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
9342	13	71-9342	USA/9342/AF-96	1 OF	6

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)*

DAHER-TLI
8161 Maple Lawn Boulevard
Suite 450
Fulton, MD 20759

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

Daher-TLI consolidated application dated March 16, 2018.

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, i.e., 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 in effect 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 ¼" 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.

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

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.

When utilizing the 5-inch steel pipe inner container in the Model No. VP-55, (5" 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/ft^3 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. 0 (sheets 1 and 2) 55 Gallon Versa-Pac Shipping Container

VP-110-LD, Rev. 0 (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.

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 hydrites 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 600ºF.

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	--

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

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

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

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.

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 A_2 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.

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: August 31, 2020.

REFERENCES

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

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA Bernard White Acting for/

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

Date: 1/24/19