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
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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)*:

U.S. Department of Energy
Naval Reactors
Washington, DC 20545

3.(b) Title and identification of report or application:

Safety Analysis Report for M-130 shipping container dated December 30, 1968, as supplemented.

3.(c) Docket No. 71-6003

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 No.: M-130

(2) Description

The M-130 shipping container is an upright cylinder 84 inches in diameter by 158 inches overall height. The container walls consist of a finned 1 inch thick outer shell (fabricated from either carbon steel, carbon steel with stainless steel clad, or solid stainless steel), 10 inches of lead shielding, and a 1 inch thick inner pressure vessel (fabricated from carbon steel clad with stainless steel). The top of the container is covered with a shielded closure head which is bolted to the container and seals the pressure vessel. An access opening with a bolted shield plug is provided in the closure head for loading and unloading spent fuel.

The pressure vessel has an inside diameter of 55 inches. The central region contains a secondary heat exchanger (not used during shipment) surrounded by a 1/2 inch thick carbon steel backup cylinder 29 inches in diameter. The annulus which remains between the backup cylinder and the pressure vessel provides a space 13 inches wide and 130 inches high for spent fuel. The spent fuel is contained in the annulus by module holders designed for the particular core to be shipped.

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5. (a) Packaging (cont'd)

(2) Description (cont'd)

The container has external penetrations to the pressure vessel for steam and water relief lines and a fill and drain line (which are capped during shipment) and a pressure sensing line which remains open to a pressure gage during shipment. The container also has penetrations which do not open to the pressure vessel for secondary heat exchanger lines (which are capped during shipment) and a temperature sensing line.

For LWBR spent fuel shipments, the heat exchanger and associated structures have been removed, external penetrations plugged and seal welded, and an external shield and energy absorber added during modifications.

The container is supported on its transport vehicle by an "A" frame structure. Gross weight of the loaded container without its support structure is approximately 220,000 pounds.

(3) Drawings

The packaging is constructed in accordance with General Electric Drawing Nos. 247E209, Sheet 1, Rev. R; Sheet 2, Rev. K; Sheet 3, Rev. T; Sheet 4, Rev. U; Sheet 5 of 5, Rev. F and 247E228, Rev. F.

For LWBR spent fuel shipments, the container has been modified in accordance with Westinghouse Electric Drawing 1176J48, Sheet 1 Rev. G, Sheet 2 Rev. E and an external energy absorber added in accordance with Westinghouse Electric Drawing 1525E32, Rev. A.

(b) Contents

(1) Type and form of material

Irradiated fuel assemblies, activated corrosion products and structural parts containing Transport Group III materials and up to 40 gallons of residual water contaminated with Transport Groups III or IV materials. The fuel assemblies and structural parts are of the following types:

(i) S3W/S4W fuel subassemblies of core type 2.

(ii) S5W fuel modules of core types 2 or 3.

(iii) S5W corner fuel modules of core types 2 or 3.

(iv) D1G fuel modules of core types 1 or 2.

5. (b) Contents (cont'd)

(1) Type and form of material (cont'd)

(v) D1G removable fuel assemblies of core types 1 or 2.

(vi) S1C/S2C fuel modules with control rods.

(vii) S1C/S2C peripheral fuel modules.

(viii) S3G-3/3A fuel module with or without control rods.

(ix) SAD cell.

(x) S3G-3/3A irradiated thermocouples and thermocouple cases.

(xi) LWBR blanket fuel modules.

(2) Maximum quantity of material per package

(i) 52 fuel assemblies as described in 5(b)(1)(i).

(ii) 12 fuel assemblies as described in 5(b)(1)(ii) or 9 fuel assemblies as described in 5(b)(1)(ii) and 4 fuel assemblies as described in 5(b)(1)(iii).

(iii) 6 fuel assemblies as described in 5(b)(1)(iv) and 4 fuel assemblies as described in 5(b)(1)(v).

(iv) 9 fuel assemblies as described in 5(b)(1)(vi) and 8 fuel assemblies as described in 5(b)(1)(vii).

(v) 10 fuel assemblies as described in 5(b)(1)(viii).

(vi) 9 fuel assemblies as described in 5(b)(1)(viii) and one fuel assembly as described in 5(b)(1)(ix).

(vii) 9 fuel assemblies as described in 5(b)(1)(viii) and one structure as described in 5(b)(1)(x).

(viii) 3 fuel assemblies as described in 5(b)(1)(xi).

Shipments shall be further limited by shielding and thermal requirements as follows:

5. (b) Contents (cont'd)

(1) Shipment of contents specified in 5(b)(1)(iv) and 5(b)(1)(v) and limited in 5(b)(2)(iii) shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.

(2) Shipment of contents specified in 5(b)(1)(vi) and 5(b)(1)(vii) and limited in 5(b)(2)(iv) shall be made in a stainless steel M-130 container and shall have a decay heat load not to exceed 18,960 Btu/hr per shipment.

(3) Shipment of contents specified in 5(b)(1)(viii), 5(b)(1)(ix) and 5(b)(1)(x) and limited in 5(b)(2)(v), 5(b)(2)(vi) and 5(b)(2)(vii) shall be made at a time after shutdown as determined from Bettis Atomic Power Laboratory report WAPD-OP(PP)S-4401 dated June 29, 1979 and shall have a decay heat load not to exceed 28,620 Btu/hr for the shipboard core and 30,000 Btu/hr for the prototype core.

(4) Shipment of contents specified in 5(b)(1)(i), 5(b)(1)(ii) and 5(b)(1)(iii) and limited in 5(b)(2)(i) and 5(b)(2)(ii) shall be made no earlier than 72 days after shutdown and shall have a decay heat load not to exceed 33,500 Btu/hr per shipment.

(5) Shipment of contents specified in 5(b)(1)(xi) and limited in 5(b)(2)(viii) shall have a heat load not to exceed 48,000 Btu/hr and a residual water quantity not to exceed 4.6 gallons.

(c) Fissile Class III

Maximum number of packages per shipment: one

6. For shipments involving the contents specified in 5(b)(1)(ii) or 5(b)(1)(iii) the M-130 package shall be inspected to verify that boron poison plates are in the module holders.

7. For shipments involving the contents specified in 5(b)(1)(viii), 5(b)(1)(ix) or 5(b)(1)(x) the thermocouples and thermocouple cases if included or the vacant module holder shall be located in the mid-position of either cage and module holder assembly.

8. Shipments shall be made in the dry condition, except for residual water as limited in 5(b)(1) and 5(b)(2)(5).

9. Expiration date: June 30, 1983.

REFERENCES

Safety analysis report for M-130 shipping container, MAO-E8-703 dated December 30, 1968.

Supplements: Naval Reactor letters A#2256 dated February 24, 1969 and G#1931 dated March 3, 1969; General Electric Company letter ONP-74520-526 dated April 3, 1972; Naval Reactors letter G#3207 dated April 27, 1972; General Electric Company letter ONP-74520-528 dated April 28, 1972; Naval Reactors letter G#3250 dated June 6, 1972; General Electric Company letters ONP-74570-635 dated October 25, 1972; ONP-74570-654 dated December 4, 1972; ONP-74570-666 dated December 12, 1972; ONP-74570-682 dated January 12, 1973; ONP-74570-698 dated January 31, 1973; ONP-74570-687 dated February 6, 1973; ONP-74390-65 dated March 26, 1973; DLGN-85570-854 dated September 24, 1973; DLGN-85570-901 dated January 10, 1974; Naval Reactors letter G#4061 dated January 29, 1974; General Electric Company letters DLGN-85570-924 dated February 15, 1974; DLGN-85570-923 dated March 6, 1974; DLGN-85570-969 dated May 24, 1974; Naval Reactors letter G#4991 dated November 25, 1975; General Electric Company letters ONP-74340-JTT-73 dated December 17, 1975; CGN-85570-1145 dated September 9, 1976; CGN-85570-1146 dated September 10, 1976; CGN-85570-1148 dated September 14, 1976; Bettis Atomic Power Laboratory letter WAPD-R(K)-1378 dated August 30, 1976; WAPD-OP(PP)S-4401 dated June 29, 1979; Naval Reactor letters G#6197 dated July 13, 1979; G#7136 dated March 17, 1982; and WAPD-LD(CES)SE-181 dated September, 1981.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

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

Date: NOV 1 0 1982

U.S. Nuclear Regulatory Commission
Transportation Certification Branch
Approval Record
Model No. M-130
Docket No. 71-6003

By application dated November 23, 1981, Naval Reactors, U.S. Department of Energy, requested an amendment to NRC Certificate of Compliance No. 6003 to provide for transporting LWBR Blanket modules in the Model M-130 cask.

The modifications made to the M-130 container were: removal of internal equipment not needed for the shipment (heat exchanger and back-up cylinder), plugging of all external pipings, addition of O-ring and gasket seals, addition of internal support structures specifically designed for the LWBR blanket modules, and addition of an external top energy absorber.

Since the M-130 container has been previously certified and successfully used for fuel transport for many years, the review was limited to those design differences associated with extending the certification to cover LWBR blanket modules.

A three level calculational approach was used by the applicant to determine the structural performance of the package for the hypothetical accident conditions: (1) container performance, (2) fuel module performance, and (3) fuel rod performance. Each level was used as a forcing function for the next level of calculation. Therefore, the M-130 container was analyzed by the IMPAC2 program to determine the force displacement characteristics in bottom and bottom corner drop orientations. The input to the FUGIT program to determine the transient response of the fuel module due to container impact. The displacement transit of the FUGIT program was used by the ACCEPT program for the fuel rod performance analysis.

The applicant did not provide calculations to show derviations of important parameters such as masses and spring constants used in the computer program. It is noted, however, the M-130 container has been certified previously for similar gross weights even without the impact limiter. The addition of the impact limiter enhances safety of the package. Although the computer results cannot be fully verified, the staff agrees with the applicant that the analytical procedures are adequate.

The staff concludes that the modifications to the package meet the structural requirements of 10 CFR Part 71.

The limit of 4.6 gallons of residual water limits the internal pressure for accident conditions to p = 310 psia. It is assumed that all 4.6 gallons are vaporized and superheated to p = 275 psia, the gas expands to 35.8 psia, and the sum yields the total pressure (~310 psia). The staff concludes the package is adequate for the thermal conditions in 10 CFR Part 71.

The staff also reviewed the criticality and shielding models and analyses of the M-130 package containing LMBR Blanket modules. The staff concluded that the package meets the shielding and criticality requirements specified in 10 CFR Part 71.

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

Date: NOV 19 1982