Form NRC-618
(12-73)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE

For Radioactive Materials Packages

1.(a) Certificate Number	1.(b) Revision No.	1.(c) Package Identification No.	1.(d) Pages No.	1.(e) Total No. Pages
4986	5	USA/4986/B( )F	1	7

2. PREAMBLE

2.(a) This certificate is issued to satisfy Sections 173.393a, 173.394, 173.395, and 173.396 of the Department of Transportation Hazardous Materials Regulations (49 CFR 170-189 and 14 CFR 103) and Sections 146-19-10a and 146-19-100 of the Department of Transportation Dangerous Cargoes Regulations (46 CFR 146-149), as amended.

2.(b) The packaging and contents described in item 5 below, meets the safety standards set forth in Subpart C of Title 10, Code of Federal Regulations, Part 71, "Packaging of Radioactive Materials for Transport and Transportation of Radioactive Material Under Certain Conditions."

2.(c) This certificate does not relieve the consignor from compliance with any requirement of the regulations of the U.S. Department of Transportation or other applicable regulatory agencies, including the government of any country through or into which the package will be transported.

3. This certificate is issued on the basis of a safety analysis report of the package design or application–

3.(a) Prepared by (*Name and address*):
General Electric Company
P.O. Box 780
Wilmington, N.C. 28401

3.(b) Title and identification of report or application:
General Electric Company application dated December 20, 1976, as supplemented.

3.(c) Docket No. 71-4986

4. CONDITIONS

This certificate is conditional upon the fulfilling of the requirements of Subpart D of 10 CFR 71, as applicable, and the conditions specified in item 5 below.

5. Description of Packaging and Authorized Contents, Model Number, Fissile Class, Other Conditions, and References:

(a) Packaging

(1) Model Nos.: RA-1, RA-2, RA-3, and RA-J

(2) Description

A fuel assembly and fuel rod shipping container. Packagings are right rectangular boxes consisting of an outer container of wooden construction and a metal inner container separated by cushioning material.

The metal inner container is 11-1/2 inches by 18 inches by 174 inches long for the Model No. RA-1, and 179 inches long for the Model Nos. RA-2, RA-3, and RA-J and is positioned within an all wood or a fiberglass coated wood on aluminium outer container approximately 32 inches by 33 inches by 207 inches long. An optional outer container for the Model No. RA-3 is of all wood construction, and is approximately 30 inches by 31 inches by 207 inches long. Cushioning is provided between the inner and outer containers by phenolic impregnated honeycomb and ethafoam, or equivalent. Closure is accomplished by bolts, latches, or equivalent. A pressure relief (breather) valve is provided on the inner container, and is set for 0.5 psi differential. The total weight of the packaging and contents is 2,800 pounds.

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5. (a) Packaging (continued)

(3) Drawings

(i) The RA-1 inner container is constructed in accordance with the following GE Drawing Nos.:

718E684, Revision 2
148F938, Revision 2
886D364, Revision 2 or 3
112C3309, Revision 2

The RA-1 outer container is constructed in accordance with GE Drawing No. 718E688, Revision 2 or any of the GE Drawings listed in Section (iv) below.

(ii) The RA-2 inner container is constructed in accordance with the following GE Drawing Nos.:

731E291, Revision 1 or 2
161F329, Revision 0
921D446, Revision 0
921D447, Revision 0

The RA-2 outer container is constructed in accordance with any of the GE Drawing listed in Section (iv) below.

(iii) The RA-3 inner container of all welded construction is constructed in accordance with the following GE Drawing Nos.:

731E674, Revision 1, 2, 3, or 4
161F329, Revision 0, 2, or 3
921D446, Revision 0, 1, 2, 3, or 4
117C3979, Revision 0, 1, or 2

The RA-3 inner container of welded and riveted construction is constructed in accordance with the following GE Drawing Nos.:

731E674, Revision 5 or 6
128D5211, Revision 1 or 2
128D5212, Revision 0 or 1
128D5177, Revision 0, 2, 3, or B
128D5178, Revision 1 or 2
117C3979, Revision 2, 3, or 4
159C5411, Revision 2
159C5372, Revision A
159C5373, Revision A

5. (a) Packaging (continued)

(3)(iii) Drawings (continued)

The RA-3 outer container is constructed in accordance with GE Drawing No. 829E209, Revision 0, 3, 4, or any of the GE Drawing Nos. listed in Section (iv) below.

(iv) The RA-1, 2, or 3 outer containers may be constructed in accordance with the following GE Drawing Nos.:

761E529, Revision 2
731E283, Revision 0, 1, 2, 3, or 4

(v) The RA-J inner container is contructed in accordance with GE Drawing No. RAJI-1, Revision 0.

(vi) The RA-J outer container is constructed in accordance with GE Drawing No. RAJO-1, Revision 0.

(4) Product Container

Five-inch, Schedule 40, Type 304 (or equivalent) stainless steel, pipe fitted with screw type or flange closure. Container shall be vented in the event it contains materials which decompose at less than 1475°F.

(b) Contents

(1) Type and form of material

(i) UO_2 fuel assemblies with a maximum average U-235 enrichment of 3.2% by weight. Assembly rods are clad with a minimum 0.032 inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.410 inch. Each assembly, made up of a maximum 8 x 8 square array of fuel rods, shall have a maximum fuel length of 174 inches with a maximum fuel cross-sectional area of 25 square inches.

(ii) UO_2 fuel assemblies with a maximum average U-235 enrichment of 3.2% by weight. Assembly rods are clad with a minimum 0.034 inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.416 inch. Each assembly, made up of a maximum 8 x 8 square array of fuel rods, shall have a maximum fuel length of 174 inches with a maximum cross-sectional area of 25 square inches.

5. (b) Contents (continued)

(1) Type and form of material (continued)

(iii) UO_2 fuel assemblies with a maximum average U-235 enrichment of 2.7% by weight. Assembly rods are clad with a minimum 0.032 inch thickness of zircaloy and a maximum fuel pellet outside diameter of 0.490 inch. Each assembly, made up of a maximum 7 x 7 square array of fuel rods, shall have a maximum fuel length of 174 inches with a maximum cross-sectional area of 25 square inches.

(iv) UO_2 fuel rods with a maximum U-235 enrichment of 5.0% by weight. Rods are clad with zircaloy, incaloy, inconel, or stainless steel such that the ratio of clad to fuel cross sectional area be at least 0.26, and a maximum fuel pellet outside diameter of 0.508 inch. Each rod shall have a maximum length of 174 inches. The clad rods shall be bundled (contained) in the product container described in 5(a)(4).

(v) UO_2 fuel rods with a maximum U-235 enrichment of 6.5% by weight. Rods are clad with zircaloy, incaloy, inconel or stainless steel such that the ratio of clad to fuel cross sectional area be at least 0.26, and a maximum fuel pellet outside diameter of 0.508 inch. Each rod shall have a maximum length of 174 inches. The clad rods shall be bundled (contained) in the product container described in 5(a)(4).

(vi) PuO_2-UO_2 fuel rods with a maximum PuO_2 concentration not exceeding 8.0% by weight in natural or depleted UO_2. Rods are clad with a minimum 0.030-inch thickness of zircaloy and a maximum fuel diameter of 0.508 inch. Each rod shall have a maximum length of 174 inches. The clad rods shall be bundled (contained) in the product containers described in 5(a)(4). Of the total plutonium, the maximum mass ratio of Pu-241 to Pu-240 shall not exceed unity (1) when the PuO_2 in natural or depleted uranium is 4.0% by weight or less. Where the PuO_2 concentration in natural or depleted uranium exceeds 4.0% by weight, the maximum mass ratios of Pu-241 to Pu-240 shall not exceed the values specified in the table provided as determined from the PuO_2 concentration and the maximum Pu-239 concentration in total plutonium.

5. (b) Contents (continued)

(1) (vi) Type and form of material

Maximum w/o Pu-239 Total Pu	Maximum Ratio of w/o Pu-241 to w/o Pu-240 Where PuO_2 Concentration Does Not Exceed		
	6 w/o	7 w/o	8 w/o
50	1.0	0.68	0.42
52	1.0	0.68	0.42
55	1.0	0.68	0.38
57	1.0	0.66	0.36
59	1.0	0.66	0.36
60	1.0	0.64	0.36
61	1.0	0.64	0.34
62	1.0	0.62	0.34
63	1.0	0.62	0.32
64	1.0	0.60	0.32
65	1.0	0.60	0.30
66	1.0	0.58	0.30
67	1.0	0.58	0.28
68	1.0	0.56	0.28
69	1.0	0.54	0.26
70	1.0	0.54	0.26
71	0.88	0.52	0.24
72	0.88	0.50	0.22
73	0.88	0.48	0.22
74	0.88	0.46	0.20
75	0.88	0.44	0.20
76	0.88	0.42	0.18
77	0.88	0.40	0.16
78	0.88	0.38	0.14
79	0.88	0.36	0.12
80	0.88	0.34	0.10
81	0.76	0.32	0.08
82	0.76	0.28	0.06
83	0.76	0.26	0.04
84	0.76	0.22	0.02
85	0.76	0.20	0.00

5. (b) Contents (continued)

(2) Maximum quantity of material per package

(i) For the contents described in 5(b)(1)(i), 5(b)(1)(ii), and 5(b)(1)(iii):

Two (2) fuel assemblies.

(ii) For the contents described in 5(b)(1)(iv), 5(b)(1)(v), and 5(b)(1)(vi):

Two (2) fuel bundles.

(A bundle is defined as an arrangement of rods which are either contained within a product container or strapped together.)

(c) Fissile Class	I and II
(1) Class I	For the contents specified in 5(b)(1); and contained within the packaging described in 5(a)(3)(i), 5(a)(3)(ii), 5(a)(3)(iii), and 5(a)(3)(iv).
(2) Minimum transport to be shown label for Class II	For the contents specified in index 5(b)(1)(i), 5(b)(1)(ii), and on 5(b)(1)(iii); and contained within the packaging described in 5(a)(3)(v) and 5(a)(3)(vi): 0.9

6. Each fuel assembly shall be unsheathed or shall be enclosed in an unsealed, polyethylene sheath which will not extend beyond the ends of the fuel assembly. The ends of the sheath shall not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

Polyethylene shipping shims may be inserted between rods within the fuel assemblies up to a maximum of 0.20 g H_2O equivalent per cubic centimeter averaged over the assembly.

7. In lieu of the product container specified in 5(a)(4), except for UO_2 fuel rods with U-235 enrichment greater than 3.2% and for rods described in 5(b)(1)(v) and 5(b)(1)(vi), the clad rods shall be bundled (bound with steel strappings at two or more locations with a maximum cross

7. (Continued)

sectional area of 20.0 square inches. The total breaking strength of the strapping shall be 30 times the weight of the bound rods.

8. The maximum spacing between adjacent rods within the bundle shall be 0.012 inch. The spacing shall be maintained by the product container wall, metal strappings or peripheral metallic dunnage with a melting point greater than 1475°F within the bundle.

9. The package authorized by this certificate is hereby authorized for use under the general license provisions of 10 CFR § 71.12(b).

10. Expiration date: July 31, 1980.

REFERENCES

General Electric Company application dated December 20, 1976.

Supplements dated: March 15, 1978; and January 5, 1979.

Exxon Nuclear Company letter dated May 30, 1978.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Charles E. MacDonald, Chief
Transportation Certification Branch
Division of Fuel Cycle and
Material Safety

Date: FEB 04 1980