NRC FORM 618
(8-2000)
10 CFR 71

U.S. NUCLEAR REGULATORY COMMISSION

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1 a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9291	11	71-9291	USA/9291/B(U)F-96	1 OF	3

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

a. ISSUED TO *(Name and Address)*

TN Americas LLC
7135 Minstrel Way, Suite 300
Columbia, MD 21045

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

TN Americas LLC, application dated January 10, 2019

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 No.: Liqui-Rad (LR) Transport Unit Package

(2) Description

The LR Package is designed to transport Type B quantities of fissile uranyl nitrate solutions. The package uses thermal and impact limiting systems to protect the containment vessel and prevent the contents from being released. The primary structural components of the LR packaging consist of a stainless steel containment vessel, a carbon steel outer vessel and a carbon steel framing system. The containment vessel is built in accordance with ASME Pressure Vessel Code (Section VIII, Division 1) but does not require an ASME stamp. Double O-ring seals on the containment vessel's primary and secondary lids provide a leak tight seal which is leak testable. A closed-cell phenolic foam or polyurethane foam surrounds the top and bottom head area of the containment vessel and ceramic fiber blanket and board insulation are used in the sidewalls and outer lid for thermal insulation and impact absorption. The maximum volume of the contents is limited to 230 gallons which maintains a minimum ullage of 33 gallons.

The LR is a cylindrical package set in a rectangular angle frame. The dimensions of the package are approximately 56 inches long (l) x 56 inches wide (w) x 73 inches high (h). The maximum weight of the package is 5,692 pounds. The outer vessel is constructed of 10 gauge carbon steel. The containment vessel is constructed of ¼ - inch stainless steel with ¼ - inch thick flanged and dished heads. The containment vessel is rated at 50 psig pressure. Closed-cell phenolic or polyurethane foam and ceramic fiber insulation are sandwiched between the containment vessel and the package's outer shell.

5.(a)(2) Description (Continued)

The package is designed to be leak-tight [maximum allowable leak rate of $1x10^{-7}$ ref-cubic centimeters per second (cm^3/s)]. The containment vessel is closed using a double O-ring and is secured by sixteen 5/8 - inch stainless steel studs. The outer lid is closed with twelve 5/8 - inch stainless steel studs and the Manual Vent Enclosure (MVE) lid is secured with four 5/8 - inch stainless steel bolts and nuts. The package is also equipped with plastic plugs to vent any gases that may be generated by the insulation during a fire event. All valves and fittings are provided within sealed enclosures to contain any leakage during valve failure.

(3) Drawings

The packaging is constructed and assembled in accordance with Columbiana Hi Tech Drawing Nos. LR-SAR, sheets 1 through 4, Rev. 10.

5.(b) Contents

(1) Type and form of material

Low enriched Uranyl Nitrate solutions with the specifications shown in Table 1 below. The uranium concentration must be less than or equal to 125 grams of Uranium per liter (gU/l) with an enrichment less than or equal to 5.0 wt.% ^{235}U. Non-fissile chemical impurities may be present up to the chemical impurity specification in Table 1. Additionally, fissile isotopes are also limited to the quantities in Table 1.

(2) Maximum quantity of material per package

230 gallons of Uranyl Nitrate solution with limits as shown in Table 1.

Table 1

ITEM	SPECIFICATION
Solution Density	≤ 1.17 g/cm^3
Chemical Impurities	≤ 1,500 µg/gU
Nitric Acid Normality	0.1 - 0.7
Uranium Concentration	≤ 125 gU/l
^{232}U	≤ 2.0×10^{-3} µg/gU
^{234}U	≤ 2.0×10^{3} µg/gU
^{235}U	≤ 0.05 g/gU (12 pounds maximum quantity of ^{235}U per LR)
^{236}U	≤ 2.5×10^{4} µg/gU
^{238}U	remainder of uranium

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5.(b)(2) Maximum quantity of material per package (Continued)

ITEM	SPECIFICATION
Pu/Np Alpha Activity	≤ 93 Becquerel/gU
Gamma Emitters	0.515×10^{-1} Curies

(c) Criticality Safety Index 0.0

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

(a) The package must be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 7 of the application.

(b) Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the application.

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

8. Packagings must be marked with Package Identification Number USA/9291/B(U)F-96.

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

10. Expiration date: July 31, 2024.

REFERENCES

TN Americas, LLC, consolidated application dated January 10, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

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

Date: February 13, 2019

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

SAFETY EVALUATION REPORT

Docket No. 71-9291
Model No. Liqui-Rad (LR) Transport Unit Package
Certificate of Compliance No. 9291
Revision No. 11

SUMMARY

By Columbiana Hi-Tech LLC (the previous certificate holder) and TN Americas, LLC applications dated May 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18156A428), and October 26, 2018 (ADAMS Accession No. ML18310A366), respectively, requested revision and renewal to Certificate of Compliance No. 9291, for its Model No. Liqui-Rad (LR) Transport Unit package. TN Americas supplemented the amendment request on January 10, 2019 (ADAMS Accession No. ML19015A373). By letter dated September 24, 2018, the U.S. Nuclear Regulatory Commission (NRC) approved Columbiana's September 7, 2018, request to name TN Americas, LLC as the new certificate holder. Hereafter in this safety evaluation report, the certificate holder is identified as either Columbiana or TN Americas, depending on which entity requested the specific change evaluated. TN America's submittal on January 10, 2019, was a consolidated application.

Columbiana requested the following: change the requirements for tightening the outer lid fasteners; allow formulations of primer and top coat equivalent to those previously specified; and to clarify the intent of American National Standards Institute (ANSI) N14.5-1997, "American National Standard for Radioactive Materials–Leakage Tests on Packages for Shipment," with respect to demonstrating no detected containment boundary leakage after performing the pre-shipment leakage rate test.

The staff used the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material" to perform the review of the proposed packaging changes. Based on the statements and representations in the application, as supplemented, and the conditions listed in the following chapters, the staff concludes that the package meets the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71.

EVALUATION OF COLUMBIANA'S REQUESTS

Clarification of Outer Lid Function and Torque Requirements

The NRC staff evaluated Columbiana's request to revise the LR certificate of compliance to clarify the function of the outer lid and to clarify the torque requirements for the primary lid, secondary lid, and outer lid. The primary and secondary lids are containment closures. The function of the outer lid is thermal insulation and impact absorption and it is not a containment closure. Columbiana explained in Enclosure 1, "Summary of page changes for Revision 9 of Liqui-Rad (LR) Transportation Unit Package SAR {LR-SAR or SAR]," of its May 30, 2018, letter, that the current torque requirements on bolt fasteners for all three lids – primary, secondary, and outer lids – is 75 [+10 -0] ft. lbs. (Columbiana 2018a). However, as shown in photographs provided by Columbiana, applying 75 [+10 -0] ft. lbs. of torque on the outer lid nut fasteners results in damage to the outer lid gasket and deformation of the metal flange on the outer lid.

Because the outer lid provides only thermal and impact protection, and is not part of the containment boundary, Columbiana requested approval to reduce the required torque for outer lid nuts to 30 [+10 -0] ft. lbs. Columbiana stated that tests had been performed to demonstrate that a torque of 30 [+10 -0] ft. lbs. applied to the outer lid nuts is sufficient to compress the outer lid environmental seal and ensure the outer lid nuts will not loosen under normal conditions of transport.

Because the functional aspects are unchanged for the outer lid and the applicant provided an evaluation which demonstrated that the revised torque values are sufficient to achieve their intended purpose, the NRC staff finds that changing the torque values for the outer lid bolts is acceptable.

Change of the Primer and Top Coat Specifications

The NRC staff evaluated Columbiana's request to revise the drawings referenced in the certificate for the LR to authorize equivalent primers and top coat on external surfaces. Specifically, Columbiana proposed to revise Drawing LR-SAR, Revision 9, Note 4, to include the phrase "(OR EQUIVALENT)" after the detailed specifications. The applicant's note 4 specifies use of a catalyzed epoxy primer (or equivalent) on all external surfaces or only carbon steel external surfaces and all surfaces in contact with foam per the manufacturer's specifications, written procedures and requirements.

Section 1.2 of the SAR provides a package description. The LR is fabricated from stainless steel, ceramic fiber, phenolic foam, epoxy primer, and carbon steel. The primary structural components of the LR packaging consist of a stainless steel containment vessel, a carbon steel outer vessel and a carbon steel framing system. The applicant states that the LR uses only a plastic plug, pressure relief device, designed to melt away between 300 °F and 400°F during a fire event to release any gases generated. This device vents the annulus between the containment vessel and outer shell only and does not penetrate the containment boundary. Pressure relief of the containment vessel is unnecessary, since the contents do not present a pressure buildup during normal conditions of transport or hypothetical accident conditions.

The NRC staff finds that the components required to be painted are for corrosion resistance and not important to safety. The packaging is visually inspected during loading and off-loading procedures for indications of corrosion. The package has been previously reviewed and approved by NRC staff in which accelerated corrosion tests, equivalent to a 20-year service life, were performed on samples representing a cross-section of the LR and the results indicated there are no chemical, galvanic, or other corrosion reactions among or between these interfacing components and that the requirements of 10 CFR 71.43(d) are satisfied.

Based on the statements and representations contained in the application and the conditions listed above, the NRC staff concludes that the materials used in the transportation package design have been adequately described and evaluated and the Model Liqui-Rad Transport Unit Package meets the requirements of 10 CFR Part 71.

Clarify the Intent of ANSI N14.5-1997, and Use of Primary Lid Tamper Indicating Seals

The NRC staff evaluated Columbiana's request to revise LR-SAR Section 7.1.2, "Loading the Contents and Securing the Package for Shipment," to clarify that the intent of ANSI N14.5-1997 is to confirm that the containment system is properly assembled for each shipment by performing a leak test of the primary and secondary lid seals to show no detected leakage when

tested to a sensitivity of $1x10^{-3}$ ref-cm^3/s. The staff reviewed the changes in LR-SAR Section 7.1.2 and finds that the description provided of the preshipment leakage rate test is in agreement with the ANSI N14.5-1997 pre-shipment leakage rate test purpose and acceptance criterion.

The NRC staff verified Drawing No. LR-SAR, sheet 4, note 11, specified the containment boundary primary lid and secondary lid closure bolts/nuts shall be torqued to 75 [+10 -0] ft. lbs. The NRC staff also verified that LR-SAR Sections 7.1.2 and 8.2(h) described the positive closure of the containment boundary primary lid as indicated by the presence of tamper indicating seals. The NRC staff also verified that LR-SAR section 7.1.2(d) described the primary lid would be leak tested as described in LR-SAR Section 8.2(h) in the event the primary lid has been opened within the 12 months since the last periodic leakage rate test as indicated if tamper indicating seals are not present. The NRC staff finds based on the statements above that the containment requirements for Type B packages in 10 CFR 71.51 would continue to be met.

EVALUATION OF TN AMERICAS' OCTOBER 2018 RENEWAL REQUEST

TN Americas submitted a consolidated LR-SAR as part of this renewal. Other than to incorporate specific changes described above, TN Americas proposed no administrative or editorial changes to the consolidated LR-SAR. TN Americas also did not request changes to the CoC, other than to revise the expiration date. TN Americas has an NRC-approved quality assurance program (Docket No. 71-0250).

The NRC staff reviewed the renewal request and verified that previous changes to the LR-SAR were incorporated into the consolidated LR-SAR. The NRC staff verified that LR-SAR drawings are available and listed in the CoC and that the TN Americas consolidated LR-SAR is available and listed in Condition 3.b. of the CoC. The NRC staff deleted all previous revision bars, revised the CoC, and updated the revision date.

CONDITIONS

The following changes were made to the certificate:

1. Condition No. 1.b. is revised to Revision Number 11.

2. Condition No. 3.b. is revised to cite the updated consolidated LR-SAR.

3. Condition No. 5.(a)(3), "Drawings" is revised to refer to Drawing No. LR-SAR, sheets 1 through 4, Rev. 10.

4. Condition No. 10., expiration date is revised to July 31, 2024.

5. The references are revised to include the consolidated LR-SAR submitted on January 10, 2019.

CONCLUSION

Based on the statements and representations contained in the application, as supplemented, and the conditions listed above, the NRC staff concludes that the design has been adequately described and evaluated, and the Model No. Liqui-Rad Transport Unit Package meets the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9291 for the Model No. Liqui-Rad Transport Unit Package, Revision No. 11.