

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

1.	a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
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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 (<i>Name and Address</i>) | b. | TITLE AND IDENTIFICATION OF REPORT OR APPLICATION |
| | DAHER-TLI
8161 Maple Lawn Boulevard
Suite 450
Fulton, MD 20759 | | Daher-TLI consolidated application dated
March 20, 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.: Versa-Pac in two configurations: VP-55 and VP-110.
- (2) Description

The Model No. Versa-Pac is either a 55-gallon (Model No. VP-55) or a 110-gallon (Model No. VP-110) package for shipment of uranium oxides, uranium metal, uranyl nitrate crystals and other uranium compounds, e.g., uranium carbides, uranyl fluorides and uranyl carbonates, uranium hexafluoride in the 1S or 2S cylinders, and thorium-232 as TRISO fuel. The 1S and 2S cylinders are ANSI N14.1 Standard compliant, which means that each cylinder (which includes new or re-certified cylinders) must be fabricated, inspected, tested, and maintained in accordance with ANSI N14.1-2012 or earlier version of ANSI N14.1 at the time of fabrication.

The exterior skin of the packaging is a UN1A2/Y425/S minimum, carbon steel material for the Model No. VP-55 and a UN1A2/Y409/S minimum, carbon steel for the Model No. VP-110.

All models use a bolted closure ring, ASTM A429 bolts and nuts, a silicone gasket, a drum cover reinforced by a 10-gauge thick plate with four or eight bolts depending upon the Model No. VP-55 or VP-110, respectively.

All models are strengthened with vertical stiffeners, two inner liners insulated by a ceramic fiber blanket and a 1/4" carbon steel reinforcing plate on the bottom. The packaging's interior is completely insulated with layers of a ceramic fiber blanket around the containment cavity with rigid polyurethane foam disks on the top and bottom of the cavity.

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

A 1/2" thick fiberglass ring is used as a thermal break at the payload cavity flange. The cavity blind flange is secured to the flange with twelve bolts.

The primary containment boundary for the Model Nos. VP-55 and VP-110 is defined as the payload cavity with its associated welds, the containment end plate, the inner flange ring, the silicone-coated fiberglass gasket, the cavity blind flange, and the bolts.

When utilizing the 5-inch steel pipe inner container in the Model No. VP-55, (5-inch pipe with the threaded cap), the containment boundary is defined as the payload cavity with its associated welds, the containment end plate, the inner flange ring, the silicone-coated fiberglass gasket, the payload vessel blind flange, and the bolts.

When transporting 1S and 2S cylinders in the VP-55, a 9 lbs/ft³ polyethylene foam liner is inserted into the package cavity, with a minimum thickness of 2 inches.

The approximate dimensions and weights of the packaging are as follows:

Table 1 - Weight and Dimensions

Model No.	Packaging OD (in.)	Packaging Height (in.)	Payload Containment Cavity ID (in.)	Payload Containment Cavity Height (in.)	Packaging Tare Weight (lbs.)	Maximum gross weight (lbs.)
VP-55	23-3/16	34-3/4	15	25-7/8	390	750
VP-110	30-7/16	42-3/4	21	29-3/4	705	965

(3) Drawings

The packaging is constructed and assembled in accordance with DAHER-TLI Drawing Nos.:

VP-55-LD, Rev. 3 (sheets 1 and 2) 55 Gallon Versa-Pac Shipping Container

VP-110-LD, Rev. 3 (sheets 1 and 2) 110 Gallon Versa-Pac Shipping Container

The 5-inch steel pipe inner container is constructed and assembled in accordance with Daher-TLI Drawing No. VP-55-2R Rev. 0, sheet 1 of 1.

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5.(b) Contents

(1) Type and form of material

- (i) Solid, homogeneous (powder or crystalline), or non-homogeneous, uranium materials with no free-standing liquids. Materials shall be stable and in a non-pyrophoric form. Density is not limited.
- (ii) Natural thorium in any form.

Contents are limited to:

- (i)
 - A. Uranium oxides (U_xO_y).
 - B. Uranyl nitrate crystals in the form of uranyl nitrate hexahydrate, trihydrate or dihydrate.
 - C. Other uranium compounds, e.g., uranyl fluorides and uranyl carbonates. Uranium compounds may also contain carbon or be mixed with carbon or graphite. Uranium carbide is authorized for shipment. However, uranium hydrides are not authorized for shipment.
 - D. Uranium metal or uranium alloys.
- (ii) TRISO fuel as C/SIC/C coated $ThUC_2$ particles pressed with a carbon matrix to form rods.
- (iii) Uranium Hexafluoride is authorized for shipment when loaded into 1S or 2S cylinders, utilizing a 9 PCF polyethylene foam liner with a thickness of at least 2 inches.

Contents may be pre-packaged in polyethylene, polytetrafluoroethylene, aluminum, and carbon steel, Aluminum Trihydrate, Sodium Borate (Borax, fused), perlite, paper labels, plastic tape, plastic bags, plastic bottles and desiccant such as "Quik-Solid" are also authorized as packing materials. Materials with a hydrogen density greater than 0.141 g/cm^3 are not authorized.

Radioactive contents shall have an auto-ignition temperature and melting point greater than 600°F .

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5.(b) Contents (continued)

(2) Maximum quantity of material per package:

The U-235 and uranium mass limits are determined by enrichment and are not to exceed the limits established below:

Table 2 - Loading Table for Model Nos. VP-55 and VP-110

Weight Percent U-235	U-235 Mass Limit (g)	
	Ground/Vessel	Air
≤ 100%	350	350
≤ 20%	410	410
≤ 10%	470	470
≤ 5%	580	580
≤ 1.25%	2,000	--

For contents restricted by Table 3, all fissile contents shall be loaded into a single 5-inch pipe.

Table 3 - Loading Table for Model No. VP-55 with 5-inch pipe

Weight Percent U-235	U-235 Mass Limit (g)	
	Ground/Vessel	Air
≤ 100%	695	395
≤ 20%	1,215	495
≤ 10%	1,605	590
≤ 5%	1,065	790

For contents restricted by Tables 4 and 5, all fissile material shall be uranium hexafluoride loaded into 1S or 2S cylinders.

If both 1S and 2S cylinders are transported in the same package and/or the number of cylinders exceeds the allowed quantity in Table 4, follow the mass limits of Table 2.

If a package containing 1S/2S cylinders is transported by air, follow the mass limits of Table 2.

For 1S or 2S cylinders with material exceeding 20 wt% U-235, each 1S or 2S cylinder shall be loaded into an individual 5-inch pipe.

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5(b)(2) Maximum quantity of material per package (continued)

Table 4: 1S/2S Cylinder Limits for the VP-55 (up to 20wt.% U-235)

Cylinder Type	Mass UF ₆ per VP-55 (lb/g)	Weight percent U-235	Number of Cylinders	U-235 Mass Limit per VP-55 (g)
1S	7.0 / 3,175	≤ 20	7	429.8
2S	9.8 / 4,445	≤ 20	2	600.8

Table 5: 1S/2S Cylinder Limits for the VP-55 with 5-inch Pipe (up to 100wt.% U-235)

Cylinder Type	Mass UF ₆ per VP-55 (lb/g)	Weight percent U-235 (e is enrichment)	Number of Cylinders	U-235 Mass Limit per VP-55 (g)
1S	1.0 / 454	20 < e ≤ 100	1	306
2S	4.9 / 2,223	20 < e ≤ 100	1	1497

The net weight of the authorized contents shall not exceed 350 lbs for the Model Nos. VP-55 and 260 lbs for the Model No. VP-110, including cribbing and dunnage.

- (3) Contents are limited to normal form material. The radionuclide inventory of the loaded contents, including U-234 and U-236, shall be less than the calculated mixture A₂ value.
- (4) Decay heat is limited to 11.4 W.

5.(c) Criticality Safety Index (CSI)

- (1) Contents Limited by Table 2 (VP-55 or VP-110): 1.0
- (2) Contents Limited by Table 3 (VP-55): 0.7 for material up to 10 wt% and 1.0 for material greater than 10 wt% and up to 100 wt%.
- (3) Contents Limited by Table 4 (only VP-55): 1.0
- (4) Contents Limited by Table 5 (only VP-55 with 5-inch pipe): 1.0

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 Operating Procedures in Section No. 7 of the application.
- (b) Each packaging must meet the Acceptance Tests and Maintenance Program of Section No. 8 of the application.

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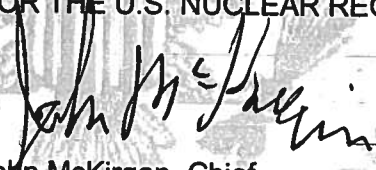
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7. Transport by air of fissile material is authorized, as limited by the 'Air' quantities in Table 2 and Table 3.
8. Transport of plutonium above minimum detectable quantities is not authorized.
9. Packages must be marked with the appropriate model number, i.e., VP-55 or VP-110, as applicable. The neoprene 1/8 inch bottom pad and 3/8 inch top pad are optional for packages that are not intended to be reused.
10. Content forms may not be mixed in a single package.
11. The package authorized by this certificate is hereby approved for use under the general license provisions of 10 CFR 71.17.
12. Expiration date: May 31, 2024.

REFERENCES

- Daher-TLI application, "Application for Certificate of Compliance for the Versa-Pac Shipping Package," Revision No.10, March 16, 2018.
- Daher-TLI application for amendment and renewal, March 20, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION


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

Date: 5/26/19



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

SAFETY EVALUATION REPORT

Docket No. 71-9342
Model No. Versa-Pac
Certificate of Compliance No. 71-9342
Revision 14

Summary

By application dated March 20, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19079A335), Daher-TLI, (Transport Logistics International, Inc. [TLI] or the applicant) requested revision to and renewal of Certificate of Compliance No. 9342, for the Model No. Versa-Pac package.

The changes made in this application are limited to the Versa-Pac licensing drawings in Section 1.4 of the safety analysis report (SAR) referenced in the certificate of compliance (CoC) in this application is listed below. To keep the designs between the VP-55 and VP-110 equivalent, identical changes were made to the VP-110 licensing drawings to match the changes described above for the VP-55 licensing drawing. Thus, any description of changes to a "Sheet" refer to changes made in both VP-55 LD and VP-110 LD licensing drawings.

- Multiple small weld changes to match the welds on the fabricated test package used for the updated drop testing,
- The weld-all-around symbols were adjusted in Sheet 2,
- Revised Note 5 on Sheet 1 and added a delta note to Sheet 2, and
- Revised Note 9 on VP-55-LD and VP-110-LD Sheet 1.

The only requested changes to the content of the CoC is an update to the revision level of the referenced drawings to revision 3 and the new expiration date as a result of the 5-year renewal request. In addition, staff made small editorial changes to improve readability of the CoC.

The staff used the guidance in NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material," as well as associated interim staff guidance documents to perform the review of the proposed package 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

1.0 GENERAL INFORMATION

1.1 Packaging Description

The Versa-Pac packaging consists of two designs, i.e., the VP-55, a 55-gallon drum, and the VP-110, a 110-gallon version, both use a bolted closure ring, standard carbon steel lugs,

5/8-inch diameter American Society for Testing and Materials (ASTM), A429 bolts and nuts, and a closed-cell rubber lid gasket.

Both drums use vertical stiffeners fabricated from 1-1/4 inch carbon steel square tubing, two inner liners of rolled 16-gauge carbon steel insulated by ceramic fiber blanket which encase the vertical tubing, and a 1/4-inch carbon steel reinforcing plate on the bottom.

The package's inner container is insulated (thermal protection) with layers of ceramic fiber blanket around the containment area with rigid polyurethane foam disks on the top and bottom. A 1/2-inch-thick fiberglass ring is used as a thermal break, which is fit in between the steel components with twelve 1/2-inch bolts connecting the structural members to the fiberglass.

The containment boundary of the package is defined as the payload vessel with its associated welds, payload vessel high temperature heat resistant silicone coated fiberglass gasket, payload vessel blind flanges, and reinforcing ring. The payload vessel is comprised of a 10 gauge carbon steel sheet for the body and bottom. The upper end of the vessel is fitted with a 1/4-inch inner carbon steel flange ring with a 1/2-inch-thick carbon steel blind flange. The vessel has three circumferential welds (two at the flange, one at the base) and one longitudinal weld. A 1/8-inch high temperature, heat resistant silicone coated fiberglass gasket is used between the steel flange ring and blind flange. The payload vessel blind flange is secured with twelve 1/2-inch bolts.

1.1.1 Model No. VP-55/VP-55 with 5-inch Pipe

The overall outer dimensions of the 55-gallon drum are 23-3/16 inches outer diameter by 34-3/4 inches in height to the top of the outer drum bolt ring. The drum cover is reinforced by a 10-gauge thick 22-3/8-inch outer diameter by 18-3/8-inch inner diameter plate, and four 1/2-inch bolts. The exterior skin of the packaging is a UN1A2/Y425/S carbon steel material (formerly UN1A2/X400/S carbon steel).

1.1.2 Model No. VP-110

The overall outer dimensions of the 110-gallon drum are 30-7/16 inches (outer diameter) by 42-3/4 inches in height to the top of the outer drum bolt ring. The drum cover is reinforced by a 10-gauge 29-3/4-inch outer diameter by 27-1/4-inch inner diameter ring. The exterior skin of the packaging is a UN1A2/Y409/S carbon steel material.

1.2 Contents

There were no changes made to the package's approved contents.

1.3 Drawings

Daher-TLI submitted revised drawings showing the approved transport configurations for the proposed changes.

The revised drawings showing the transport packaging include:

VP-55-LD, Rev. 3 (sheets 1 and 2) 55-Gallon Versa-Pac Shipping Container

VP-110-LD, Rev. 3 (sheets 1 and 2) 110-Gallon Versa-Pac Shipping Container

2.0 STRUCTURAL EVALUATION

The objective of this NRC structural and materials evaluation is to verify that the applicant has adequately evaluated the structural performance of the package (packaging together with contents) and demonstrated that it meets the regulations in 10 CFR Part 71, "Packaging and Transportation of Radioactive Material".

The applicant has requested to make a few revisions to the weld types called for on the licensing drawings. For those welds that were revised, they were revised to match the welds used in the prototypes. These prototypes were used in the original drop testing campaign. As a result, these modifications will not affect the package's performance with respect to normal and hypothetical accident drop tests.

The staff reviewed the structural performance of the packaging under the normal conditions of transport prescribed in 10 CFR 71.71 and concludes that there will be no substantial reduction in the effectiveness of the packaging that would prevent it from satisfying the requirements of 10 CFR 71.55(d)(2).

The staff reviewed the structural performance of the packaging under the hypothetical accident conditions required by 10 CFR 71.73 and concludes that the packaging has adequate structural integrity to satisfy the subcriticality requirements of 10 CFR 71.55(e) for a fissile material package.

2.1 Evaluation Findings

Based on review of the statements and representations in the application, the NRC concludes that the package has been adequately described and evaluated to demonstrate that it satisfies the structural integrity requirements of 10 CFR Part 71.

Based on the review of the statements and representations in the application, the NRC staff concludes that the materials used in the transportation package design have been adequately described and evaluated for potential chemical, galvanic, and other reactions and that the package meets the requirements of 10 CFR Part 71.

3.0 THERMAL EVALUATION

There were no changes that affected the package's thermal evaluation.

4.0 CONTAINMENT

There were no changes that affected the package's containment evaluation.

5.0 SHIELDING EVALUATION

There were no changes that affected the package's criticality evaluations.

6.0 CRITICALITY EVALUATION

There were no changes that affected the package's criticality evaluation.

7.0 PACKAGE OPERATIONS

There were no changes that affected the package's operations.

8.0 ACCEPTANCE TESTS AND MAINTENANCE PROGRAM REVIEW

There were no changes that affected the package's acceptance tests or maintenance program.

9.0 CONDITIONS

The staff made editorial changes to improve the readability of the CoC. The CoC includes the following condition(s) of approval:

Condition No. 3.b., "Title and Identification of Report or Application," has been updated to reflect the consolidated application submitted by Daher-TLI.

Condition No. 5(a)(1) was edited to account for only two configurations.

Condition No. 5(a)(3), "Drawings," has been updated to reflect applicable revisions to the licensing drawings for VP-55 and VP-110 packages.

Condition No. 5(c) and portions of Condition No. 5(b) were moved above Tables 3, 4, and 5 for clarity and readability.

Condition 12 was revised to reflect a new expiration date of May 31, 2024.

The references section has been updated to include reference to this request.

10.0 CONCLUSIONS

Based on the statements and representations contained in the application, as supplemented, and the conditions listed above, the staff concludes that the design has been adequately described and evaluated, and the Versa-Pac package meets the requirements of 10 CFR Part 71.

Issued with Certificate of Compliance No. 9342, Revision No. 14, for the Model No. Versa-Pac.