

October 22, 2018

Document Control Desk

Director, Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards
US Nuclear Regulatory Commission
Washington, DC 20555-001

Subject: Certificate of Compliance Amendment Request, Docket 71-9185

Dear Sir/Madam:

Enclosed please find one electronic document submittal of Industrial Nuclear Company's amendment request to Certificate of Compliance 71-9185 which adds an equivalent drum and a polyurethane support structure to the OP100 Type B shipping container certificate. The enclosed Safety Analysis Report, OP100 Package, Docket 71-9185, Revision 6, includes all required drop tests and analyses for the addition of the drum and polyurethane support structure to this shipping container.

In response to INC's request for an amendment to SAR Rev. 5 the NRC issued a letter on October 25, 2017 requesting additional information. In response to this letter, INC and their contracted design and testing consultant Orano Federal Services (formerly AREVA), met with representatives of the NRC on June 19, 2018. Orano and INC personnel proposed a series of additional NCT and HAC tests. The results of these tests would provide the requested additional information needed to accept the package modification.

On September 11, 2018 a series of drop tests as described in SAR Rev. 6 were performed and witnessed by the NRC's structural reviewer assigned to this project. The results of these drop tests indicated that the new foam supported OP100 performance exceeded that of the currently licensed OP100. Based on the drop test results, INC believes that all RAIs issues expressed have been satisfied.

Please contact Mike Rose at 510.352.6766 if you have any questions.

Sincerely,



Mike Rose, QA Manager/ARSO Industrial Nuclear Company

COPY: William Allen, NRC Project Manager

Request for Additional Information
for the
Model No. OP-100 Package
Docket No. 71-9185

By letter dated August 10, 2017, Industrial Nuclear Company, Inc., (INC) submitted an application to amend the certificate of compliance (CoC) for the Model No. OP-100 package. INC requested adding an equivalent drum and a polyurethane support to the Model No. OP-100 package to allow the shipment of a new source assembly.

This request for additional information (RAI) identifies information needed by the staff in connection with its review of the application. The staff reviewed the application using the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material."

Chapter 2 STRUCTURAL EVALUATION

- 2-1 Provide a tabular comparison of all material properties (i.e., modulus of elasticity, yield strength, ultimate strength, etc.) for the ASTM A366, A1008 and A568 carbon steel materials.

The licensee proposes the addition of A1008 and A568 carbon steel materials in the drum lid, ring, and body of the package. The requested information is needed in order to demonstrate and confirm that the A1008 and A568 carbon steel materials will meet the design requirements under the hypothetical accident condition (HAC) tests.

This information is needed to determine compliance with 10 CFR 71.35(a).

Response: ASTM A366 was replaced by ASTM A1008. The older drums that were used for the OP-100 package specified the cold-rolled commercial quality (CRCQ) carbon steel per the A366 standard. Since the A366 specification is no longer in effect, the drum manufacturers are supplying drums utilizing CRCQ carbon steel per the current ASTM A1008 specification. The chemical and physical properties for both the obsolete A366 and current A1008 standards are identical. Typical yield strengths per these ASTM specifications are 20-40 ksi, with elongation being equal or greater than 30%. These specifications for CRCQ carbon steel do not specify minimum ultimate strengths. The ASTM A568 specification provides the general standards for a steel mill to meet the applicable material specifications, such as chemical tolerances, thickness tolerances, steel widths, imperfections, etc., for a particular carbon steel, such as the ASTM A1008 specification. There are no physical properties requirements specified in the ASTM A568 standard. Since this standard does not directly apply to the CRCQ carbon steel utilized for the drum, reference to the A568 standard has been removed from the application.

- 2-2 With respect to the addition of the polyurethane foam support structure:

- (a) Confirm that the density of polyurethane foam support structure is still 4 lb/ft³ and that this value has not changed.

The applicant had previously indicated on September 13, 2017 that the density, if needed, may be increased. However, based on the information provided on the amendment request, the staff understands that no changes have occurred.

Response: The polyurethane foam specified for the OP-100 package has a nominal density of 4 lb_m/ft³. There is no plan to revise the foam density for the value specified in the application.

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- (b) Provide any analytical demonstrations, engineering judgement information and/or comparison data with similar radiography packages with polyurethane foam that discusses:
- a. Damage assessments on: (i) the polyurethane foam support structure, (ii) the lock box and safety plug areas, and (iii) external surfaces of the Model IR-100 Exposure Device and Model IR-50 Source Changer.
 - b. Information that confirms that the demonstrated ability of the OP-100 package to maintain the shielding integrity of the IR-100 and IR-50 devices under the plywood support structure will be maintained under the polyurethane foam support structure under the 30 ft. drop of the HAC.

The amendment request states that "... *the polyurethane foam provides greater protection of the payload than the plywood...*" Given that all tests were performed with the plywood support structure, the information is needed in order to demonstrate and confirm that this assumption is a conservative approach, and that the polyurethane will perform equally, or better, than the plywood under the HAC tests.

Response: To support the assertion that the polyurethane foam support structure provides greater protection to either the IR-100 or IR-50 devices, supplementary free HAC drop tests were performed on two OP-100 certification test units (CTUs). As discussed in the meeting with the NRC staff on January 19, 2018, an IR-50 Source Changer was loaded into the foam support structure in each CTU. Two free drop orientations and a test temperature were selected for each CTU:

1. Bottom down, followed by CG-over-top corner, CTU at -100 °F (hot)
2. Top down, followed by CG-over bottom corner, CTU at -20 °F (cold)

The result of these supplementary tests demonstrated that the polyurethane foam support structure fully protected the IR-50 Source Changer, which sustained no damage from the multiple free drop impacts. The details and results of these free drop tests have been included in Appendix 2.12.2, *Supplementary Certification Tests*, of the application. Therefore, the polyurethane foam support structure does provide greater protection than the plywood support structure for the authorized payloads of the OP-100 package.

- (c) Provide additional information that demonstrates that the location of the center of gravity of the OP-100 package has not changed after the 30 ft. HAC drop, when using the polyurethane foam.

This information is needed to determine compliance with 10 CFR 71.33, 71.45, 71.47 and 71.73.

Response: There is no data available for determining the center of gravity of the payload following the 30-foot free drop from the original certification tests perform in 1998. Additionally, 10 CFR §71.51 states that "A Type B package, in addition to the satisfying the requirements of §§71.41 through 71.47, must be designed, constructed, and prepared for shipment so that under the testes specified in: ... (2) Section 71.73 ("Hypothetical accident conditions") there would be...no external radiation dose rate exceeding 10 mSvh (1 mrem/h) at 1m (40 in) form the external surface of the package." The hypothetically accident condition (HAC) tests specified in 10 CFR §71.73 require that the package must be subject to a sequence of tests, free drop, crush, puncture drop, thermal, and immersion, to satisfy the requirements in 10 CFR §71.51. As shown in Appendix 2.12.1 of the application, the 10-gallon drums CRCQ

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carbon steel drums for the OP-100 test units sustained significant deformation from the 30-foot free drop impacts. There was no ability to remove the lid to determine the center of gravity location of either the IR-100 or IR-50 payload, and then reassemble without affecting the test unit configuration to complete the remaining regulatory tests.

As noted in Chapter 5.0, *Shielding Evaluation*, all radiation measurements (pre- and post-test) were performed with the payload (IR-100 or IR-50 devices) out of the OP-100 package, i.e., no shielding credit was utilized in satisfying the requirements of 10 CFR §71.51. Hence, the location of the center of gravity of the payload following a 30-foot free drop has no effect on the shielding effectiveness of either the IR-100 or IR-50 device. Note that the IR-100 Exposure Device is also licensed under NRC Docket No. 71-9157 to be shipped separately without the outer OP-100 package.