication of horizontal control rods.

Originator: J. H. Rector, Pile Technology Unit.

Basis and Justification: In an effort to reduce the costs involved in flame-spraying boron on control rods two new low-cost methods of bonding boron to aluminum tubing have been developed.

Method 1: A mixture of either boron-glyptal or boron-Armstrong's compound is spun on to the aluminum tubing by placing a small amount of this material in a tray mounted on the carriage of the lathe. While the tubing is turning at approximately 120 rpm the carriage containing the tray is moved along the length of the tube. By this means a layer 0.001 of an inch can be coated on the tubing. By repeating this process any desired thickness can be bonded to the tubing.

Method 2: Powdered boron carbide mixed with varying amounts of powdered boron, carbon, and aluminum is pressed under pressure around the aluminum tube to be used as a control rod. By controlling the amount of boron in the mixture the poisoning effect of the control rod can be varied.

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References: M. W. Hulin to Files, HW-26184, 11-11-52, Production Test No. 105-530-A.
New Methods of Fabricating Horizontal Control Rods.

M. W. Hulin to Files, HW-27072, 2-6-53, Production Test No. 105-530-A,
Supplement A. New Methods of Fabricating Horizontal Control Rods.

Schedule: This Production Test authorizes the irradiation of thirteen samples. These will be divided into four groups, each group receiving a one month's irradiation, as outlined in the original Production Test and in Supplement A. This Production Test will authorize the use of empty process tubes for this irradiation until poison addition and discharge equipment has been installed at B Pile.

Costs:

Cost Code: In coding time distribution use xxxx-5220-20022.
In coding Work Orders use xxxx-5220-25322.

Reactivity: Two inhours per sample plus five inhours for loss of tube.
This will make a total of eleven inhours for three groups
of three samples and thirteen inhours for one group of four samples.

Reactor Section: Not over twenty-four man-hours. Three men for two hours for charging and discharging each group.

Elevator Time: Eight hours. One hour for charging and one hour for discharging each group.

Shutdown Time: Eight hours.

Descriptive Details:

Description of Slugs and Charging Order: Open ended slugs of the same type shown in the original Production Test will be used. These will be charged between perfs and centered in the graphite stack with solid aluminum pieces.

Material and Amount in Slug:

Slug	Material
A-1	50% Boron - 50% Glyptal
A-2	75% Boron - 25% Glyptal
A-3	40% Boron - 60% Armstrongs Compound
A-4	79.4% Al, 20.6% B ₄ C (0.160 g B/cm ²)
A-5	77.7% Al, 12.6% B ₄ C, 9.7% B (0.139 g B/cm ²)
A-6	72.9% Al, 27.1% B ₄ C (0.195 g B/cm ²)
A-7	73.4% Al, 11.9% B ₄ C, 14.7% B (0.104 g B/cm ²)
#1	50% Boron - 50% Armstrong's Adhesive Baked at 200°C for 30 minutes.
#2	20% Boron - 50% Glyptal Baked at 120°C for 30 minutes.
#3	50% Boron - 50% Glyptal
#4	50% Boron - 50% Armstrong's Adhesive
#5	36.4% Al Powder - 63.6% B ₂ O ₃ Powder (Sprayed on)
#6	67% Al - 33% B ₄ C (1.04 grams)

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Number of Slugs: Thirteen

Slug Identification: A-1 through A-7, #1 through #6.

Length: Nine and one-half inches.

Pile Facilities Required: Empty process tubes until poison addition and discharge equipment is installed at B Pile.

Heat Generated: Two kilowatts per charge.

Cooling Time: One week.

Shielding Estimate: Three inches of lead per piece.

Special Instructions:

Special Hazards: None. Sufficient space has been allowed in the slugs to take care of any gas emission that might develop from the irradiation of this material.

Special Equipment: None.

Shipping Instructions: After one week's cooling, the samples will be shipped to 111-B where they will be opened and examined.

Responsibility: The Reactor Section Operations Sub-Section will be responsible for all scheduling and charging of samples and for the operational safety and production continuity of the pile. H. F. Zuhr and M. W. Hulin will be responsible for technical aspects.

M. W. Hulin
PILE TECHNOLOGY SUB-SECTION
ENGINEERING DEPARTMENT

MW HULIN:lra

Approvals:

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File Technology, Engineering Department

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J. H. Warren J. H. Warren, Production Superintendent
Operations Sub-Section, Reactor Section

E. P. Lee E. P. Lee, Manager
Reactor Section

Date of Completion: March 24, 1953

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