



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

December 20, 2018

Mr. Mike Rose  
Quality Assurance Manager/ARSO  
Industrial Nuclear Company, Inc.  
14320 Wicks Blvd.  
San Leandro, CA 94577

SUBJECT: REVISION NO. 11 OF CERTIFICATE OF COMPLIANCE NO. 9185 FOR THE  
MODEL NO. OP-100 PACKAGE

Dear Mr. Rose:

As requested by your application dated August 10, 2017, as supplemented October 22, 2018, enclosed is Certificate of Compliance No. 9185, Revision No. 11, for the Model No. OP-100 package. Changes made to the enclosed certificate are indicated by vertical lines in the margin. The staff's Safety Evaluation Report is also enclosed.

Those on the attached list have been registered as users of the package under the general license provisions of Title 10 of the *Code of Federal Regulations* 10 CFR 71.17 or 49 CFR 173.471. The approval constitutes authority to use the package for shipment of radioactive material and for the package to be shipped in accordance with the provisions of 49 CFR 173.471.

If you have any questions regarding this certificate, please contact me or Chris Allen of my staff at (301) 415-6877.

Sincerely

/RA/

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

Docket No. 71-9185  
CAC No. L25242  
EPID L-2017-LLA-0117

Upon removal of Enclosure 3, this  
document is uncontrolled

Enclosures: 1. Certificate of Compliance  
No. 9185, Rev. No. 11  
2. Safety Evaluation Report  
3. Registered Users

cc w/encls 1 & 2: R. Boyle, Department  
of Transportation  
J. Shuler Department of  
Energy, c/o L.F. Gelder  
Registered Users

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M. Rose

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MODEL NO. OP-100 PACKAGE, DOCUMENT DATE: December 20, 2018

Closes CAC No. L25242

Closes EPID L-2017-LLA-0117

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**ADAMS Package: ML18355A657**

**Ltr: ML18355A659**

<b>OFC:</b>	DSFM		DSFM		DSFM		DSFM			
<b>NAME:</b>	WAllen		SFigueroa via e-mail		YKim		CBajwa		JMcKirgan	
<b>DATE:</b>	12/11/18		12/17/18		12/12/18		12/13/18		12/20/18	

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**UNITED STATES  
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**SAFETY EVALUATION REPORT**

Docket No. 71-9185  
Model No. OP-100 Package  
Certificate of Compliance No. 9185  
Revision No. 11

**SUMMARY**

By application dated August 10, 2017, as supplemented October 22, 2018, Industrial Nuclear Company, Inc., requested an amendment to Certificate of Compliance (CoC) No. 9185, for the Model No. OP-100 Package. The applicant requested adding an equivalent drum and a polyurethane support to the Model No. OP-100 package. For this amendment request, staff reviewed Chapters 1, 2, 7 and 8 of the application using the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material" and associated Interim Staff Guidance. Staff reviewed these changes and conclude that they do not affect the ability of the package to meet the requirements of 10 CFR Part 71.

**EVALUATION**

**1.0 GENERAL INFORMATION**

The applicant modified the Model No. OP-100 package design to allow the use of polyurethane foam as a support structure as an alternative to the previously approved plywood support structure. The applicant also modified the package design to allow the use of drum lid rings with different gauge thicknesses and fabricated from alternative carbon steel materials. In addition, the applicant added drawing OP100-1-2 depicting the polyurethane foam, and updated the part numbers for components on drawing IR50-1A. Based on a review of the statements and representations in the application, staff concludes that the package has been adequately described to meet the requirements of 10 CFR Part 71.

**2.0 STRUCTURAL EVALUATION**

The objective of the structural review is to confirm that the structural performance of the package meets the requirements of 10 CFR Part 71 including the tests and conditions for normal conditions of transport and hypothetical accident conditions (HAC).

**2.1 Description of Structural Design**

In the current OP-100 package configuration, the applicant houses both plywood dunnage and a payload of either the Model No. IR-100 Exposure Device or Model No. IR-50 Source Changer inside a 10-gallon steel drum. The plywood dunnage centrally locates the payload within the steel drum overpack. The steel drum complies with DOT/UN Standard No. 1A2/X150/S, and a carbon steel closure ring secures the ASTM A366 drum lid to the steel drum using a 5/8-inch diameter by 4-inch long carbon steel hex bolt.

## 2.2 Discussion

In the application, the applicant proposed to use: (i) a 10-gallon steel drum, DOT/UN Standard No. 1A2/X120/S, with a steel drum lid fabricated from either an ASTM A1008 or an A568 carbon steel closure ring, and (ii) a polyurethane foam support structure to centrally locate the payload (either the Model IR-100 or the Model IR-50) within the steel drum. The applicant provided information to justify the additions (a 10-gallon DOT/UN Standard No. 1A2/X120/S steel drum with a drum lid and a polyurethane foam) to the OP-100 package in revision 5 of the safety analysis report (SAR) submitted with the application. However, the NRC staff found that the proposed SAR, Rev. 5 had insufficient information to determine whether those additions adequately met the 10 CFR Part 71 requirements. Therefore, the NRC staff issued a request for additional information (RAI) on October 25, 2017 (ADAMS Accession No. ML17299A005) to complete the review of the OP-100 package structural design.

## 2.3 Evaluation

Use of a steel drum, DOT/UN Standard No. 1A2/X120/S with a drum lid made of an ASTM A1008 or A568 carbon steel: In the applicant's responses to the staff's RAI, dated October 22, 2018, (ADAMS Accession No. ML18295A601), the applicant stated that the proposed 10-gallon steel drum (DOT/UN Standard No. 1A2/X120/S) with a lid made of an A1008 carbon steel is equivalent to the current 10-gallon steel drum (DOT/UN Standard No. 1A2/X150/S) with a lid made of an A366 carbon steel. The applicant indicated that, although the proposed steel drum is lighter and slightly taller than the current 10-gallon steel drum, the proposed steel drum has structural properties that are almost identical to the structural properties of the current 10-gallon steel drum.

The applicant stated that the 10-gallon steel drum (DOT/UN Standard No. 1A2/X150/S) currently in use with the OP-100 package is specified as cold-rolled commercial quality (CRCQ) carbon steel per the American Society for Testing and Materials (ASTM) A366 standard. The applicant explained that ASTM A366 has been replaced by ASTM A1008, and that drum manufacturers are supplying drums utilizing CRCQ carbon steel per the current ASTM A1008 specification. The applicant indicated that the chemical and physical properties for both the obsolete ASTM A366 and current ASTM A1008 standards are identical, and that the typical yield strength of these two carbon steels (ASTM A366 and A1008) is in the range of 20-40 ksi. As mentioned in the RAI response, the applicant decided not to use A568 steel for the steel drum, although it was originally proposed in the application, because the ASTM A568 standard does not directly apply to the CRCQ carbon steel utilized for the drum.

The NRC staff reviewed the applicant's RAI responses, and found them acceptable as the structural properties of the proposed 10-gallon steel drum (DOT/UN Standard No. 1A2/X120/S) and the current 10-gallon steel drum (DOT/UN Standard No. 1A2/X150/S) are equivalent, and the chemical and physical properties for both the obsolete ASTM A366 and current ASTM A1008 standards are almost identical. Therefore, the staff finds that the use of a DOT/UN Standard No. 1A2/X120/S steel drum, with a drum lid made of an ASTM A1008 carbon steel, is acceptable and does not affect the structural performance of the OP-100 package.

Use of a polyurethane foam: As explained in the responses to the staff's RAI, dated October 22, 2018, (ADAMS Accession No. ML18295A601), the applicant performed supplementary HAC free drop tests on two OP-100 certification test units-5 and -6 (CTU-5 and CTU-6) in addition to the previously approved four OP-100 certification test units (CTU-1 through CTU-4). The applicant performed these additional CTU tests to demonstrate that the polyurethane foam support structure provides greater protection than the current wood dunnage support structure for either the IR-100 or IR-50 devices. For the supplementary CTU tests, the applicant loaded

an IR-50 Source Changer and the polyurethane foam support structure into each CTU. For CTU-5, the applicant performed a bottom down free drop test followed by a center of gravity-over-the-top corner drop test. The drop test temperatures for CTU-5 drop tests equaled or exceeded 100 °F. For CTU-6, the applicant performed a top down drop test followed by a center of gravity-over bottom corner drop test. The applicant performed the CTU-6 drop tests at temperatures less than or equal to -20 °F (cold).

Based upon detailed free drop test and dose rate information in Appendix 2.12.2 *Supplementary Certification Tests* of Rev. 6 of the OP-100 Package SAR, the applicant provided the following assessment: (i) no failure of the drum closure lid/closure ring bolt occurred that would have permitted separation of the payload from the protective overpack, (ii) no evidence of excessive distortion of an IR-50 Source Changer lock box occurred that would have significantly displaced the special form source from its desired shielded position, and (iii) no evidence of rupture of the IR-50 Source Changer stainless steel housing that could have resulted in thermal degradation of the depleted uranium (DU) gamma shield due to excessive oxidation in a subsequent fire event. Therefore, the applicant concluded the following: (i) that the various OP-100 packaging design features are adequate to withstand the HAC 30-foot free drop event specified in 10 CFR Part 71.73, and (ii) that the tests demonstrated the ability of the OP-100 packaging, with the polyurethane foam support structure, to maintain the integrity of the shielding surrounding the payload.

The NRC staff reviewed the information provided in Appendix 2.12.2 *Supplementary Certification Tests* regarding the test facility, CTU description, technical basis, temperature, free drop test procedure, and test results. Based on the review, the NRC staff found the information acceptable for the following reasons. First, the applicant employed test procedures for the supplemental free drop tests that were identical to those previously reviewed and accepted by the NRC staff for the CTU-1 through CTU-4 drop tests. Second, the supplemental tests results for CTU-5 and CTU-6 showed no failure of the drum closure lid/closure ring bolt and no evidence of excessive distortion of the IR-50 Source Changer.

The staff finds that the supplementary test results demonstrated that the polyurethane foam support structure fully protected the IR-50 Source Changer payload (i.e., the IR-50 Source Changer payload sustained no damage from the multiple free drop impacts). Therefore, the NRC staff finds that the use of a polyurethane foam support structure which centrally locates a payload of either the Model IR-100 or the Model IR-50 within the steel drum overpack is acceptable.

## 2.4 Findings

Based on a review of the statements and representations in the application, the NRC staff concludes that the OP-100 package with the proposed additions will perform its intended functions and maintain structural integrity to meet the requirements of 10 CFR Part 71. Based on review of the statements and representations in the application, the staff concludes that the package design has been adequately described and evaluated and that the package meets the requirements of 10 CFR Part 71.

## 3.0 OPERATIONS EVALUATION

The applicant added instructions for use of the polyurethane dunnage. The staff reviewed the operating procedures for using the package with polyurethane dunnage added to the SAR and found them to be adequate.

#### **4.0 MAINTENANCE EVALUATION**

The applicant added instructions for maintenance of the polyurethane dunnage. The staff reviewed the maintenance procedures for the package with polyurethane dunnage added to the SAR and found them to be adequate.

#### **CONDITIONS**

The following changes have been made to the certificate:

Condition No. 5.(a)(2) was modified to discuss the polyurethane foam support structure.

Condition No. 5(a)(3) was revised to include the latest revisions of the licensing drawings.

Condition No. 10 was updated to authorize use of Revision No. 10 of the Certificate of Compliance until February 28, 2019.

The references section has been updated to include this request.

#### **CONCLUSION**

Based on the statements and representations contained in the application and the conditions listed above, the staff concludes that the design has been adequately described and evaluated, and the Model No. OP-100 package meets the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9185, Revision No. 11 on December 20, 2018.