

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

1. a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9319	12	71-9319	USA/9319/B(U)F-96	1	OF 6

2. PREAMBLE

- a. This certificate is issued to certify that the package (packaging and contents) described in Item 5 below meets the applicable safety standards set forth in Title 10, Code of Federal Regulations, Part 71, "Packaging and Transportation of Radioactive Material."
 - b. 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

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| a. ISSUED TO (<i>Name and Address</i>)
Framatome Inc.
2101 Horn Rapids Road
Richland, WA 99354 | b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Framatome Inc. application dated August 6, 2019. |
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4. CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 71, as applicable, and the conditions specified below.

5.
(a) Packaging

- (1) Model Nos.: MAP-12 and MAP-13
- (2) Description

The MAP package is designed to transport unirradiated uranium fuel assemblies with enrichment up to 5.0 weight percent. The package is designed to carry two fuel assemblies with core components. The package consists of two components: a base and lid. The containment system of the MAP package is the fuel rod cladding.

The base consists of a fixed stainless steel strong-back which supports the fuel assemblies. A series of inner stiffeners are secured to the underside of the strong-back to support the fuel assemblies. A neutron moderator and absorber are positioned directly beneath the strong-back between each inner stiffener. The base inner stiffeners are retained by a stainless steel cover. Exterior to the cover is a layer of rigid polyurethane foam and a stainless steel outer shell. A second stainless steel sheet is provided between the two middle stiffeners. Four stainless steel outer stiffeners support the package base. The payload rests on the "W" shaped strong-back (referred to as a W-plate) and is held in place with hinged and latched aluminum doors. The lid is very similar to that of the base – a "W" shaped stainless steel inner shell is fitted with a series of inner stiffeners, neutron moderator and absorbers, and a stainless steel cover is fitted over the stiffeners. The lid is fitted with trapezoidal impact limiters at each end. The impact limiters are constructed from rigid polyurethane foam encased by the package outer stainless shell skin. The base and lid include end plates with interlocking interfacing angles.

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5.(a) (2) Description (continued)

There are two models of the MAP package, the MAP-12 and MAP-13. The weights and dimensions of the package are as follows:

MAP-12 (for 144-in Maximum Nominal Active Fuel Length):

Maximum Gross Weight	8,630 lbs
Maximum Payload Weight	3,400 lbs
Outer Dimensions	
Length	208 in
Width	45 in
Height	31 in

MAP-13 (for 150-in Maximum Nominal Active Fuel Length):

Maximum Gross Weight	8,930 lbs
Maximum Payload Weight	3,400 lbs
Outer Dimensions	
Length	221 in
Width	45 in
Height	31 in

(3) Drawings

The MAP-12 and MAP-13 packages are fabricated and assembled in accordance with the following Framatome Inc. Drawing Nos.:

9045393, Rev. 9;	9045402, Rev. 6;
9045397, Rev. 3;	9045403, Rev. 6;
9045399, Rev. 4;	9045404, Rev. 5;
9045401, Rev. 5;	9045405, Rev. 6.

(b) Contents

(1) Type and Form of Material

Enriched commercial grade uranium or slightly contaminated uranium with trace quantities limits as defined in Table 1 below. Uranium oxide fuel rods, enriched to no more than 5.0 weight percent in the U-235 isotope, with limits specified in Table 1 below.

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5.(b) Contents (continued)

(2) Maximum Quantity of Material per Package

Table 1: Maximum Authorized Concentrations

Isotope	Maximum Content
U-232	2.00×10^{-9} g/g U
U-234	2.00×10^{-3} g/g U
U-235	5.00×10^{-2} g/g U
U-236	2.50×10^{-2} g/g U
U-238	Balance of Uranium
Np-237	1.66×10^{-6} g/g U
Pu-238	6.20×10^{-11} g/g U
Pu-239	3.04×10^{-9} g/g U
Pu-240	3.04×10^{-9} g/g U
Gamma Emitters	5.18×10^5 MeV – Bq/kg U



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5.(b) Contents (continued)

(3) Fuel Assembly

(i) The parameters of the authorized fuel assemblies are specified in the table below.

Fuel Rod Array	14x14		15x15			16x16	17x17			
	1	2	1	2	3	1	1	2		
Assembly Type	1	2	1	2	3	1	1	2		
No. of Fuel Rods	176	179	208	216	204	236	264	264		
No. of Non-Fuel Cells	20	17	17	9	21	20	25	25		
Nominal Fuel Rod Pitch (in)	0.580	0.556	0.568	0.550	0.563	0.506	0.502	0.496		
Maximum Pellet Outer Diameter (in)	0.3812	0.3682	0.3622	0.3707	0.3742	0.3617	0.3682	0.3282	0.3252	0.3232
Minimum Fuel Rod Outer Diameter (in)	0.438	0.422	0.414	0.428	0.428	0.414	0.422	0.380	0.377	0.372
Minimum Clad Wall Thickness ^(a) (in)	0.0245	0.0230	0.0220	0.0245	0.0230	0.0220	0.0230	0.0220	0.0220	0.0205
Minimum Guide Tube Wall Thickness (in)	N/A	N/A	0.0140	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum Guide Tube Outer Diameter (in)	N/A	N/A	0.528	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of Guide Tubes	N/A	N/A	16	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum Instrument Tube Wall Thickness (in)	N/A	N/A	0.0240	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Minimum Instrument Tube Outer Diameter (in)	N/A	N/A	0.491	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Number of Instrument Tubes	N/A	N/A	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Clad/Tube Material Type ^(a)	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy	Zr Alloy
Maximum Active Fuel Length (in)	160	160	160	160	160	160	160	160	160	160

(a): the clad tube/material may include chromium coated cladding. The thickness of the coating (maximum 20 µm) is not included as part of the minimum clad wall thickness.

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5.(b) Contents (continued)

(3) Fuel Assembly (continued)

(ii) Non-fissile base-plate mounted and spider body core components are permitted.

(iii) Fuel rods assembled into the fuel assemblies are those loaded with sintered pellets of uranium oxides and/or with sintered pellets of uranium oxides mixed with various additives (e.g., Chromium, Boron, Gadolinium, and Europium).

(c) Criticality Safety Index: 2.8

6. In addition to the requirements of Subpart G of 10 CFR Part 71:

(a) The package shall be prepared for shipment and operated in accordance with the Package Operations in Section 7 of the application, as supplemented.

(b) Each package must meet the Acceptance Tests and Maintenance Program of Section 8 of the application, as supplemented.

(c) Each fuel assembly must be unsheathed or must be enclosed in an unsealed, polyethylene or polypropylene sheath, which may not extend beyond the ends of the fuel assembly. The ends of the sheath may not be folded or taped in any manner that would prevent the flow of liquids into or out of the sheathed fuel assembly.

(d) The fuel rods must be leak tested after fabrication to ensure that the leakage rate of the containment boundary is less than 1E-7 ref cc/sec.

7. Transport by air of fissile material is not authorized.

8. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.

9. Revision No. 11 of this certificate may be used until September 30, 2020.

10. Expiration date: February 28, 2023.

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REFERENCES

Framatome Inc., application "MAP PWR Fuel Shipping Package, FS1-0038397, Revision No. 4", dated August 6, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA Bernie White Acting for/

John McKirgan, Chief
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: September 17, 2019





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION REPORT
Docket No. 71-9319
Model Nos. MAP-12 and MAP-13
Certificate of Compliance No. 9319
Revision No. 12

SUMMARY

By letter dated May 24, 2019, Framatome Inc., (or the applicant) requested an amendment to Certificate of Compliance (CoC) No. 9319 for the MAP packaging to include a weight difference between the MAP-12 and MAP-13 packages, update packaging licensing drawings, include additional information on the ball lock pins and discuss ball lock pin brittle fracture, and provide regulatory consistency with the definition of the slightly contaminated uranium contents similarly to what was approved for the Model No. TN-B1 package.

The application was revised on August 6, 2019 in response to staff's requests for clarification regarding an apparent discrepancy with respect to the description of the performance of the MAP package closure pins during drop testing and the proposed weight margins associated with fabrication tolerances.

The staff reviewed the revised application dated August 6, 2019, and determined that the changes do not affect the ability of the package to meet the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71. The certificate has been updated to Revision No. 12.

EVALUATION

The scope of the structural review was limited to the evaluation of weight margins associated with fabrication tolerances. The staff reviewed enclosures, additions and edits to the application, including licensing drawings for completeness and technical sufficiency. In Section 2.12.4 of the application, the applicant justified the addition of 300 lbs. to the gross package weight of the MAP-13, from 8630 lbs. to 8930 lbs., by (i) the additional center cover plates (150 lbs.) that were accounted for during the drop test campaign (container CTU3), and (ii) 150 lbs. estimated for fabrication tolerances. The applicant discussed how the gross package weight was calculated for the MAP-13 package: weights for individual components were generated by multiplying the volume of each component by their respective density while weight information from the supplier was used for components, such as fasteners and rivets, purchased commercially. The applicant further discussed that variations in material sizes, particularly sheet/plate thickness, during fabrication could represent a significant variation in weight; therefore, an additional 150 lbs. (above the 150 lbs. previously accounted for the center cover plates) to the MAP-13 gross package weight should provide sufficient margin to account for any discrepancy. The staff finds that the applicant properly characterized how additional weights were considered and calculated in the analysis. As such, the resulting gross weight of the package provides a reasonable margin to account for unexpected fabrication tolerances.

In Section 2.5.1, the applicant included the new gross package weight of 8930 lbs. into the calculation for lifting devices and compression and demonstrated sufficient safety margins in all

cases considered with the additional weight. The staff reviewed the calculations and finds that margins of safety are maintained. In Section 2.5.4, the applicant stated that the additional weight will not influence the package's center of gravity calculation since the increased weight, related to fabrication tolerances, would be uniformly distributed.

The staff reviewed the applicant's assessment and concludes that (i) the additional weight of 300 lbs. -from 8630 lbs. to 8930 lbs.- is minimal in relation to the overall gross weight of the MAP-13 package, (ii) it is reasonable to consider it to be uniformly distributed, and thus would not have any adverse effect on the package center of gravity calculation. In Section 2.12.4, the applicant stated that the results of previous drop tests, although performed at 8630 lbs., have enough margin to encompass the 300 lbs. added weight. In the physical drop tests, the impact limiter only deformed about half of its full capacity.

The staff reviewed the performance of the impact limiters and finds that there is reasonable assurance that the additional 300 lbs., i.e., about 3% of the MAP-13 gross weight, would not challenge the impact limiters. Based on review of the statements and representations in the application, the NRC staff concludes that the structural design has been adequately described and evaluated and that the package has adequate structural integrity and continues to meet the requirements of 10 CFR Part 71.

The staff also reviewed the list of drawing changes and the updated drawings for the MAP-12/13 package. The staff determined that the drawing changes were limited to minor corrections, clarifications and updates to material specifications. The staff determined that the revised drawings were consistent with the guidance in NUREG/CR-5502 and contain material specifications, dimensions and tolerances, welding specifications and nondestructive examination requirements.

The staff reviewed the updated information on the ball lock pins used to secure the upper and lower sections of the MAP-12/13 package. The staff reviewed the results of hypothetical accident condition tests and determined that the MAP-12/13 package specifies an adequate number of ball lock pins to secure the upper and lower package sections. The staff reviewed the material specifications for the ball lock pins and determined that the combination of material used, which include a precipitation hardened stainless steel and an austenitic stainless steel, would not be susceptible to brittle fracture under low temperature conditions.

The staff determined that the evaluation of the performance of the ball lock pins is acceptable based on the material specifications, package testing results, and the package design which does not rely on the ball lock pins to maintain containment function during normal conditions of transport or under accident conditions.

The staff reviewed the change in the allowable normal operational temperature for the aluminum alloy fuel cavity doors. The staff determined that the revised maximum allowable normal temperature for the fuel cavity doors was acceptable because the maximum temperature is consistent with the allowable temperatures for the aluminum alloy in the ASME B&PV Code Section II Part D.

The staff reviewed the applicant's justifications for allowing a trace amount of material as defined in Table 1 of this CoC in the UO₂ fuel and finds the justifications presented to be acceptable. Although the pregnancy of some of the isotopes, e.g. U-232, in the slightly contaminated uranium will elevate the A₂ value and the radiation sources, the limits in Table 1 are to be applied at the time of shipment, thus not allowing a significant amount of time for the

build up of high gamma emitting daughter products. It is unrealistic to specify radionuclide values exactly at the time of shipment because radioactive daughters are constantly building up; therefore, a trace amount of contaminants is accounted for within the allowable gamma source and this amount will not cause a significant increase in the A_2 value and radiation sources.

Based on this reason, the staff determines that the trace amount of material, as defined in Table 1 of the CoC, will not impose significant additional impacts on the safety of the package with respect to the containment and shielding design, and the package will continue to meet the respective parts of the regulatory requirements of 10 CFR Part 71. The trace amount of fissile isotopes, as specified in Table 1, will not also cause significant changes to the neutron multiplication factor, k_{eff} , because their quantities are negligible with respect to the criticality safety of the package.

Based on the discussion above, the staff found the applicant's proposed changes to the CoC would not affect the ability of the Model No. MAP package to meet the criticality safety requirements of 10 CFR Part 71.

CONDITIONS

The following changes were made to the certificate of compliance:

Item No. 3(b) identifies the revised application dated August 6, 2019.

Condition No. 5(a)(2) is revised to update the maximum gross weight of the MAP-13 package to 8,930 lbs.

Condition No. 5(a)(3) is modified to include new revisions of the licensing drawings.

Condition No. 5(b)(1) revises the description of the contents as "slightly contaminated uranium with trace quantities limits".

Condition No. 9 has been modified to extend the previous revision of the certificate for approximately one year.

The expiration date of the certificate (Condition No. 10) was not modified.

The References section of the certificate was updated to include the application MAP PWR Fuel Shipping Package, FS1-0038397, Revision 4, dated August 6, 2019.

CONCLUSION

Based on the statements and representations in the application, the staff finds that these changes do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9319, Revision No. 12,
On September 17, 2019.