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RL-NRD-657 SUP B

This document classified

by

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This document consists of
3 pages.

SUPPLEMENT B

PRODUCTION TEST PT-NR-57

COPRODUCER TARGET ELEMENT EVALUATION

T. W. Evans

December 30, 1965

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1. OBJECTIVES

PT-NR-57 authorizes the charging of up to five columns of 1.3" diameter Zr-2 clad lithium bearing prototype ceramic coproduct target elements contained in Zr-2 shroud tubes. The objectives of the test are (1) to provide irradiated ceramic target elements for extraction process test work, (2) to evaluate the in-reactor performance of prototype target elements and (3) to provide irradiated elements for use in simulated reactor accident tests.

2. DISCUSSION

This supplement to PT-NR-57 authorizes the charging of one column of ceramic target elements that represent a small variation in design from those already authorized under the basic test. These elements have nominally 95 mil Zr-2 cladding (86 mil minimum) instead of the 30 mil material used in Supplement A.

This cladding thickness was selected after elements with 30 mil cladding had undergone partial collapse of the cladding in the autoclave test at 1500 psi and 300 C. Cladding of this size will withstand the system pressure of N-Reactor even if empty. The maximum core temperature is increased by about 25 C by this change. In all other respects this should be a much safer element than those charged under Supplement A.

The nominal dimensions of these elements and the shroud tubes are given below and are compared with the corresponding values for PT-57, SUP A.

	<u>SUP A</u>	<u>SUP B</u>
Shroud Tube		
Outer diameter	2.415"	2.415"
Inner Diameter	1.819	1.959
Target Rod		
Zr diameter	1.316	1.456

Although the annuli are the same, the increased diameter here produces the following thermal-hydraulic consequences (compared to the SUP A case):

Flow increase	+ 13%
Venturi pressure differential	+ 27%

The test charge will be made up of the following types of element:

- 12 elements - sintered pellets of γ -LiAlO₂
- 2 elements - γ -LiAlO₂ prepared by direct encapsulation
- 2 elements - vibrationally compacted sintered γ -LiAlO₂ powder

The first two processes were described in the main production test document. The last two elements were prepared by vibrationally compacted powder prepared from material that had been sintered to 85% of theoretical density. The packing density of about 83% was achieved so the overall density is 70%.

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It requires seventeen elements of this length to make a full column. There will be one empty shroud tube provided so the standard dummy pattern may be used. The empty shroud tube should be charged at the downstream end of the column of targets.

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