

THE UNIVERSITY OF MICHIGAN  
MICHIGAN MEMORIAL-PHOENIX PROJECT

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April 2, 1980

PHOENIX MEMORIAL LABORATORY  
NORTH CAMPUS  
ANN ARBOR, MICHIGAN 48106

Docket No. 50-2  
License No. R-28

U. S. Nuclear Regulatory Commission  
Attn: Mr. Monte Conner  
Operating Reactors Branch No. 4  
Division of Operating Reactors  
Washington, D. C. 20555

Dear Mr. Conner:

The University of Michigan requests the following amendment to the Ford Nuclear Reactor (FNR) License No. R-28.

1. Change section 5.2, Technical Specifications, Appendix A to License No. R-28, to read:

5.2 REACTOR FUEL

The fuel assemblies shall be of the MTR type, consisting of plates containing uranium-aluminum alloy, uranium aluminide ( $UAl_x$ ), or uranium oxide ( $U_3O_8$ ) fuel (uranium enriched in the isotope U-235), clad with aluminum. Partially loaded fuel assemblies in which some of the plates do not contain uranium may be used.

5.2.1 High Enrichment Uranium (HEU) Fuel

High enrichment (93%) fuel assemblies may consist of plates containing uranium-aluminum alloy,  $UAl_x$ , or  $U_3O_8$ . The authorized fuel assembly designs are:

<u>Number of Plates</u>	<u>Maximum Plate Loading (grams of Uranium 235)</u>	<u>Maximum Assembly Loading (grams of Uranium 235)</u>
18	7.78 ± 2%	140 ± 2%
9	7.78 ± 2%	70 ± 2%
10	16.90 ± 2%	169 ± 2%

5.2.2 Low Enrichment Uranium (LEU) Fuel

Low enrichment (19.5%) fuel assemblies shall consist of plates containing  $UAl_x$ . The authorized fuel assembly designs are:

<u>Number of Plates</u>	<u>Maximum Plate Loading (grams of Uranium 235)</u>	<u>Maximum Assembly Loading (grams of Uranium 235)</u>
18	9.28 ± 2%	167 ± 2%
9	9.28 ± 2%	84 ± 2%

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5.2.3 Reactor Power Level and Scram Setpoints for Authorized Core Loadings

The 9-plate fuel assembly shall be used in all loadings for the control rod fuel assemblies. The reactor power level and scram setpoints for authorized core loadings shall be:

<u>Fuel Loading</u>	<u>Power Level</u>	<u>Limiting Safety System Setting</u>
Normal 18 plate core	2 MW	2.4 MW
Fringe* 18 or 10-plate with center of 18-plate core	2 MW	2.4 MW
Intermixed (nonfringe*) 18 and 10 fuel plate core	1 MW	1.2 MW

\*Fringe fuel assemblies are those in east, west and south locations L5, L6, L7, L8, L9, L10, L20, L30, L40, L50, L60, L70, L75, L76, L77, L78, L79 and L80.

A safety analysis for the utilization of low enrichment uranium (LEU) fuel is enclosed. The LEU fuel necessitates higher weight percents of uranium aluminate (56.5 wt % UAL<sub>x</sub>, 42.0 wt % U) than are presently used for the FNR high enrichment fuel. The present UAL<sub>x</sub> compound weight percent is 19.1. However, test plates in the Materials Test Reactor (MTR), Engineering Test Reactor (ETR), High Flux Isotope Reactor (HFIR), and the FR2 Reactor in Karlsruhe, Germany with higher weight percentages of UAL<sub>x</sub> than that proposed for LEU fuel have been operated to higher fission densities than the FNR limit with no excess swelling or blister failure. Operational fuel elements with aluminate loadings comparable to those proposed are routinely used in the Advanced Test Reactor (ATR) to higher fission densities than the FNR limit of 1.5 x 10<sup>21</sup> fissions/cc.

The LEU fuel elements will be physically identical, except for plate core construction, to present uranium-aluminum alloy elements which comprise 60% of the present FNR core and have been used since 1957.

The safety analysis indicates that fast and thermal flux distributions within the core and in the reflector region are slightly changed by the use of LEU fuel. No reductions in the margins of safety are expected.

Sincerely,

*William Kerr*

William Kerr  
Director  
Michigan Memorial-Phoenix Project

WK/RRB/z

Enclosures

Subscribed to and sworn to before me  
this 2nd day of April, 1980.

*Donna Zeeb*  
Notary Public

DONNA M. ZEEB  
Notary Public, Washtenaw County, Mich.  
My Commission Expires on Oct. 21, 1981