

**CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES**

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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>)
DAHER-TLI
8161 Maple Lawn Boulevard
Suite 450
Fulton, MD 20759 | b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION
Daher-TLI application dated December 14, 2015. |
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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 No.: Versa-Pac in three configurations, i.e., VP-55, VP-55HC, and VP-110.

- (2) Description

The Model No. Versa-Pac is either a 55-gallon (Model No. VP-55 or Model No. VP-55HC) 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, and thorium 232 as TRISO fuel.

The exterior skin of the packaging is a UN1A2/X400/S minimum, 16 gauge carbon steel material for the Model No. VP-55 or Model No. VP-55HC and a UN1A2/Y409/S minimum, 16 gauge carbon steel for the Model No. VP-110.

All models use a 12 gauge bolted closure ring, ASTM A 307 bolts and nuts, a closed-cell EPDM gasket, a drum cover reinforced by a 10 gauge thick plate with four or eight bolts depending upon the Model No. VP-55/VP-55HC 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

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

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.

A ½" 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.

The primary containment boundary of the Model No. VP-55HC is defined as the inner containment vessel (5" pipe with the threaded cap), payload vessel 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.

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

Model No.	Packaging OD (in.)	Packaging Height (in.)	Payload Containment Cavity ID (in.)	Payload Containment Cavity Height (in.)	Packaging Weight (lbs.)	Maximum loaded weight (lbs.)
VP-55 and VP-55HC	23-1/16	34 ¾	15	25-7/8	390	640
VP-110	30-7/16	42 ¾	21	29-3/4	705	965

(3) Drawings

The packaging is constructed and assembled in accordance with Century Industries Drawing Nos.:

VP-55-LD-1 Rev. No. 11, VP-55-LD-2 Rev. No. 12, sheets 1 of 2 and 2 of 2.

VP-110-LD-1 Rev. No. 11, VP-110-LD-2 Rev. No. 10, sheets 1 of 2 and 2 of 2.

The VP-55HC 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/SIS/C coated $ThUC_2$ particles pressed with a carbon matrix to form rods.

Contents may be pre-packaged in polyethylene, polytetrafluoroethylene, aluminum, and carbon steel per Table No.1-4 of the application. 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 .

(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:

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

Table 1 – Loading Table for Model Nos. VP55 and VP-110

Weight Percent U-235	U-235 Mass Limit (g)	Uranium Mass Limit (g)
100%	350	350
20%	410	2,050
10%	470	4,700
5%	580	11,600

Table 2-1A - Loading Table for Model No. VP-55HC

Weight Percent U-235	U-235 Mass Limit (g)	Uranium Mass Limit (g)
100%	695	695
20%	1,215	6,075
10%	1,605	16,050
5%	1,065	21,300

Net weight of the authorized contents shall not exceed 250 lbs for the Model Nos. VP-55 and VP-55HC, and 260 lbs for the Model No. VP-110.

(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 A_2 value.

(4) Decay heat is limited to 11.4 W.

- 5(c) (1) Model Nos. VP-55 and VP-110 Criticality Safety Index (CSI): 1.0
(2) Model No. VP-55HC CSI: 0.7 for material up to 10 wt% and 1.0 for material greater than 10 wt% and up to 100 wt%.

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.

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

8. Transport of plutonium above minimum detectable quantities is not authorized.

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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: August 31, 2020.

REFERENCES

Daher-TLI application, "Application for Certificate of Compliance for the Versa-Pac Shipping Package," Revision No. 9, December 2015.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

Steve Ruffin, Acting Chief
Spent Fuel Licensing Branch
Division of Spent Fuel Management
Office of Nuclear Material Safety
and Safeguards

Date: 01-29-2016