U.S. Department
of Transportation

Pipeline and
Hazardous Materials
Safety Administration

East Building, PHH-23
1200 New Jersey Ave, SE
Washington, D.C. 20590

COMPETENT AUTHORITY CERTIFICATION FOR A TYPE B(U)F FISSILE RADIOACTIVE MATERIALS PACKAGE DESIGN CERTIFICATE USA/9225/B(U)F-96, REVISION 66

The Competent Authority of the United States certifies that the radioactive material package design described in this certificate satisfies the regulatory requirements for a Type B(U)F package for fissile material as prescribed in the regulations of the International Atomic Energy Agency[1] and the United States of America[2] The package design is approved for use within the United States for import and export shipments made in accordance with applicable international and domestic transport regulations.

1. Package Identification - NAC-LWT.

2. Package Description and Authorized Radioactive Contents - as described in U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9225, Revision 76 (attached).

3. Criticality - The minimum criticality safety index is as assigned in paragraph 5.(c) of NRC Certificate of Compliance. The maximum number of packages per conveyance is determined in accordance with Table 11 of the IAEA regulations cited in this certificate.

4. General Conditions -

   a. Each user of this certificate must have in his possession a copy of this certificate and all documents necessary to properly prepare the package for transportation. The user shall prepare the package for shipment in accordance with the documentation and applicable regulations.

   b. Each user of this certificate, other than the original petitioner, shall register his identity in writing to the Office of Engineering and Research, (PHH-23), Pipeline and Hazardous

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[1] "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, No. SSR-6" published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

[2] Title 49, Code of Federal Regulations, Parts 100-199, United States of America.

Materials Safety Administration, U.S. Department of Transportation, Washington D.C. 20590-0001.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

d. This certificate provides no relief from the limitations for transportation of plutonium by air in the United States as cited in the regulations of the U.S. Nuclear Regulatory Commission 10 CFR 71.88.

e. Records of Management System activities required by Paragraph 306 of the IAEA regulations[1] shall be maintained and made available to the authorized officials for at least three years after the last shipment authorized by this certificate. Consignors in the United States exporting shipments under this certificate shall satisfy the applicable requirements of Subpart H of 10 CFR 71.

5. Special Conditions -

   a. Air transport is not authorized.

6. Marking and Labeling - The package shall bear the marking USA/9225/B(U)F-96 in addition to other required markings and labeling.

7. Expiration Date - This certificate expires on April 30, 2030. Previous editions which have not reached their expiration date may continue to be used.

CERTIFICATE USA/9225/B(U)F-96, REVISION 66

This certificate is issued in accordance with paragraph(s) 810 and 816 of the IAEA Regulations and Section 173.471 and 173.472 of Title 49 of the Code of Federal Regulations, in response to the January 30, 2024 petition by NAC International, Norcross, GA, and in consideration of other information on file in this Office.

Certified By:

for William Schoonover
Associate Administrator for Hazardous
Materials Safety

February 18, 2025
(DATE)

Revision 66 - Issued to endorse U.S. Nuclear Regulatory Commission Certificate of Compliance No. 9225, Revision 76.

PREAMBLE

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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)*

NAC International, Inc.
Atlanta Corporate Headquarters
2 Sun Court, Suite 220
Peachtree Corners, GA 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

NAC International, Inc., application
dated August 16, 2024

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.: NAC-LWT

(2) Description

The NAC-LWT is a steel-encased, lead-shielded shipping cask. The cask is designed to transport various radioactive contents as listed in 5.(b)(1). The overall dimensions of the package, with impact limiters, are 232 inches long by 65 inches in diameter. The cask body is approximately 200 inches in length and 44 inches in diameter. The cask cavity is 178 inches long and 13.4 inches in diameter. The volume of the cavity is approximately 14.5 cubic feet.

The cask body consists of a 0.75-inch-thick stainless steel inner shell, a 5.75-inch-thick lead gamma shield, a 1.2-inch-thick stainless steel outer shell, and a neutron shield tank. The inner and outer shells are welded to a 4-inch-thick stainless steel bottom end forging. The cask bottom consists of a 3-inch-thick, 20.75-inch-diameter lead disk enclosed by a 3.5-inch-thick stainless steel plate and bottom end forging. The cask lid is 11.3-inch-thick stainless steel stepped design, secured to a 14.25-inch-thick ring forging with twelve 1-inch diameter bolts. The cask seal is a metallic O-ring. A second teflon O-ring and a test port are provided to leak test the seal. Other penetrations in the cask cavity include the fill and drain ports, which are sealed with port covers and O-rings.

The neutron shield tank consists of a 0.24-inch-thick stainless steel shell with 0.50-inch-thick end plates. The neutron shield region is 164 inches long and 5 inches thick. The neutron shield tank contains an ethylene glycol/water solution that is 1% boron by weight.

The cask is equipped with aluminum honeycomb impact limiters. The top impact limiter has an outside diameter of 65.25 inches and a maximum thickness of 27.8 inches. The bottom impact limiter has an outside diameter of 60.25 inches and maximum thickness of 28.3 inches. Both impact limiters extend 12 inches along the side of the cask body.

The maximum weight of the package is 52,000 pounds and the maximum weight of the contents and basket is 4,000 pounds.

5.(a) Packaging (continued)

(3) Drawings

(i) The packaging is constructed in accordance with the following Nuclear Assurance Corporation Drawings:

LWT 315-40-01, Rev. 7	Cask Assembly
LWT 315-40-02, Rev. 25 (Sheets 1-2)	Body Assembly
LWT 315-40-03, Rev. 22 (Sheets 1-7)*	Transport Cask Body
LWT 315-40-04, Rev. 12	Cask Lid Assembly
LWT 315-40-05, Rev. 10	Upper Impact Limiter
LWT 315-40-06, Rev. 10	Lower Impact Limiter
LWT 315-40-08, Rev. 18 (Sheets 1-5)	Cask Parts Detail

* Packaging Unit Nos. 1, 2, 3, 4, and 5 are constructed in accordance with Drawing No. LWT 315-40-03, Rev. 6 (Sheets 1-6).

(ii) The fuel assembly baskets are constructed in accordance with the following Nuclear Assurance Corporation and NAC International Drawings:

LWT 315-40-09, Rev. 2	PWR Basket Spacer
LWT 315-40-10, Rev. 9 (Sheets 1-2)	PWR Basket
LWT 315-40-11, Rev. 2	BWR Basket Assembly
LWT 315-40-12, Rev. 3	Metal Fuel Basket Assembly
LWT 315-40-045, Rev. 6	42 MTR Element Base Module
LWT 315-40-046, Rev. 6	42 MTR Element Intermediate Module
LWT 315-40-047, Rev. 6	42 MTR Element Top Module
LWT 315-40-048, Rev. 3	42 MTR Element Cask Assembly
LWT 315-40-049, Rev. 6	28 MTR Element Base Module
LWT 315-40-050, Rev. 6	28 MTR Element Intermediate Module
LWT 315-40-051, Rev. 6	28 MTR Element Top Module
LWT 315-40-052, Rev. 3	28 MTR Element Cask Assembly
LWT 315-40-070, Rev. 7	Weldment, 7 Cell Basket TRIGA Base Module
LWT 315-40-071, Rev. 7	Weldment, 7 Cell Basket TRIGA Intermediate Module
LWT 315-40-072, Rev. 7	Weldment, 7 Cell Basket TRIGA Top Module
LWT 315-40-079, Rev. 6	Transport Cask Assembly, 120 TRIGA Fuel Elements or 480 Cluster Rods
LWT 315-40-080, Rev. 4	7 Cell Poison Basket TRIGA Base Module
LWT 315-40-081, Rev. 4	7 Cell Poison Basket TRIGA Intermediate Module
LWT 315-40-082, Rev. 4	7 Cell Poison Basket TRIGA Top Module
LWT 315-40-083, Rev. 0	Spacer, LWT Cask Assembly TRIGA Fuel
LWT 315-40-084, Rev. 4	LWT Transport Cask Assy, 140 TRIGA Elements

5.(a)(3)(ii) Drawings (continued)

LWT 315-40-085, Rev. 1	Axial Fuel and Cell Block Spacers, MTR, and TRIGA Fuel Baskets
LWT 315-40-086, Rev. 1	Assembly, Sealed Fuel Can, TRIGA Fuel
LWT 315-40-087, Rev. 7	Canister Lid Assembly, Sealed Fuel Can, TRIGA Fuel
LWT 315-40-088, Rev. 3	Canister Body Assembly, Sealed Failed Fuel Can, TRIGA Fuel
LWT 315-40-090, Rev. 4	35 MTR Element Base Module
LWT 315-40-091, Rev. 4	35 MTR Element Intermediate Module
LWT 315-40-092, Rev. 4	35 MTR Element Top Module
LWT 315-40-094, Rev. 4	35 MTR Element Cask Assembly
LWT 315-40-096, Rev. 3	Fuel Cluster Rod Insert, TRIGA Fuel
LWT 315-40-098, Rev. 6 (Sheets 1-3)	PWR/BWR Rod Transport Canister Assembly
LWT 315-40-099, Rev. 3 (Sheets 1-3)	Can Weldment, PWR/BWR Transport Canister
LWT 315-40-100, Rev. 4 (Sheets 1-5)	Lids, PWR/BWR Rod Transport Canister
LWT 315-40-101, Rev. 0	4 x 4 Insert, PWR/BWR Transport Canister
LWT 315-40-102, Rev. 2	5 x 5 Insert, PWR/BWR Transport Canister
LWT 315-40-103, Rev. 0	Pin Spacer, PWR/BWR Transport Canister
LWT 315-40-104, Rev. 6 (Sheets 1-3)	LWT Cask Assembly, PWR/BWR Rod Transport Canister
LWT 315-40-105, Rev. 3 (Sheets 1-2)	PWR Insert, PWR/BWR Transport Canister
LWT 315-40-106, Rev. 2 (Sheets 1-3)	MTR Plate Canister, LWT Cask
LWT 315-40-108, Rev. 1 (Sheets 1-3)	7 Cell Basket, Top Module, DIDO Fuel
LWT 315-40-109, Rev. 1 (Sheets 1-3)	7 Cell Basket, Intermediate Module, DIDO Fuel
LWT 315-40-110, Rev.1 (Sheets 1-3)	7 Cell Basket, Base Module, DIDO Fuel
LWT 315-40-111, Rev. 2	LWT Transport Cask Assy DIDO Fuel
LWT 315-40-113, Rev. 0	Spacer, Top Module DIDO Fuel
LWT 315-40-120, Rev. 2 (Sheets 1-3)	Top Module, General Atomics IFM, LWT Cask
LWT 315-40-123, Rev. 1 (Sheets 1-2)	Spacer, General Atomics IFM, LWT Cask
LWT 315-40-124, Rev. 1	Transport Cask Assembly, General Atomics IFM, LWT Cask
LWT 315-40-125, Rev. 3 (Sheets 1-3)	Transport Cask Assembly, Framatome/EPRI, LWT Cask
LWT 315-40-126, Rev. 2 (Sheets 1-2)	Weldment, Framatome/EPRI, LWT Cask
LWT 315-40-127, Rev. 2 (Sheets 1-2)	Spacer Assembly, TPBAR Shipment
LWT 315-40-128, Rev. 5 (Sheets 1-2)	Transport Cask Assy., TPBAR Shipment
LWT 315-40-129, Rev. 2	Canister Body Assembly, Failed Fuel Can, PULSTAR
LWT 315-40-130, Rev. 2	Assembly, Fail ed Fuel Can, PULSTAR

5.(a)(3)(ii) Drawings (continued)

LWT 315-40-133, Rev. 2 (Sheets 1-2)	Transport Cask Assembly, PULSTAR Shipment, LWT Cask
LWT 315-40-134, Rev. 2	Body Weldment, Screened Fuel Can, PULSTAR Fuel
LWT 315-40-135, Rev. 1	Assembly, Screened Fuel Can, PULSTAR Fuel
LWT 315-40-139, Rev. 1	Transport Cask Assembly, ANSTO Fuel
LWT 315-40-140, Rev. 1 (Sheets 1-2)	Weldment, 7 Cell Basket, Top Module, ANSTO Fuel
LWT 315-40-141, Rev. 1 (Sheets 1-2)	Weldment, 7 Cell Basket, Intermediate Module, ANSTO Fuel
LWT 315-40-142, Rev. 1 (Sheets 1-2)	Weldment, 7 Cell Basket, Base Module, ANSTO Fuel
LWT 315-40-145, Rev. 0	Irradiated Hardware, Lid Spacer, LWT Cask
LWT 315-40-148, Rev. 0	LWT Transport Cask Assembly, ANSTO-DIDO Combination Basket
LWT 315-40-156, Rev. 3 (Sheets 1-4)	Canister Assembly SLOWPOKE Fuel
LWT 315-40-158, Rev. 0	Legal Weight Truck Transport Cask Assy, SLOWPOKE Fuel
LWT 315-40-170, Rev. 1	LWT Transport Cask Assy., AECL NRU/NRX Components
LWT 315-40-172, Rev. 2 (Sheets 1-2)	Lid Assembly, NRU/NRX
LWT 315-40-173, Rev. 2 (Sheets 1-2)	Basket Weldment, NRU/NRX
LWT 315-40-174, Rev. 0	Basket Spacer, NRU/NRX
LWT 315-40-175, Rev. 2 (Sheets 1-2)	Caddy Assembly, NRU/NRX
LWT 315-40-185, Rev. 0	LWT Transport Cask Assembly, SLOWPOKE Contents
LWT 315-40-186, Rev. 2 (Sheets 1-2)	Fuel Core Basket Assembly, SLOWPOKE
LWT 315-40-187, Rev. 1 (Sheets 1-2)	Basket Lid Assembly, SLOWPOKE
LWT 315-40-188, Rev. 2P (Sheets 1-2)	LWT Transport Cask Shipping Configuration, LANL MOX
LWT 315-40-189, Rev 3P (Sheets 1-2)	Transfer Tube Details, LANL MOX
LWT 315-40-190, Rev 0P	LWT Transport Cask Shipping Configuration, WESF Capsules, Zeno
LWT 315-40-191, Rev 2P	WESF Capsules Basket Assembly, Zeno LWT
LWT 315-40-192, Rev 2P	WESF Capsules Container Assembly, Zeno LWT
LWT 315-40-193, Rev 1P	LWT Lid Spacer, WESF Capsules, Zeno
LWT 315-40-195, Rev 1P	LWT Transport Cask Shipping Configuration, BUP-500, Zeno
LWT 315-40-196, Rev 2P	BUP-500 Basket Assembly, Zeno
LWT 315-40-197, Rev 1P	BUP-500 Cavity Spacer, Zeno

5.(a)(3) Drawings (continued)

(iii) The high enriched uranyl nitrate inner containers are constructed in accordance with the following NAC International Drawings:

LWT 315-40-180, Rev. 4P	LWT Transport Cask Assembly, HEUNL Contents
LWT 315-40-181, Rev. 6P (Sheets 1-2)	Container Assembly, HEUNL
LWT 315-40-182, Rev. 3P (Sheets 1-2)	Container Spacer, HEUNL
LWT 315-40-183, Rev. 1P	Container Guide, HEUNL

(iv) The General Atomics (GA) Irradiated Fuel Material (IFM) enclosures are constructed in accordance with the following GA Drawings:

GA 32334 - 032230, Rev. A	RERTR Secondary Enclosure
GA 32334 - 032231, Rev. A	HTGR Secondary Enclosure
GA 32334 - 032236, Rev. B	RERTR Primary Enclosure
GA 32334 - 032237, Rev. B	HTGR Primary Enclosure

5.(b) Contents

(1) Type and form of material

All contents listed include both unirradiated and irradiated conditions.

(i) PWR fuel assemblies. The maximum fuel assembly weight is 1650 pounds, the maximum average burnup is 35,000 MWd/MTU, the minimum cool time is 2 years, and the maximum initial fuel pin pressure at 70°F is 565 psig. The fuel assemblies consist of uranium dioxide pellets within zirconium alloy type cladding, with the specifications listed below, and with fuel rod pitch, rod diameter, clad thickness, and pellet diameter as described in Table 1.2-5, of the application.

Fuel Type	No. Fuel Rods	Max. Initial Uranium Enrichment (wt % ^{235}U)	Max. Initial Uranium Mass (MTU)	Max. Active Fuel Length (in.)
B&W 15x15	208	3.5	0.4750	144.0
B&W 17x17	264	3.5	0.4658	143.0
CE 14x14	176	3.7	0.4037	137.0
CE 16x16	236	3.7	0.4417	150.0
WE 14x14 Std	179	3.7	0.4144	145.2
WE 14x14 OFA	179	3.7	0.3612	144.0
WE 15x15	204	3.5	0.4646	144.0
WE 17x17 Std	264	3.5	0.4671	144.0
WE 17x17 OFA	264	3.5	0.4282	144.0
Ex/ANF 14x14 WE	179	3.7	0.3741	144.0
Ex/ANF 14x14 CE	176	3.7	0.3814	134.0
Ex/ANF 15x15 WE	204	3.7	0.4410	144.0
Ex/ANF 17x17 WE	264	3.5	0.4123	144.0

5.(b)(1) Type and form of material (Continued)

(ii) BWR fuel assemblies. The maximum fuel assembly weight is 750 pounds, the maximum average burnup is 30,000 MWd/MTU, the minimum cool time is 2 years, and the maximum initial fuel pin pressure at 70°F is 565 psig. The fuel assemblies consist of uranium dioxide pellets within zirconium alloy type cladding, with the specifications listed below, and with fuel rod pitch, rod diameter, clad thickness, and pellet diameter as described in Table 1.2-6, of the application.

Fuel Type	No. Fuel Rods	No. Water Rods	Max. Initial Uranium Enrichment (wt % ^{235}U)	Max. Initial Uranium Mass (MTU)	Max. Active Fuel Length (in.)
GE 7x7	49	0	4.0	0.1923	146
GE 8x8-1	63	1	4.0	0.1880	146
GE 8x8-2	62	2	4.0	0.1847	150 (1)
GE 8x8-4	60	4	4.0	0.1787	150 (1,2)
GE 9x9	74	2	4.0	0.1854	150 (1,3,4)
	79	2	4.0	0.1979	150 (1,4)
Ex/ANF 7x7	49	0	4.0	0.1960	144
Ex/ANF 8x8-1	63	1	4.0	0.1764	145.2
Ex/ANF 8x8-2	62	2	4.0	0.1793	150
Ex/ANF 9x9	79	2	4.0	0.1779	150
	74	2	4.0	0.1666	150 (3)

Notes:
(1) Six-inch natural uranium blankets on top and bottom.
(2) One large water hole - 3.2 cm ID, 0.1 cm thickness.
(3) Two large water holes occupying seven fuel rod locations - 2.5 cm ID, 0.07 cm thickness.
(4) Shortened active fuel length in some rods.

(iii) Deleted.

(iv) MTR fuel elements. MTR fuel elements composed of U-Al, U_3O_8-Al, or U_3Si_x-Al positioned within the MTR fuel basket specified in 5.(a)(3)(ii). Loose fuel plates must meet the requirements of the MTR fuel element content tables and must be loaded into an MTR plate canister prior to shipment. The fuel elements are composed of aluminum clad plates, with initial uranium enrichment up to 94.0 weight percent ^{235}U. The maximum burnup and the minimum cool time shall be consistent with the decay heat limits in Item 5.(b)(2)(iv) and shall be determined using the operating procedures in Section 7.1.5 of the application.

5.(b)(1)(iv) Type and form of material - MTR fuel elements. (Continued)

NISTR MTR fuel elements specifications are listed in Item 5.(b)(1)(iv)(a), generic MTR fuel elements are listed in Item 5.(b)(1)(iv)(b), and expanded fuel specifications applicable to LEU MTR fuel (up to 25.0 wt %^{235}U) are listed in Items 5.(b)(1)(iv)(c) and 5.(b)(1)(iv)(d).

(a) NISTR MTR Fuel Content Description

Parameter	Plate	Plate (cut in half)
Enrichment, wt % ^{235}U	≤94	
Number of fuel plates	≤17	≤34
^{235}U content per plate	22	≤11
Plate thickness (cm)	≥0.115	
Clad Thickness (cm)	≥0.02	
Active fuel width (cm)	≤6.6	
Active fuel height (cm)	≥54 cm	27 to 30
Maximum ^{235}U content per element (g)	≤380	

(b) Generic MTR Fuel Content Description

Parameter	Limiting Values[2,3]					
Enrichment, wt. % ^{235}U	≤94					
Number of fuel plates	≤23	≤19	≤23[1]	≤17	≤19	≤23
^{235}U content per plate	≤18	≤20	≤20[1]	≤21	≤21	≤16.5
Plate thickness (cm)	≥0.115	≥0.115	≥0.123[1]	≥0.115	≥.200	≥0.115
Clad Thickness (cm)	≥0.02					
Active fuel width (cm)	≤6.6	≤6.6	≤6.6	≤6.6	≤6.6	≤7.3
Active fuel height (cm)	≥56					
^{235}U content per element (g)	≤380[2]					

Notes:

1. HEU (>90 wt% ^{235}U enriched) MTR fuel having 23 plates with up to 20 g of ^{235}U per plate, with a minimum plate thickness of 0.123 cm, must have at least 2.0 cm of non-fuel material at the ends of each element. This fuel may also be loaded up to 460 g ^{235}U per element.
2. At enrichments ≤25 wt% ^{235}U, MTR fuel elements with extended fuel characteristics may be loaded with the specifications defined in 5.(b)(1)(iv)(c).
3. Reduced active fuel height is permissible for loading provided that the ^{235}U content per plate and ^{235}U content per assembly is proportionally reduced (e.g., a ≤ 7.3 cm active fuel width element is authorized for loading at a minimum of 42 cm active fuel height provided the maximum ^{235}U content per plate is ≤ 12.375 g, 16.5 × 42/56 and ^{235}U content per assembly is ≤ 285 g, 380 × 42/56).

5.(b)(1)(iv) Type and form of material - MTR fuel elements. (Continued)

(c) Expanded LEU MTR Fuel Content Description

Parameter	Base	≤7.0 cm Active Fuel Width				≤7.1 cm Active Fuel Width		≤7.15 cm Active Fuel Width		
Enrichment, wt. % ^{235}U	≤25	≤25				≤25		≤25		
Number of fuel plates	≤23	≤23				≤17	≤23	≤22	≤23	≤23
^{235}U content per plate	≤22	≤22	≤22	≤21.5	≤23.5	≤22		≤22	≤21.5	≤22
Plate thickness (cm)	≥0.115	≥0.119	≥0.115	≥0.115	≥0.130	≥0.115	≥0.200	≥0.119		
Clad Thickness (cm)	≥0.02									
Active fuel width (cm)	≤6.6	≤7.0				≤7.1		≤7.15		
Active fuel height (cm)	≥56	≥56	≥63	≥56		≥56		≥56	≥56	≥61
^{235}U content per element (g)	≤490	≤490				≤490		≤490		

(d) Expanded LEU MTR Fuel Content Description for High Fissile Material Mass

Parameter	Limiting Value
Enrichment, wt.% ^{235}U	≤25
Number of fuel plates	≤23
^{235}U content per plate (g)	≤32
Plate thickness (cm)	≥0.115
Clad thickness (cm)	≥0.02
Active fuel width (cm)	≤7.3
Active fuel height (cm)	≥56
^{235}U content per element (g)	≤640

5.(b)(1) Type and form of material (Continued)

(v) Metallic fuel rods containing natural enrichment uranium pellets with aluminum cladding 0.080-inches thick. The fuel pellet diameter is 1.36 inches and the maximum fuel rod length is 120.5 inches. The maximum weight of uranium per rod is 54.5 kg with a maximum average burnup of 1,600 MWd/MTU and a minimum cooling time of one year.

(vi) TRIGA damaged and undamaged fuel elements. TRIGA fuel elements that have a cladding breach that allows the escape of gas or intrusion of water are considered damaged and will be loaded and transported in a sealed damaged fuel can.

(a) TRIGA fuel elements acceptable for loading in the poisoned TRIGA basket and meeting the following specifications:

	TRIGA HEU (Notes 1, 2, 6, & 7)	TRIGA LEU (Notes 1, 2, 6, & 7)	TRIGA LEU (Notes 1, 2, 6, & 7)
Fuel Form	Clad U-ZrH rod	Clad U-ZrH rod	Clad U-ZrH rod
Maximum Element Weight, lbs	13.2	13.2	13.2
Maximum Element Length, in	47.74	47.74	47.74
Element Cladding	Stainless Steel	Stainless Steel	Aluminum
Clad Thickness, in	0.02	0.02	0.03
Active Fuel Length, in	15	15	14-15 (Note 4)
Element Diameter, in	1.478 max.	1.478 max.	1.47 max.
Fuel Diameter, in	1.435 max.	1.435 max.	1.41 max.
Maximum Initial U Content/Element, kilograms	0.196	0.845	0.205
Maximum Initial ^{235}U Mass, grams	137	169	41
Maximum Initial ^{235}U Enrichment, weight percent	70	20	20
Zirconium Mass, grams (Note 5)	2060	1886 – 2300	2300
Hydrogen to Zirconium Ratio, max. (Note 5)	1.6	1.7	1.0
Maximum Average Burnup, MWd/MTU	460,000 (80% ^{235}U)	151,100 (80% ^{235}U)	151,100 (80% ^{235}U)
Minimum Cooling Time	90 days (Note 3)	90 days (Note 3)	90 days (Note 3)

Notes:
1. Mixed TRIGA LEU and HEU contents authorized.
2. TRIGA Standard, instrumented and fuel follower control rod type elements authorized.
3. Maximum decay heat of any element is 7.5 watts.
4. Aluminum clad fuel with 14 inch active fuel is solid and has no central hole with a zirconium rod.
5. Zirconium mass and H/Zr ratio apply to the fuel material (U-Zr-H_x) and do not include the center zirconium rod.
6. Listed TRIGA fuel elements have a 0.225-inch diameter zirconium rod in the center.
7. Dimensions listed are as-fabricated (unirradiated) nominal values.

5.(b)(1)(vi) Type and form of material - TRIGA damaged and undamaged fuel elements. (Continued)

(b) TRIGA fuel elements acceptable for loading in the nonpoisoned TRIGA basket and meeting the following specifications:

	TRIGA HEU (Notes 1, 2, & 6)	**TRIGA LEU (Notes 1, 2, & 6)**	**TRIGA LEU (Notes 1, 2, & 6)**
Fuel Form	Clad U-ZrH rod (Note 4)	Clad U-ZrH rod (Note 4)	Clad U-ZrH rod (Note 4)
Maximum Element Weight, lbs	13.2	13.2	13.2
Maximum Element Length, in	47.74	47.74	47.74
Element Cladding	Stainless Steel	Stainless Steel	Aluminum
Minimum Clad Thickness, in	0.01	0.01	0.01
Maximum Element Diameter, in	1.5 max.	1.5 max.	1.5 max.
Active Fuel Length, in	15	15	15
Maximum Initial U Content/Element, kilograms	0.196	0.845	0.205
Maximum Initial ^{235}U Mass, grams	137	169	41
Maximum Initial ^{235}U Enrichment, weight percent	70	20	20
Hydrogen to Zirconium Ratio, max. (Note 5)	2.0	2.0	2.0
Maximum Average Burnup, MWd/MTU	460,000 (80% ^{235}U)	11,100 (80% ^{235}U)	151,100 (80% ^{235}U)
Minimum Cooling Time	90 days (Note 3)	90 days (Note 3)	90 days (Note 3)

Notes:

1. Mixed TRIGA LEU and HEU contents authorized.
2. TRIGA Standard, instrumented and fuel follower control rod type elements authorized.
3. Maximum decay heat of any element is 7.5 watts.
4. Element may contain a zirconium rod in the center.
5. H/Zr ratio applies to the fuel material (U-Zr-H_x) and does not include the center zirconium rod.
6. Dimensions listed are as-fabricated (unirradiated) nominal values.

5.(b)(1)(vi) Type and form of material - TRIGA damaged and undamaged fuel elements. (Continued)

(c) General Atomics TRIGA fuel elements acceptable for loading in the nonpoisoned TRIGA basket and meeting the following specifications:

	TRIGA HEU (Notes 1, 2, & 6)		**TRIGA LEU (Notes 1, 2, & 6)**		**TRIGA LEU (Notes 1, 2, & 6)**
Fuel Form	Clad U-ZrH rod (Note 4)		Clad U-ZrH rod (Note 4)		Clad U-ZrH rod (Note 4)
Maximum Element Weight, lbs	13.2		13.2		13.2
Maximum Element Length, in	47.74		47.74		47.74
Element Cladding	Stainless Steel		Stainless Steel		Aluminum
Minimum Clad Thickness, in	0.01		0.01		0.01
Maximum Element Diameter, in	1.5 max.		1.5 max.		1.5 max.
Active Fuel Length, in	15		15		15
Maximum Initial U Content/Element, kilograms	0.198	0.186	0.845	1.447	0.205
Maximum Initial ^{235}U Mass, grams	138	$175^{7,8}$	169	$275^{7,8}$	41
Maximum Initial ^{235}U Enrichment, weight percent	71	$95^{7,8}$	25	$25^{7,8}$	25
Hydrogen to Zirconium Ratio, max. (Note 5)	2.0		2.0		2.0
Maximum Average Burnup, MWd/MTU	460,000 (80% ^{235}U)	583,000 (80% ^{235}U)	151,100 (80% ^{235}U)		151,100 (80% ^{235}U)
Minimum Cooling Time	90 days (Note 3)		90 days (Note 3)		90 days (Note 3)

Notes:
1. Mixed TRIGA LEU and HEU fuel elements and LEU and HEU TRIGA fuel cluster rod contents authorized.
2. TRIGA Standard, instrumented and fuel follower control rod type elements authorized.
3. Maximum decay heat of any element is 7.5 watts.
4. Element may contain a zirconium rod in the center.
5. H/Zr ratio applies to the fuel material (U-Zr-H_x) and does not include the center zirconium rod.
6. Dimensions listed are as-fabricated (unirradiated) nominal values.
7. Limited to loading in top and bottom basket modules only.
8. Limited to a maximum of three elements per basket module cell.

5.(b)(1) Type and form of material (Continued)

(vii) TRIGA fuel cluster rods.

(a) TRIGA fuel cluster rods. TRIGA HEU fuel cluster rods have a maximum average burnup of 600,000 MWd/MTU (80% ^{235}U depletion) and a minimum cooling time of 90 days. TRIGA LEU fuel cluster rods have a maximum average burnup of 140,000 MWd/MTU (80% ^{235}U depletion) and a minimum cooling time of 90 days. TRIGA fuel cluster rods must meet the following specifications prior to irradiation:

	TRIGA Fuel Cluster Rods	
	HEU	LEU
Fuel Form	Clad U-ZrH rod	
Maximum Rod Weight, lbs	1.5	
Maximum Rod Length, in	31	
Rod Cladding	Incoloy 800	
Minimum Clad Thickness, in	0.015	
Maximum Active Fuel Length, in	22.5	
Maximum Fuel Pellet Diameter, in	0.53	
Maximum U Content/Rod, grams	48.6	289.5
Maximum ^{235}U Mass, grams	45.4	55.0
Maximum ^{235}U Enrichment, weight percent	93.3	20
Maximum Zirconium Mass, grams	421	357
Hydrogen to Zirconium Ratio, max.	1.7	

NOTE: TRIGA fuel cluster rods that have a cladding breach that allows the escape of gas or intrusion of water are considered damaged and will be loaded and transported in a sealed damaged fuel can.

5.(b)(1)(vii) Type and form of material - TRIGA fuel cluster rods. (Continued)

(b) General Atomics TRIGA fuel cluster rods. TRIGA HEU fuel cluster rods have a maximum average burnup of 600,000 MWd/MTU (80% ^{235}U depletion) and a minimum cooling time of 90 days. TRIGA LEU fuel cluster rods have a maximum average burnup of 140,000 MWd/MTU (80% ^{235}U depletion) and a minimum cooling time of 90 days. TRIGA fuel cluster rods must meet the following specifications prior to irradiation:

	TRIGA Fuel Cluster Rods	
	HEU	**LEU**
Fuel Form	Clad U-ZrH rod	
Maximum Rod Weight, lbs	1.5	
Maximum Rod Length, in	31	
Rod Cladding	Incoloy 800	
Minimum Clad Thickness, in	0.015	
Maximum Active Fuel Length, in	22.5	
Maximum Fuel Pellet Diameter, in	0.53	
Maximum U Content/Rod, grams	48.6	289.5
Maximum ^{235}U Mass, grams	46.5	55.0
Maximum ^{235}U Enrichment, weight percent	93.3	20
Maximum Zirconium Mass, grams	421	357
Hydrogen to Zirconium Ratio, max.	1.7	

NOTE: TRIGA fuel cluster rods that have a cladding breach that allows the escape of gas or intrusion of water are considered damaged and will be loaded and transported in a sealed damaged fuel can.

(viii) PWR rods, consisting of uranium dioxide pellets within zirconium alloy type or non-zircaloy cladding (FeCrAl based alloy) cladding. The maximum uranium enrichment is 5 weight percent ^{235}U, the maximum active fuel length is 150 inches, and the maximum pellet diameter is 0.3765 inches. The maximum burnup is 80,000 MWd/MTU, and the minimum cool time is 150 days. Non-zircaloy clad fuel rods, and non-fueled, non-zirconium rod sections, require an additional 90-day cool time beyond the indicated zircaloy based value.

5.(b)(1) Type and form of material (continued)

(ix) BWR rods, consisting of uranium dioxide pellets within zirconium alloy type or non-zircaloy cladding (FeCrAl based alloy). The maximum uranium enrichment is 5 weight percent ^{235}U, the maximum active fuel length is 150 inches, and the maximum pellet diameter is 0.490 inch. The maximum burnup is 80,000 MWd/MTU and the minimum cool time is between 150 - 270 days, as specified in the table below:

BWR Fuel Type Array Size	**Burnup, b (GWd/MTU)**	**Minimum Cool Time (days)^2**
7 x 7	$b \leq 60$ $60 < b \leq 70$ $70 < b \leq 80$	210 240 270
8 x 8^1	$b \leq 80$	150

Note 1: Includes rods from all larger BWR assembly arrays (e.g., 9 x 9, 10 x 10)
Note 2: Non-zircaloy clad (FeCrAl) fuel rods, and non-fueled non-zirconium rod sections, require an additional 90-day cool time beyond the indicated zircaloy based value.

(x) Intact or degraded clad DIDO fuel elements composed of U-Al, U_3O_8-Al, or U_3Si_x-Al plates fabricated into four concentric tubes of varying diameters. The fuel elements have an initial enrichment up to 94.0 weight percent ^{235}U. Maximum degraded clad allowable per element is ≤ 5% surface area. Degraded clad DIDO fuel elements are to be loaded into an aluminum damaged fuel can (DFC) per Figure 1.2.3-18 of the application. The fuel elements shall have the specifications listed below:

Parameter	**LEU$^{(1)}$**	**MEU$^{(1)}$**	**HEU$^{(1)}$**
Maximum ^{235}U content per Element	≤ 190 g	≤ 190 g	≤ 190 g
Maximum Uranium content per Element	≤ 1000 g	≤ 475.0 g	≤ 211.1g
Minimum Fuel Tube Thickness	0.130 cm	0.130 cm	0.130 cm
Minimum Clad Thickness	0.025 cm	0.025 cm	0.025 cm
Maximum Outer Diameter	9.535 cm	9.535 cm	9.535 cm
Minimum Inner Diameter	5.88 cm	5.88 cm	5.88 cm
Minimum Initial Enrichment	19 wt% ^{235}U	40 wt% ^{235}U	90 wt% ^{235}U

Notes:
1 The maximum burnup and minimum cool time shall be consistent with the decay heat limits in Item 5.(b)(2)(xi)(a) and (b) and shall be determined using the operating procedures in Section 7.1.4 of the application.

5.(b)(1) Type and form of material (Continued)

(xi) General Atomics (GA) Irradiated Fuel Material (IFM) consisting of two separate types of fuel materials: (a) High Temperature Gas Cooled Reactor (HTGR); and (b) Reduced-Enrichment Research and Test Reactor (RERTR) type TRIGA fuel entities.

(a) GA HTGR IFM comprised of four forms: fuel particles (kernels), fuel particles (coatings), fuel compacts (rods), and fuel pebbles. Fuel particles (kernels) are solid, spheroidized, high-temperature sintered fully-densified, ceramic kernel substrate, composed of UO_2, UCO_2, $(Th,U)C_2$, or $(Th,U)O_2$. Fuel particles (coatings) are solid , spheridized, isotropic, discrete multi-layered fuel particle coatings with chemical composition including pyrolitic-carbon (PyC) and silicon carbide (SiC). Fuel compacts (rods) are multi-coated ceramic fuel particles, bound in solid, cylindrical, injection molded, high-temperature heat-treated compacts which are composed of carbonized graphite shim, coke, and graphite powder. Fuel pebbles are multi-coated fuel particles, bound in solid, spherical injection-molded, high-temperature heat-treated pebbles composed of carbonized graphite shim, coke and graphite powder. Initial enrichment of the HTGR IFM varies from 10.0 to 93.15 wt% ^{235}U.

(b) GA RERTR IFM comprised of irradiated TRIGA fuel elements which contain three distinct mass loadings of uranium of 20, 30, and 45 wt% U. The average mass of the fuel portion of the elements is 551 g with a maximum initial enrichment of 19.7 wt% ^{235}U.

GA IFM content description:

	GA HTGR IFM	GA RERTR IFM
Fuel material	UC_2, UCO, UO_2 $(Th,U)C_2$, $(Th,U)O_2$	U-ZrH metal alloy
Maximum fuel weight, lbs	23.52	23.73
Maximum overall length, in	n/a	29.92
Maximum active fuel length, in	n/a	22.05
Fuel rod cladding	n/a	Incoloy 800
Maximum Uranium, kg U	0.21	3.86
Maximum initial ^{235}U, wt%	93.15	19.7
Maximum Activity, Ci	483	2920

5.(b)(1) Type and form of material (continued)

(xii) Tritium-producing burnable absorber rods (TPBARs), as described in Section 1.2.3.6 of the application. Each TPBAR is approximately 153 inches in length and 0.381 inches in diameter and is stainless steel clad. The TPBARs contain lithium aluminate annular pellets, with an inner zircaloy liner and an outer nickel-plated zircaloy tube. Each TPBAR contains a maximum of 1.2 grams tritium. The minimum cool time is 30 days.

(xiii) Intact or damaged PULSTAR fuel elements, including fuel debris, pieces and nonfuel components of PULSTAR fuel assemblies as specified below.

Description	Value
Maximum Pellet Diameter (inch)	0.423
Minimum Element (Rod) Cladding Thickness (inch)	0.0185
Minimum Element (Rod) Diameter (inch)	0.470
Maximum Active Fuel Height (inch)	24.1
Nominal Element (Rod) Length (inch)	26.2
Nominal Assembly Length (inch)	38
Maximum Assembly or Loaded Can Weight (lb)	80
Maximum PULSTAR Can Content Weight (lb)	39.6
Maximum Enrichment (wt % ^{235}U)	6.5
Maximum ^{235}U Content per Element (g)	33
No. of Elements (Rods) per Assembly	25
No. of Elements (Rods) per Can[1]	≤25
Maximum Depletion (% ^{235}U)	45
Minimum Cooling Time (yrs)	1.5
Maximum Heat Load per Assembly (W)	30
Maximum Heat Load per Element (W)	1.2

Notes:

1 Damaged PULSTAR fuel elements, including fuel debris, pieces and nonfuel components of PULSTAR fuel assemblies must be loaded into a PULSTAR can. The contents of a PULSTAR can are restricted to the equivalent of the fuel material in 25 intact PULSTAR fuel elements and of the displaced volume of 25 intact PULSTAR fuel elements.

5.(b)(1) Type and form of material (continued)

(xiv) Intact or degraded clad ANSTO fuel consisting of spiral fuel assemblies and MOATA plate bundles. Maximum degraded clad allowable per element is ≤ 5% surface area. Degraded clad ANSTO fuel elements are to be loaded into an aluminum damaged fuel can (DFC) per Figure 1.2.3-18 of the application.

Spiral fuel assemblies consist of 10 curved uranium-aluminum alloy fuel plates between an inner and an outer aluminum shell, with the following fuel parameters:

Parameter	Limiting Values
Number of fuel plates per assembly	10
Maximum ^{235}U content per assembly (g)	160
Maximum enrichment (wt % ^{235}U)	95
Maximum assembly weight (lb)	18
Minimum plate thickness (cm)	0.124
Minimum active fuel height (cm)	59.075

MOATA plate bundles consist of uranium-aluminum alloy fuel plates with aluminum cladding, with the following specifications:

Parameter	Limiting Values
Maximum number of fuel plates per assembly	14
Maximum ^{235}U content per plate (g)	22.3
Maximum enrichment (wt % ^{235}U)	92
Maximum plate spacer thickness (cm)	0.18
Maximum active fuel width (cm)	7.32
Maximum bundle weight (lb)	18

(xv) Segmented TPBARs and associated segmentation debris resulting from post-irradiation examination, as described in Section 1.2.3.6 of the application. Each equivalent TPBAR contains a maximum of 1.2 grams of tritium. The minimum cool time is 90 days.

(xvi) Solid, irradiated and contaminated fuel assembly structural or reactor internal component hardware, which may include fissile material, provided the quantity of fissile material does not exceed a Type A quantity and qualifies as an exempt quantity under 10 CFR 71.15.

5.(b)(1) Type and form of material (continued)

(xvii) PWR MOX (mixed oxide) undamaged fuel rods consisting of uranium and plutonium and plutonium dioxide pellets within zirconium alloy type cladding. The plutonium enrichment is 7.0 weight percent maximum and 2.0 weight percent minimum, the maximum active fuel rod length is 153.5 inches, and the maximum pellet diameter is 0.3765 inch. The maximum burnup is 62,500 MWd/MTU and the minimum cool time is 90 days.

(xviii) Damaged or undamaged SLOWPOKE fuel rods, including fuel pieces and debris as specified below:

Parameter	Limiting Values
Maximum Cask Heat Load (W)	5
Maximum Canister Heat Load (W)	0.625
Payload Limit (lb/canister)	25
Maximum ^{235}U per rod (g)	2.800
Maximum U per rod (g)	3.111
Maximum Enrichment (wt% ^{235}U)	95
Minimum cool time (yr)	14
Maximum burnup (GWd/MTU) or wt% ^{235}U Depletion	30 4.5

(xix) Undamaged or damaged NRU or NRX fuel assemblies as specified below:

Parameter	NRU (HEU)	NRU (LEU)	NRX
Maximum Heat Load per Package (W)	640.0		
Maximum Heat Load per Tube (W)	35.6		
Maximum Weight of Contents per Tube (lb/tube)	20.0		
Maximum Mass ^{235}U per Rod (g)	43.24	43.68	79.05
Maximum Mass U per Rod (g)	48	230	87
Minimum Cool Time (yr)	19	3	18
Maximum Burnup (MWd/assembly or wt% ^{235}U Depletion)	364.0 87.4	363.0 83.6	375.0 85.1

(xx) High Enriched Uranyl Nitrate Liquid as specified below:

Liquid Parameter	Limiting Values
Maximum HEUNL Payload per Inner Container [1.]	58.1 L (15.35 gallons)
Maximum Package Heat Load	4.65 W
Maximum per Inner Container Heat Load	1.16 W
Maximum HEUNL Heat Load	0.02 W/L
Maximum Curie Content (gamma emitters)	9.0 Ci/L
Maximum ^{235}U content	7.4 g/L
Maximum ^{235}U enrichment	93.4 wt%

1. See also Condition 5.(b)(2)(xxi) for the HEUNL Inner Container minimum 1 gallon of headspace.

5.(b)(1) Type and form of material (continued)

(xxi) SLOWPOKE Fuel Core as specified below:

Parameter	Limiting Value
Maximum Cask Heat Load (W)	45
Maximum Weight of SLOWPOKE Fuel Core (lb)	15
Maximum Number of Fuel Rods per Core	298
Maximum Initial ^{235}U per Rod (g)	2.83
Maximum Initial Enrichment (wt% ^{235}U)	95.3
Maximum Initial ^{235}U per core (g)	837
Minimum Initial Enrichment (wt% ^{235}U)	90
Minimum Cool Time	2 Weeks
Maximum Core Average Depletion (% ^{235}U)	2.1%

(xxii) EFN Rods, Booster Rods, and Moly Targets (Short and Double Length)

Parameter	Short Moly	Double Length Moly	EFN	Boosters
Maximum Cask Heat Load (W)	101	101	144	4
Maximum Per Caddy Heat Load (W)	0.3	0.8	8	0.2
Payload Limit (lb/tube)	20			
# Rod/Targets (Equivalent)	20	36	36	16
Maximum ^{235}U per rod (g)	1.1	2.41	13	18.1
Minimum Cool Time (yr)	38	8	23	37
Maximum ^{235}U Depletion (%)	94.8	30.4	87.4	2.9
Maximum Enrichment wt% ^{235}U	94			

(xxiii) SrF_2 Capsules

Parameter	WESF capsules	BUP 500 capsules
Maximum Cask Heat Load (W)	2400	2200
Maximum per Capsule Heat Load (W)	400	1100
Maximum Activity per Cask (Ci Sr-90)	1.062E+06	3.52E+05
Payload Limit (lb)	396	300

5.(b)(1) Type and form of material (continued)

(xxiv) Los Alamos National Laboratory Mixed Oxide Fuel Rods

Mixed oxide fuel rods as specified in the table below:

Parameter	PNNL	EXXON	UO_2	ROD 063	530-000	NIS5
Max. rod OD (inch)	0.565	0.451	0.229	0.55	0.63	0.5
Min. wall thick. (inch)	0.035	0.035	0.015	0.015	0.015	0.015
Rod material	Zr Alloy	Zr Alloy	SS304	Zr Alloy	Zr Alloy	SS316
Max. active length (inch)	35.6	70	36.1	47.913	18	13.5
Max. pellet OD (inch)	0.486	0.372	0.1988	0.48	0.56	0.31
Max. # of rods per transfer tube	4	2	8	3	1	3
Max. # of tubes per cask	16	16	16	6	1	4
Fuel form	Oxide	Oxide	Oxide	Oxide	Oxide or Carbide	Carbide
^{235}U wt%	0.712	0.712	94	0	0	94
^{240}Pu wt%[1]	16	16	0	10	10	4
Pu wt%	5.36	6.31	0	100	100	20
U-235 (g/rod)	6.76	7.71	159.9	0	0	159.58
U (g/rod)	949.85	1083.44	170.11	0	0	169.76
Pu (g/rod)	56.29	76.35	0	1378.77	922.01	42.38
Total U/Pu (g/rod)	1006.14	1159.79	170.11	1378.77	922.01	212.14

1. Fissile Pu-239 and Pu-241 comprise the remaining plutonium. A 9 to 1 ratio of Pu-239 to Pu-241 bounds the range of Pu-240 weight fractions analyzed herein.
2. Maximum number of tubes for ROD1063 and NIS5 is governed by the damaged fuel evaluation.

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

Not to exceed 4,000 pounds, including contents and fuel assembly basket or other internal support structure.

(i) For the contents described in Item 5.(b)(1)(i): one PWR assembly positioned within the PWR fuel assembly basket. Maximum decay heat not to exceed 2.5 kilowatts per PWR assembly.

(ii) For the contents described in Item 5.(b)(1)(ii): two BWR assemblies positioned within the BWR fuel assembly basket. Maximum decay heat not to exceed 1.1 kilowatts per BWR assembly.

(iii) Deleted.

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

(iv) For MTR fuel elements as described in Item 5.(b)(1)(iv):

Up to 42 fuel elements positioned within the MTR fuel assembly basket (7 fuel elements per basket module). Each of the MTR basket cell openings may contain a loose plate canister. The contents of each loose plate canister are limited to the number of fuel plates, dimensions, and masses that are equivalent to an intact MTR fuel element, as specified in Item 5.(b)(1)(iv).

(a) The maximum decay heat is not to exceed 1.26 kilowatts per package, with each MTR fuel assembly basket module not to exceed 210 watts.

(b) LEU MTR fuel elements with decay heat not exceeding 40 watts per element, and MEU and HEU fuel elements with decay heat not exceeding 30 watts per element, may be loaded in any basket position.

(c) Mixed HEU, MEU, and LEU MTR contents, with decay heat limits as specified above, are authorized.

(d) MTR fuel elements with degraded or mechanically damaged cladding are authorized, provided the total surface area of through-clad corrosion and/or mechanical damage does not exceed 5% of the total surface area of the damaged element.

(e) For HEU-MTR fuel elements only, the center fuel element in any basket module is not to exceed 120 watts. The two exterior fuel elements vertically in-line with the center assembly for transport are not to exceed 70 watts.

(f) MTR fuel elements containing more than 23.5 g ^{235}U per plate (490 g ^{235}U per element) are limited to up to four elements loaded in basket positions 4, 5, 6, and 7 of a seven-element basket per Figure 7.1-1 of the application. Basket positions 1, 2, and 3 are to be blocked by spacer hardware.

(v) For the contents described in Item 5.(b)(1)(v): up to 15 intact metallic fuel rods positioned within the appropriate basket. Maximum decay heat not to exceed 0.036 kilowatts per rod. Total weight of all rods not to exceed 1,805 pounds.

(vi) For failed metallic fuel rods of the type described in Item 5.(b)(1)(v):

(a) Up to six canisters containing one defective metallic fuel rod per canister. The canisters are 2.75-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D2, Rev. 10, and are placed in a six-hole liner as shown on Nuclear Assurance Corporation Drawing No. 315-040-43, Rev. 1. The maximum decay heat load for a defective metallic fuel rod is limited to 5 watts; or

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

(b) Up to three canisters containing either up to three defective metallic fuel rods per canister or up to 10 failed fuel filters per canister. The canisters are 4.00-inch I.D. failed fuel rod canisters as shown on Nuclear Assurance Corporation Drawing No. 340-108-D1, Rev. 10, and are placed in a three-hole basket as shown on Nuclear Assurance Corporation Drawing No. LWT 315-40-12. The weight of the filters is limited to 125 pounds per canister. For canisters containing fuel rods, the maximum decay heat load is 15 watts per canister; and for canisters containing filters, the maximum decay heat load is 5 watts per canister.

(vii)(a) For TRIGA fuel elements as described in Item 5.(b)(1)(vi)(a):

Up to 140 intact fuel elements in the TRIGA fuel package with poisoned baskets. Up to four fuel elements per basket cell and up to seven cells per basket may be loaded. Damaged TRIGA fuel elements or fuel element debris (up to a total of two equivalent elements) shall be transported in a sealed damaged fuel can (one damaged fuel can per cell). The sealed cans are to be in accordance with NAC International Drawing Nos. LWT 315-40-086, LWT 315-40-087, and LWT 315-40-088.

Mixed intact and damaged fuel contents and fuel debris are authorized. Base and top fuel basket modules may contain intact fuel elements or sealed damaged fuel cans containing damaged fuel and fuel debris. A maximum of seven damaged fuel cans is authorized per top and base basket modules with a maximum of 14 per package. Intermediate fuel basket modules may contain only intact TRIGA fuel elements.

The maximum decay heat shall not exceed 7.5 watts per TRIGA fuel element (or equivalent for damaged fuel) and 1050 watts per package. The cask and baskets must be configured as shown in NAC International Drawing Nos. LWT 315-40-084, LWT 315-40-080, LWT 315-40-081, and LWT 315-40-082.

(vii)(b) For TRIGA fuel elements as described in Item 5.(b)(1)(vi)(b):

Up to 120 intact fuel elements in the TRIGA fuel package with non-poisoned basket. Up to four fuel elements per basket cell only loaded in the six periphery cells. TRIGA fuel elements or sealed cans may not be loaded in the center cell of the non-poisoned basket. Damaged TRIGA fuel elements or fuel debris (up to two equivalent elements) shall be transported in a sealed damaged fuel can (one damaged fuel can per cell). The sealed cans are to be in accordance with NAC International Drawing Nos. LWT 315-40-086, LWT 315-40-087, and LWT 315-40-088.

Mixed intact and damaged fuel contents and fuel debris are authorized. Base and top fuel basket modules may contain intact fuel elements or sealed damaged fuel cans containing damaged fuel or fuel debris. A maximum of six damaged fuel cans is authorized only in the periphery cells per top and base basket modules with a maximum of 12 per package. Intermediate fuel basket modules may contain only intact TRIGA fuel elements.

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

Maximum decay heat not to exceed 7.5 watts per TRIGA fuel element (or equivalent for damaged fuel) and 900 watts per package. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket. The cask and baskets must be configured as shown in NAC International Drawing Nos. LWT 315-40-070, LWT 315-40-071, LWT 315-40-072, and LWT 315-40-079.

(c) For General Atomics TRIGA fuel elements as described in Item 5.(b)(1)(vi)(c):

Up to 120 intact fuel elements in the TRIGA fuel package with non-poisoned basket. Up to four fuel elements per basket cell only loaded in the six periphery cells. TRIGA fuel elements or sealed cans may not be loaded in the center cell of the non-poisoned basket. Damaged TRIGA fuel elements or fuel debris (up to two equivalent elements of maximum 1.5 inch diameter) shall be transported in a sealed damaged fuel can (one damaged fuel can per cell). The sealed cans are to be in accordance with NAC International Drawing Nos. LWT 315-40-086, LWT 315-40-087, and LWT 315-40-088.

Loading of TRIGA HEU and LEU fuel elements having >138 g and >169 g initial ^{235}U mass contents, respectively, are limited to top and bottom basket modules and up to three rods per basket cell. A minimum of one TRIGA dummy rod per NAC Drawing No. LWT 315-40-085 shall be installed in place of a TRIGA fuel element to limit the maximum number of rods per cell to three.

Mixed loading in separate cells of TRIGA fuel elements and TRIGA fuel cluster rods [per 5.(b)(1)(vii)(b)] is authorized in fuel basket modules with the content quantities limited in accordance with the other conditions and limitations of 5.(b)(2)(vii)(c) and 5.(b)(2)(viii)(b).

Maximum decay heat not to exceed 7.5 watts per TRIGA fuel element (or equivalent for damaged fuel) and 900 watts per package. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket. The cask and baskets must be configured as shown in NAC International Drawing No. LWT 315-40-079.

(viii)(a) For TRIGA fuel cluster rods as described in Item 5.(b)(1)(vii)(a):

Maximum decay heat not to exceed 1.875 watts per TRIGA fuel cluster rod (or equivalent for failed fuel) and 1050 watts per package. TRIGA fuel cluster rods must be positioned in either the non-poisoned TRIGA fuel basket or in the poisoned TRIGA fuel basket. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket. The non-poisoned basket must be configured as shown in NAC International Drawing Nos. LWT 315-40-070, LWT 315-40-071, and LWT 315-40-072, and the poisoned basket must be configured as shown in NAC International Drawing Nos. LWT 315-40-080, LWT 315-40-081, and LWT 315-40-082.

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

Up to 480 intact cluster rods per package in the non-poisoned TRIGA fuel baskets (up to six periphery cells loaded with 16 cluster rods each), and up to 560 intact cluster rods per package in the poisoned TRIGA fuel baskets (up to 7 total cells loaded with 16 cluster rods each). TRIGA fuel cluster rods must be positioned within the fuel rod inserts as shown on NAC International Drawing No. LWT 315-40-096.

Damaged TRIGA fuel cluster rods or cluster rod debris (up to six equivalent rods) shall be transported in a sealed damaged fuel can. The sealed cans are to be in accordance with NAC International Drawing Nos. LWT 315-40-086, LWT 315-40-087, and LWT 315-40-088.

Mixed intact and damaged fuel contents and fuel debris are authorized. Base and top fuel basket modules may contain intact fuel cluster rods or sealed DFCs. Intermediate fuel basket modules may contain only intact fuel cluster rods.

(viii)(b) For TRIGA fuel cluster rods as described in Item 5.(b)(1)(vii)(b):

Maximum decay heat not to exceed 1.875 watts per TRIGA fuel cluster rod (or equivalent for failed fuel) and 1050 watts per package. TRIGA fuel cluster rods must be positioned in the non-poisoned TRIGA fuel basket. Fuel may not be loaded in the center cell of the non-poisoned TRIGA fuel basket. The non-poisoned basket must be configured as shown in NAC International Drawing Nos. LWT 315-40-070, LWT 315-40-071, and LWT 315-40-072.

Up to 480 intact cluster rods per package in the non-poisoned TRIGA fuel baskets (up to six periphery cells loaded with 16 cluster rods each), and up to 560 intact cluster rods per package in the poisoned TRIGA fuel baskets (up to 7 total cells loaded with 16 cluster rods each). TRIGA fuel cluster rods must be positioned within the fuel rod inserts as shown on NAC International Drawing No. LWT 315-40-096.

Damaged TRIGA fuel cluster rods or cluster rod debris (up to six equivalent rods) shall be transported in a sealed damaged fuel can. The sealed cans are to be in accordance with NAC International Drawing Nos. LWT 315-40-086, LWT 315 40-087, and LWT 315-40-088.

Mixed intact and damaged fuel contents and fuel debris are authorized. Base and top fuel basket modules may contain intact fuel cluster rods or sealed DFCs. Intermediate fuel basket modules may contain only intact fuel cluster rods.

Mixed loading in separate cells of TRIGA fuel elements [per 5.(b)(1)(vi)(c)] and TRIGA fuel cluster rods [per 5.(b)(1)(vii)(b)] is authorized in fuel basket modules with the content quantities limited in accordance with the other conditions and limitations of 5.(b)(2)(vii)(c) and 5.(b)(2)(viii)(b).

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

(ix) For PWR fuel rods, as described in Item 5.(b)(1)(viii): up to 25 fuel rods. Maximum decay heat not to exceed 2.3 kilowatts per package.

Intact individual rods may be placed either in an irradiated or unirradiated fuel assembly lattice (skeleton) or in a fuel rod insert. The PWR fuel assembly lattice must be transported in the PWR basket.

Up to 14 of the 25 fuel rods may be classified as damaged. Damaged fuel rods may include fuel debris, particles, loose pellets, and fragmented rods, or unfueled rods/rod segments in addition to the fuel rods. Fuel rods may be composed of segments. Damaged fuel rods and iron clad fuel rods must be placed in a fuel rod insert. Damaged fuel rods may also be placed in individual failed fuel rod capsules, as shown in Figure 1.2.3-11 of the application, prior to placement in the fuel rod insert. Guide/instrument tubes and tube segments may be placed in the fuel rod insert. The fuel rod insert must be transported in a PWR/BWR transport canister, which is positioned in the PWR insert in the PWR basket. No more than 14 fueled or unfueled iron clad rods may be loaded. ^{60}Co impurity is limited to 1.2 g/kg in iron clad rods.

(x) For BWR fuel rods, as described in Item 5.(b)(1)(ix): up to 25 fuel rods. Maximum decay heat not to exceed 2.1 kilowatts per package.

Intact individual rods may be placed either in a fuel assembly lattice or in a fuel rod insert. The BWR fuel assembly lattice must be transported in the PWR insert in the PWR basket.

Up to 14 of the 25 fuel rods may be classified as damaged. Damaged fuel rods may include fuel debris, particles, loose pellets, and fragmented rods or unfueled rods/rod segments in addition to the fuel rods. Fuel rods may be composed of segments. Damaged fuel rods must be placed in a fuel rod insert. Damaged fuel rods and iron clad rods may also be placed in individual failed fuel rod capsules, as shown in Figure 1.2.3-11 of the application, prior to placement in the fuel rod insert. Water rods and inert rods may be placed in the fuel rod insert. The fuel rod insert must be transported in a PWR/BWR transport canister, which is positioned in the PWR insert in the PWR basket. No more than 14 fueled or unfueled iron clad rods can be loaded. ^{60}Co impurity is limited to 1.2 g/kg in iron clad rods.

(xi) For DIDO fuel as described in Item 5.(b)(1)(x):

(a) Up to 42 DIDO fuel elements with a maximum decay heat not to exceed 25 watts per DIDO fuel element, provided the top basket fuel element active fuel region is spaced a minimum 3.7 inches from the bottom of the cask lid. Spacing of the active fuel may be accomplished by fuel element hardware, lid spacer, or a combination thereof. Maximum decay heat is 1.05 kilowatts per package. At a top basket active fuel region to cask lid spacing of less than 3.7 inches, the maximum decay heat not to exceed 18 watts per DIDO fuel element and a total of 756 watts per package. The DIDO fuel elements are to be loaded into a DIDO basket configured as shown in NAC International Drawing No. LWT 315-40-111.

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

(xi)(b) A mixed fuel load of up to 42 DIDO fuel elements and spiral and MOATA fuel assemblies [per item 5.(b)(1)(xiv)] in an ANSTO-DIDO combination basket configured as shown in NAC International Drawing No. LWT 315-40-148, consisting of a top ANSTO basket module per NAC International Drawing No. LWT 315-40-140; four intermediate DIDO basket modules per NAC International Drawing No. 315-40-109; and one bottom DIDO basket module per NAC International Drawing No. LWT 315-40-110. DIDO fuel elements loaded into intermediate and bottom basket modules are limited to ≤18 Watts. Up to seven degraded clad DIDO, spiral, and/or MOATA fuel assemblies in DFCs per Figure 1.2.3-18 of the application, or intact DIDO, spiral, and/or MOATA assemblies may be loaded in the top ANSTO module. The per element or DFC heat load limits for the top ANSTO module are: DIDO fuel element with or without DFC is 10 Watts; spiral fuel element in DFC is 10 Watts and 15.7W without DFC; and MOATA fuel element in DFC is 1 Watt and 3 Watts without DFC. Maximum heat load per package is 753 Watts.

(xii) For GA IFM as described in Item 5.(b)(1)(xi):

(a) Mixture of fuel particles (kernels and coatings), fuel compacts (rods), and fuel pebbles, packaged in its own Fuel Handling Unit (FHU).

GA HTGR FHU consists of two redundant canisters. GA HTGR IFM is packaged inside a primary canister with welded closure, as shown in General Atomics Drawing No. 032237, Rev. B, “HTGR Primary Enclosure.” The primary canister is packaged inside a secondary canister with welded closure, as shown in General Atomics Drawing No. 032231, Rev. A, “HTGR Secondary Enclosure.”

GA HTGR FHU total maximum decay heat not to exceed 2.05 watts, and maximum loaded weight not to exceed 71.5 lbs.

(b) Twenty irradiated TRIGA fuel elements; 13 of the elements are intact, and the remaining 7 are sectioned. GA RERTR IFM is packaged in its own FHU.

GA RERTR FHU consists of two redundant canisters. GA RERTR IFM is packaged inside a primary canister with welded closure, as shown in General Atomics Drawing No. 032236, Rev. B, “RERTR Primary Enclosure.” The GA RERTR IFM primary canister is packaged inside a secondary canister with welded closure, as shown in General Atomics Drawing No. 032230, Rev. A, “RERTR Secondary Enclosure.”

GA RERTR FHU total maximum decay heat not to exceed 11 watts, and maximum loaded weight not to exceed 76.0 lbs.

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

(xiii) For TPBARs as described in Item 5.(b)(1)(xii):

Up to 300 TPBARs, including a maximum of 2 damaged rods, positioned within a consolidation canister, as shown in Figure 1.2.3-10 of the application. The consolidation canister is transported in a TPBAR basket assembly. The maximum decay heat is 2.31 watts per rod and 693 watts per package. The maximum weight of the TPBARs and the consolidation canister is 1,000 pounds. Consolidation canisters with fewer than 300 TPBARs may also contain stainless steel spacers of various geometries. The total weight and volume of the reduced TPBAR contents plus the spacers must be less than or equal to the weight and volume of 300 TPBARs.

Up to 25 TPBARS, including a maximum of 2 prefailed rods, positioned within a PWR/BWR Rod Transport Canister. The PWR/BWR Rod Transport Canister is transported in a TPBAR basket assembly. The maximum decay heat is 2.31 watts per rod and 58 watts per package.

(xiv) For PULSTAR fuel as described in Item 5.(b)(1)(xiii):

Up to 700 intact or damaged PULSTAR fuel elements in either assembly or element form, including fuel debris, pellets, pieces and nonfuel components of PULSTAR fuel assemblies. The contents of a PULSTAR can are restricted to the equivalent of the fuel material in 25 intact PULSTAR fuel elements and of the displaced volume of 25 intact PULSTAR fuel elements.

(xv) For ANSTO fuel as described in Item 5.(b)(1)(xiv):

(a) Up to 42 spiral fuel assemblies, MOATA plate bundles, or any combination of spiral fuel assemblies and MOATA plate bundles. ANSTO fuel must be loaded within ANSTO basket modules. Spiral fuel assemblies may be cropped by removing nonfuel-bearing hardware to fit the ANSTO basket modules. Fuel assemblies that are cropped, but are otherwise intact, may be considered intact. For spiral fuel assemblies, the maximum decay heat per assembly is 15.7 watts. The minimum cool time as a function of burnup shall be consistent with the maximum decay heat limit and shall be determined using the procedures for medium enriched DIDO fuel in Section 7.1.4 of the application; the minimum cool time may not be less than 270 days. For MOATA plate bundles, the maximum heat load per bundle is 3 watts, and the minimum cool time is 10 years.

(b) A mixed fuel load of up to 42 spiral and MOATA fuel assemblies and DIDO fuel elements [per item 5.(b)(1)(x)] in an ANSTO basket configured as shown in NAC International Drawing No. LWT 315-40-139. Degraded clad elements placed in DFCs per Figure 1.2.3-18 of the application or intact DIDO fuel elements are limited to loading in the top ANSTO basket module. Maximum heat load per DIDO element is 10W. Degraded clad spiral and MOATA fuel assemblies in DFCs are also limited to loading in the top ANSTO basket module. Spiral fuel assemblies placed into DFCs are limited to a maximum of 10W and MOATA plate bundles loaded in DFCs are limited to 1W. Spiral fuel elements not placed in DFCs are limited to 15.7W and MOATA plate bundles not placed in DFCs are limited to a maximum of 3W with a minimum cool time of 10 years.

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

(xvi) For segmented TPBARs as described in Item 5.(b)(1)(xv):

Up to 55 equivalent TPBARs as segments and segmentation debris, placed within a welded waste container, as shown in Figure 1.2.3-16 of the application. The waste container is transported in a TPBAR basket assembly. The maximum decay heat is 2.31 watts per equivalent TPBAR and 127 watts per package. The maximum weight of the segmented TPBARs and the TPBAR waste container is 700 pounds.

(xvii) For solid irradiated hardware as described in Item 5.(b)(1)(xvi):

Up to 4,000 pounds, including spacers, dunnage and containers, and meeting the gamma source defined in Table 1.2-13 of the application. An irradiated hardware spacer source, per NAC Drawing No. LWT 315-40-145, shall be installed.

(xviii) For intact PWR MOX fuel rods as described in Item 5.(b)(1)(xvii):

Up to 16 undamaged irradiated PWR MOX rods or a combination of PWR MOX and high burnup PWR fuel rods as described in Item 5.(b)(1)(viii). Maximum decay heat not to exceed 2.3 kW per package. Individual PWR MOX and PWR UO_2 fuel rods shall be placed in a 5x5 insert loaded into a screened or free flow rod canister in accordance with NAC International Drawing No. LWT 315-40-104, for transport. Up to nine nonstainless burnable poison rods (BPRs) may be loaded in the spare locations in the 5x5 insert. The PWR/BWR fuel rod canister shall be transported in the PWR basket and the PWR insert installed in the cask cavity.

(xix) For the SLOWPOKE fuel described in Item 5.(b)(1)(xviii):

Up to 100 SLOWPOKE fuel rods (or the equivalent quantity of damaged material) may be loaded per SLOWPOKE canister in accordance with NAC Drawing No. LWT 315-40-156, utilizing either a 4x4 or 5x5 tube array or any combination thereof. Up to 4 SLOWPOKE canisters may be loaded within a 28 MTR fuel basket module with the three center fuel cells blocked. Only the top and top intermediate fuel basket modules may be loaded with SLOWPOKE fuel. Cask configuration is to be in accordance with NAC Drawing No. LWT 315-40-158.

(xx) For NRU/NRX fuel described in item 5.(b)(1)(xix):

Up to 18 undamaged or damaged NRU or NRX fuel assemblies (or the equivalent number of loose rods) may be loaded per NRU/NRX fuel basket in accordance with NAC Drawing Nos. LWT 315-40-172, LWT 315-40-173, LWT 315-40-174, and LWT 315-40-175. Package configuration to be in accordance with NAC Drawing No. LWT 315-40-170. The NRU/NRX Caddy Plug described in drawing LWT 315-40-175, Assembly 98, is not required for NRU/NRX fuel shipments. Maximum decay heat not to exceed 0.64 kW per package.

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

The following are the payload specific configuration requirements for NRU/NRX fuel:

(a) NRU and NRX fuel may not be comingled within a single package.
(b) Undamaged and damaged NRX fuel may be comingled within a single package provided they are not comingled in a single fuel tube location.
(c) Undamaged and damaged NRU fuel may be comingled within a single package provided they are not comingled in a single fuel tube location.
(d) Undamaged and damaged NRX fuel assemblies, loose rods, or rod segments shall be placed in the fuel caddy.
(e) Undamaged and damaged NRU loose rods or rod segments shall be placed in the fuel caddy. Loading undamaged and/or damaged NRU fuel assemblies in a caddy is optional.
(f) NRU/NRX fuel assemblies cropped by removing non-fuel bearing components of the fuel assemblies are considered undamaged provided the integrity of the rod array is maintained.
(g) NRU fuel assemblies with exposed fuel material from the cropping process are considered damaged but do not require the use of a caddy provided loose, fuel containing, rod segments are not loaded into the same basket opening as a cropped assembly.
(h) NRX fuel assemblies with exposed fuel material from the cropping process are considered damaged and shall be placed in the fuel caddy.
(i) Fuel tube locations that have damaged fuel loaded must use fuel basket lid mesh screens. The fuel basket lid mesh screens are optional for undamaged fuel.
(j) Each NRU/NRX basket fuel tube may contain unirradiated metallic dunnage provided the total payload weight in the basket fuel tube does not exceed 20 pounds.
(k) Each NRU/NRX fuel caddy may contain unirradiated metallic dunnage provided the total loaded weight of the fuel caddy does not exceed 20 pounds.
(l) Damaged NRU and NRX fuel assemblies are limited to no more than 2% clad removed from the fueled surface area.

(xxi) For the HEUNL material described in Item 5.(b)(1)(xx):

Up to a maximum of 58.1 liters (15.35 gallons) may be loaded per inner container; each inner container must have a minimum of 1 gallon of headspace (ullage). A total of four inner containers must be loaded in each package and shall be in accordance with NAC Drawing Nos. LWT 315-40-181, LWT 315-40-182, and LWT 315-40-183. Package configuration with HEUNL inner containers shall be in accordance with NAC Drawing No. LWT 315-40-180.

(xxii) For the SLOWPOKE Core as described in 5.(b)(1)(xxi):

One undamaged SLOWPOKE fuel core may be loaded into a SLOWPOKE fuel core basket. The SLOWPOKE fuel core shall contain up to 298 fuel rods, upper and lower plates and the center tube. A single loaded SLOWPOKE fuel core basket, shall be accompanied by intermediate MTR-42 baskets and a bottom MTR-42 basket, such that the SLOWPOKE fuel core basket is adjacent to the NAC-LWT lid, as shown in NAC Drawing No. LWT 315-40-185, may be transported in the NAC-LWT. Beryllium is not authorized for transport with the SLOWPOKE fuel core.

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

(xxiii) For EFN Rods, Booster Rods, and Moly Targets (Short and Double Length), as described in Item 5.(b)(1)(xxii):

Up to eighteen (18) NRU/NRX caddies loaded with EFN rods, Booster rods, or Moly targets, may be loaded per NRU/NRX fuel basket in accordance with NAC Drawing Nos. LWT 315-40-172, LWT 315-40-173, LWT 315-40-174, and LWT 315-40-175. Package configuration to be in accordance with NAC Drawing No. LWT 315-40-170. Maximum heat loads not to exceed 144W for EFN rods (8 W per caddy), 101 W for EFN/Moly mixed basket (8W per caddy for EFN rods and 0.8 W per caddy for Moly targets), 4W for Booster rods (0.2 W per caddy).

NRU/NRX caddies are limited to 36 EFN rods, 16 Booster rods, 20 Short Moly Targets, or 36 double length Moly targets or the equivalent number in rod/target segments or fragments. All materials must be placed in a caddy. One single fuel type may be loaded into one NRU/NRX caddy. EFN and Moly targets may be loaded into a single package. Booster rod caddies may not be mixed with EFN rod or Moly target caddies in a single package. Undamaged and damaged material is permitted for transport. Only a limited amount of cladding integrity is credited for full basket loads of EFN rods. Therefore, there are no cladding damage limits except for full cask loads of EFN rods which require the equivalent of 30% clad (fueled surface area), which represents an equivalent of a 0.02 cm thick cladding layer. Complete loss of clad is permitted for damaged Booster rods and Moly targets or when loading of damaged EFN rods is limited to the outer 12 basket locations (with or without Moly targets loaded). Small fragmented rods/targets require the use of the NRU/NRX caddy plug. Larger rod segments are retained axially within the caddy by the NRU/NRX basket tube and basket lid structure.

(xxiv) For SrF_2 Capsules, as described in Item 5.(b)(1)(xxiii):

Up to eighteen (18) WESF capsules may be loaded using the WESF Capsules Basket Assembly in accordance with NAC Drawing Nos. LWT 315-40-190, LWT 315-40-191, LWT 315-40-192, and LWT 315-40-193. Package configuration to be in accordance with NAC Drawing No. LWT 315-40-190 for WESF capsules. WESF capsules must be loaded in the WESF capsule container assemblies with a maximum of one capsule per container opening. The LWT WESF lid spacer and all six (6) WESF container assemblies must be installed. Each WESF capsule container assembly is limited to a maximum heat load of 400 W. Each WESF capsule is limited to a maximum heat load of 400W.The maximum decay heat for WESF capsule shipments shall not to exceed 2.4 kW per package.

Up to two (2) BUP 500 capsules may be loaded using the BUP-500 Basket Assembly in accordance with NAC Drawing Nos. LWT 315-40-195, LWT 315-40-196, and LWT 315-40-197. Package configuration to be in accordance with NAC Drawing No. LWT 315-40-195 for BUP-500 capsules. BUP-500 capsules must be loaded in the BUP-500 basket assembly. A single BUP-500 capsule may be loaded with a short spacer installed in place of the second BUP-500 capsule. Each BUP-500 capsule is limited to a maximum heat load of 1100 W. The maximum decay heat for BUP 500 capsule shipments shall not to exceed 2.2 kW per package.

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

(xxv) For LANL MOX Fuel Rods, as described in item 5.(b)(1)(xxiv):

Up to 16 transfer tubes filled with LANL MOX fuel rods can be loaded in the PWR/BWR transport can assembly. Different LANL MOX fuel types may be loaded in the same package but only one fuel type may be loaded into any one transfer tube (up to 16 transfer tubes containing PNNL, EXXON, or UO2 fuel rods may be mix loaded into a cask; up to 6 transfer tubes containing ROD1063 fuel rods may loaded into a cask but shall not be mix loaded with other materials in the cask; up to 4 transfer tubes of NIS5 and up to one transfer tube of 530-000 may be mixed loaded in a cask). If needed for operational convenience a divider assembly may be used to segregate transfer tubes. A transfer tube spacer is required at the top and bottom end of any transfer tube loaded with fuel rods. transfer tube spacers may be used to separate contents but are not required. As required, empty transfer tubes with or without spacers shall be loaded such that there are a total of 16 transfer tubes in the PWR/BWR transport can assembly. The maximum total heat load per cask is limited to 25 watts.

5.(c) Criticality Safety Index (CSI)

For PWR fuel assemblies described in 5.(b)(1)(i) and limited in 5(b)(2)(i)	100
For BWR fuel assemblies described in 5.(b)(1)(ii) and limited in 5(b)(2)(ii)	5.0
For MTR fuel elements described in 5.(b)(1)(iv) and limited in 5(b)(2)(iv)	0.0
For metallic fuel rods described in 5.(b)(1)(v) and limited in 5(b)(2)(v) and (vi)	0.0
For TRIGA fuel elements (in poisoned TRIGA fuel baskets) described in 5.(b)(1)(vi)(a) and limited in 5(b)(2)(vii)(a)	0.0
For TRIGA fuel elements (in nonpoisoned TRIGA fuel baskets) described in 5.(b)(1)(vi)(b) and 5.(b)(1)(vi)(c) and limited in 5.(b)(2)(vii)(b) and 5.(b)(2)(vii)(c), respectively	12.5
For mixed loads of TRIGA fuel elements described in 5.(b)(1)(vi)(c) and limited in 5.(b)(2)(vii)(c), and TRIGA fuel cluster rods described in 5.(b)(1)(vii)(b) and limited in 5.(b)(2)(viii)(b)	12.5
For TRIGA fuel cluster rods described in 5.(b)(1)(vii) and limited in 5.(b)(2)(viii)	0.0
For PWR rods described in 5.(b)(1)(viii) and limited in 5.(b)(2)(ix)	0.0
For BWR rods described in 5.(b)(1)(ix) and limited in 5.(b)(2)(x)	0.0
For DIDO fuel elements described in 5.(b)(1)(x) and limited in 5.(b)(2)(xi)	12.5
For General Atomic Irradiated Fuel Material (GA IFM) described in 5.(b)(1)(xi) and limited in 5.(b)(2)(xii)	0.0

5.(c) Criticality Safety Index (CSI)

For TPBARS and segmented TPBARS described in 5.(b)(1)(xii) and 5.(b)(1)(xv) and limited in 5.(b)(2)(xiii) and 5.(b)(2)(xvi)	0.0
For intact (uncanned) PULSTAR fuel described in 5.(b)(1)(xiii) and limited in 5.(b)(2)(xiv)	0.0
For (canned) PULSTAR fuel described in 5.(b)(1)(xiii) and limited in 5.(b)(2)(xiv) – for a package with any number of PULSTAR cans	33.4
For ANSTO fuel described in 5.(b)(1)(xiv) and limited in 5.(b)(2)(xv)	0.0
For solid irradiated hardware described in 5.(b)(1)(xvi) and limited in 5.(b)(2)(xvii)	0.0
For PWR MOX rods described in 5.(b)(1)(xvii) and limited by 5.(b)(2)(xviii)	0.0
For a mixed fuel load of DIDO and ANSTO fuel elements described in 5.(b)(1)(x) and 5.(b)(1)(xiv) and limited by 5.(b)(2)(xi)(b) and 5.(b)(2)(xv)(b)	0.0
For (canned) SLOWPOKE fuel described in 5.(b)(1)(xviii) and limited by 5.(b)(2)(xix)	0.0
For the NRU/NRX fuel described in 5.(b)(1)(xix) and limited by 5.(b)(2)(xx)	100.0
For HEUNL contents as described in 5.(b)(1)(xx) and limited in 5.(b)(2)(xxi)	0.0
For the SLOWPOKE fuel core described in 5.(b)(1)(xxi) and limited in 5.(b)(2)(xxii)	100
For, EFN rods, Booster rods, and Moly targets described in 5.(b)(1)(xxii) and limited in 5.(b)(2) (xxviii)	100
For, SrF_2 Capsules (WESF or BUP) described in 5.(b)(1)(xxiii) and limited in 5.(b)(2) (xxiv)	0.0
For, LANL MOX Fuel Rods described in 5.(b)(1)(xxiv) and limited in 5.(b)(2)(xxv)	25.0

Packages having a CSI of 100 must be transported in exclusive use mode.

6. Known or suspected damaged fuel assemblies (rods) or elements, and fuel with cladding defects greater than pin holes and hairline cracks are not authorized, except as described in Items 5.(b)(1)(x); 5.(b)(1)(xiv); 5.(b)(1)(xviii); 5.(b)(2)(iv)(d); 5.(b)(2)(vi); 5.(b)(2)(vii)(a); 5.(b)(2)(vii)(b); 5.(b)(2)(viii); 5.(b)(2)(ix); 5.(b)(2)(x); 5.(b)(2)(xi); 5.(b)(2)(xiv); 5.(b)(2)(xv); and 5.(b)(2)(xix).

7. The cask must be dry (no free water) when delivered to a carrier for transport.

8. Bolt torque: The cask lids bolts must be torqued to 260 +/- 20 ft-lbs. The bolts used to secure the alternate vent and drain port covers must be torqued to 100 +/- 10 inch-lbs. The bolts used to secure the Alternate B port covers must be torqued to 285 +/- 15 inch-lbs.

9. Prior to each shipment, the package must be leak tested to 1×10^{-3} std cm^3/sec, except that replaced seals must be leak tested to 2.0×10^{-7} std cm^3/sec (He). Prior to first use, and at least once within the 12-month period prior to each subsequent use, the package must be leak tested to 2.0×10^{-7} std cm^3/sec (He).

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

    (a) The metallic O-ring lid seal must be replaced prior to each shipment; and

    (b) Each package must meet the Acceptance Tests and Maintenance Program of Chapter 8 of the application, as supplemented; and

    (c) The package shall be prepared for shipment and operated in accordance with the Package Operations of Chapter 7 of the application, as supplemented. If the cask is loaded under water or water is introduced into the cask cavity, the cask must be vacuum dried as described in Chapter 7 of the application. The cask cavity must be backfilled with 1.0 atm of helium when shipping PWR or BWR assemblies, individual PWR and BWR rods, or TPBAR contents.

11. When shipping PWR, BWR, PWR MOX, MTR, DIDO assemblies, TRIGA fuel elements, TRIGA fuel cluster rods, high burnup PWR or BWR rods, GA IFM, PULSTAR fuel elements, spiral fuel assemblies, and MOATA plate bundles, the neutron shield tank must be filled with a mixture of water and ethylene glycol which will not freeze or precipitate in a temperature range from -40 °F to 250 °F. The water and ethylene glycol mixture must contain at least 1% boron by weight.

12. A personnel barrier must be used when shipping PWR or BWR assemblies. Shipments of MTR, DIDO fuel assemblies, TRIGA fuel elements, TRIGA fuel cluster rods, high burnup PWR or BWR rods, PWR MOX rods, TPBAR contents, PULSTAR fuel elements, spiral fuel assemblies, MOATA plate bundles, or irradiated hardware must use the ISO container.

13. Packages used to ship metallic fuel rods may be shipped in a closed shipping container provided that the closed container, the cask tie-down and support system and transport vehicle (trailer) meet the applicable requirements of the Department of Transportation. When the cask is shipped in a closed shipping container, the center of gravity of the combined cask, closed shipping container and trailer must not exceed 75 inches.

14. For shipment of TPBAR contents:

    (a) Prior to first use for shipment of TPBAR contents, each packaging must be hydrostatic pressure tested to 450 +15/-0 psig, as described in Section 8.1.2 of the application;

    (b) The package must be marked with Package Identification Number USA/9225/B(M)-96;

    (c) The package must be configured as shown in NAC International Drawing No. LWT 315-40-128 (Sheets 1-2), for the applicable TPBAR contents; and

    (d) Prior to each shipment, after loading, each cask containment seal must be tested to show no leakage greater than 2 x 10^{-7} std-cm^3/s (helium).

15. For shipment of PULSTAR fuel:

    (a) Intact fuel elements may be configured as PULSTAR fuel assemblies, may be placed into a TRIGA fuel rod insert (a 4 x 4 rod holder), or may be loaded into PULSTAR fuel cans. Intact PULSTAR fuel assemblies and PULSTAR fuel elements in a TRIGA fuel rod insert may be loaded in any module of the 28 MTR basket assembly. PULSTAR fuel cans may only be loaded into the top or base module of the 28 MTR basket assembly.

    (b) Damaged PULSTAR fuel elements and nonfuel components of PULSTAR fuel assemblies must be loaded into PULSTAR cans. Damaged PULSTAR fuel, including fuel debris, pellets or pieces, may be placed in an encapsulating rod prior to loading into a PULSTAR fuel can. PULSTAR fuel cans may only be loaded into the top or base module of the 28 MTR basket assembly.

    (c) Loading of modules with mixed PULSTAR payload configuration is allowed.

16. For shipment of HEUNL contents:

    (a) Hydrogen concentration can be assumed to be less than 5% provided the package shipment is completed within 3 months of closure of the HEUNL containers.

    (b) The maximum cumulative time (service life) an HEUNL container shall contain the HEUNL solution is 15 months.

    (c) An HEUNL container that has a cumulative time containing HEUNL solution greater than 12 months is not authorized to be loaded with HEUNL solution.

17. For shipment of NRU\NRX Fuel:

    NRU/NRX basket weldment serial numbers (S/N's) 315-391-173-01 and -03 through -06 are authorized for use with exception to the requirement presented in License Drawing No. LWT 315-40-173, Rev. 2, (sheets 1-2) note No. 8. No other NRU/NRX basket weldments are authorized for use with exception to note No. 8, other than the S/N’s specified in this condition.

18. For shipment of non-fissile contents, with fissile content in the package not exceeding Type A quantity, and qualifying as a fissile exempt quantity under 10 CFR 71.15, the Model No. NAC-LWT shall be designated as Type B(U)F-96, with package identification number USA/9225/B(U)-96.

19. Transport by air is not authorized.

20. Revisions 73, 74, and 75 of this certificate may be used until April 30, 2025.

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

22. Expiration Date: April 30, 2030.

REFERENCES

NAC International, Inc., application dated August 16, 2024, as supplemented on September 20, 2024, and October 4, 2024.

FOR THE U. S. NUCLEAR REGULATORY COMMISSION

Signed by Diaz-Sanabria, Yoira
on 12/19/24

Yoira Diaz-Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Dated: December 19, 2024

U.S. Department of Transportation

Pipeline and Hazardous Materials Safety Administration

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CERTIFICATE NUMBER: USA/9225/B(U)F-96

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