9NRC FORM 618 (8-2000) 10 CFR 71	CERTIFICATE OF COMPLIANCE FOR RADIOACTIVE MATERIAL PACKAGES			U.S. NUCLEAR REGULATORY COMMISSION
a. CERTIFICATE NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE / PAGES
9235	20	71-9235	USA/9235/B(U)F-96	1 OF 26

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)*

NAC International
3930 East Jones Bridge Road, Suite 200
Norcross, Georgia 30092

b. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

NAC International, application dated June 7, 2018, as supplemented.

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-STC

(2) Description: For descriptive purposes, all dimensions are approximate nominal values. Actual dimensions with tolerances are as indicated on the Drawings.

A steel, lead and polymer (NS4FR) shielded shipping cask for (a) directly loaded irradiated pressurized water reactor (PWR) fuel assemblies, (b) intact, damaged and/or the fuel debris of Yankee Class or Connecticut Yankee irradiated PWR fuel assemblies in a canister, (c) non-fissile, solid radioactive materials (referred to hereafter as Greater Than Class C (GTCC) as defined in 10 CFR Part 61) waste in a canister, and (d) West Valley Demonstration Project (WVDP) High-Level Waste (HLW) canisters in a HLW Overpack. The cask body is a right circular cylinder with an impact limiter at each end. The package has approximate dimensions as follows:

Cavity diameter	71 inches
Cavity length	165 inches
Cask body outer diameter	87 inches
Neutron shield outer diameter	99 inches
Lead shield thickness	3.7 inches
Neutron shield thickness	5.5 inches
Impact limiter diameter	124 inches
Package length:	
without impact limiters	193 inches
with impact limiters	257 inches

The maximum gross weight of the package is about 260,000 pounds (lbs.).

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

Cask body. The cask body is made of two concentric stainless steel shells. The inner shell is 1.5 inches thick and has an inside diameter of 71 inches. The outer shell is 2.65 inches thick and has an outside diameter of 86.7 inches. The annulus between the inner and outer shells is filled with lead.

The inner and outer shells are welded to steel forgings at the top and bottom ends of the cask. The bottom end of the cask consists of two stainless steel circular plates which are welded to the bottom end forging. The inner bottom plate is 6.2 inches thick and the outer bottom plate is 5.45 inches thick. The space between the two bottom plates is filled with a 2-inch thick disk of a synthetic polymer (NS4FR) neutron shielding material.

The cask is closed by two steel lids which are bolted to the upper end forging. The inner lid (containment boundary) is 9 inches thick and is made of Type 304 stainless steel. The outer lid is 5.25 inches thick and is made of SA-705 Type 630, H1150 (17-4PH) stainless steel. The inner lid is fastened by 42, 1-½-inch diameter bolts and the outer lid is fastened by 36, 1-inch diameter bolts. The inner lid is sealed by two O-ring seals. The outer lid is equipped with a single O-ring seal. The inner lid is fitted with a vent and drain port which are sealed by O-rings and cover plates. The containment system seals may be metallic or Viton. Viton seals are used only for directly-loaded fuel that is to be shipped without long-term interim storage.

The cask body is surrounded by a ¼-inch thick jacket shell constructed of 24 stainless steel plates. The jacket shell is 99 inches in diameter and is supported by 24 longitudinal stainless steel fins which are connected to the outer shell of the cask body. Copper plates are bonded to the fins. The space between the fins is filled with NS4FR shielding material.

Four lifting trunnions are welded to the top end forging. The package is shipped in a horizontal orientation and is supported by a cradle under the top forging and by two trunnion sockets located near the bottom end of the cask.

Impact limiter. The package is equipped at each end with an impact limiter made of redwood and balsa. Two impact limiter designs consisting of a combination of redwood and balsa wood, encased in Type 304 stainless steel, are provided to limit the g-loads acting on the cask during an accident. The predominantly balsa wood impact limiter is designed for use with all the proposed contents. The predominately redwood impact limiters may only be used with directly loaded fuel (both low and high burnup fuel) or the Yankee-multi-purpose canister (MPC) configuration.

Shield Ring Assembly: The package includes an optional stainless steel ring assembly which, when applicable, is installed on the upper cask body between the top impact limiter and the neutron shield shell in the upper region of the packaging. The shield ring consists of four sectors: bottom sector, top sector and two side sectors.

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

The bottom sector of the shield ring assembly is an SA-705, Type 630, 17-4PH stainless steel forging. The top sector and side sectors are fabricated from SA-240, Type 304 stainless steel. The bolt material is SA-193, Grade B6, Type 410 stainless steel for all bolts.

Basket and transportable storage canister. The spent fuel contents are transported either directly-loaded (uncanistered) into a stainless steel fuel basket, or within a stainless steel transportable storage canister (TSC). The WVDP-HLW contents are transported in a stainless steel basket inside a transportable canister referred to as the HLW Overpack or WVDP-HLW Overpack.

Directly-loaded fuel basket. The directly-loaded fuel basket within the cask cavity can accommodate up to 26 PWR fuel assemblies. The fuel assemblies are positioned within square sleeves made of stainless steel. Neutron absorber sheets are encased outside the walls of the sleeves. The sleeves are laterally supported by 31, ½-inch thick, 71-inch diameter stainless steel disks. The basket also has 20 heat transfer disks made of Type 6061-T651 aluminum alloy. The support disks and heat transfer disks are connected by six, 1-5/8-inch diameter by 161-inch long threaded rods made of Type 17-4 PH stainless steel.

Yankee Class MPC and Connecticut Yankee MPC TSC assemblies. The Yankee Class MPC and Connecticut Yankee MPC TSC assemblies include a vessel shell, bottom plate, and welded shield and structural lids that are fabricated from stainless steel. The bottom is a 1-inch thick steel plate for the Yankee-MPC and 1.75-inch thick steel plate for the CY-MPC. The shell is constructed of 5/8-inch thick rolled steel plate and is 70 inches in diameter. The shield lid is a 5-inch thick steel plate and contains drain and fill penetrations for the canister. The structural lid is a 3-inch thick steel plate. The canister contains a stainless steel fuel basket that can accommodate up to 36 intact Yankee Class fuel assemblies and Reconfigured Fuel Assemblies (RFAs), or up to 26 intact Connecticut Yankee fuel assemblies with RFAs, with a maximum weight limit of 35,100 lbs. Alternatively, a stainless steel GTCC waste basket is used for up to 24 containers of waste.

Yankee Class MPC TSC fuel basket. The Yankee Class MPC TSC fuel basket configuration can store up to 36 intact Yankee Class fuel assemblies or up to 36 RFAs within square sleeves made of stainless steel. Boral sheets are encased outside the walls of the sleeves. The sleeves are laterally supported by 22 ½-inch thick, 69-inch diameter stainless steel disks, which are spaced about 4 inches apart. The support disks are retained by split spacers on eight 1.125-inch diameter stainless steel tie rods. The basket also has 14 heat transfer disks made of Type 6061-T651 aluminum alloy.

Connecticut Yankee MPC fuel basket. The Connecticut Yankee MPC fuel basket is designed to store up to 26 Connecticut Yankee Zirc-clad assemblies enriched to 3.93 wt. percent, stainless steel clad assemblies enriched up to 4.03 wt. percent, RFAs, or damaged fuel in CY-MPC damaged fuel cans (DFCs). Zirc-clad fuel enriched to between 3.93 and 4.61 wt. percent, such as Westinghouse Vantage 5H fuel, must be stored in the 24-assembly basket.

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

Assemblies approved for transport in the 26-assembly configuration may also be shipped in the 24-assembly configuration. The construction of the two basket configurations is identical except that two fuel loading positions of the 26-assembly basket are blocked to form the 24-assembly basket.

RFAs can accommodate up to 64 Yankee Class fuel rods or up to 100 Connecticut Yankee fuel rods, as intact or damaged fuel or fuel debris, in an 8x8 or 10x10 array of stainless steel tubes, respectively. Intact and damaged Yankee Class or Connecticut Yankee fuel rods, as well as fuel debris, are held in the fuel tubes. The RFAs have the same external dimensions as a standard intact Yankee Class, or Connecticut Yankee fuel assembly.

LaCrosse boiling water reactor multi-purpose canister MPC-LACBWR TSC assembly. The LaCrosse boiling water reactor multi-purpose canister MPC-LACBWR TSC assembly consists of a vessel shell, a bottom plate and a welded closure lid/closure ring assembly that are fabricated from stainless steel. The MPC-LACBWR TSC bottom stainless steel thickness is 1.25 inches. The shell is ½-inch thick rolled steel plate and 70.6 inches in diameter. The closure lid is a 7.0-inch thick steel plate/forging. The closure lid redundant welded closure is provided by a closure ring. The closure lid is provided with vent and drain penetrations to access the TSC cavity and they are closed by redundant welded port cover plates. The MPC-LACBWR TSC fuel basket is designed to hold up to 68 irradiated LACBWR fuel assemblies, including up to 32 damaged fuel assemblies contained in DFCs and up to 36 intact fuel assemblies.

TSC GTCC basket. The TSC GTCC basket positions up to 24 Yankee Class or Connecticut Yankee waste containers within square stainless steel sleeves. The Yankee Class basket is supported laterally by eight 1-inch thick, 69-inch diameter stainless steel disks. The Yankee Class basket sleeves are supported full-length by 2.5-inch thick stainless steel support walls. The support disks are welded into position at the support walls. The Connecticut Yankee GTCC basket is a right-circular cylinder formed by a series of 1.75-inch thick Type 304 stainless steel plates, laterally supported by 12 equally spaced welded 1.25-inch thick Type 304 stainless steel outer ribs. The GTCC waste containers accommodate radiation activated and surface contaminated steel, cutting debris (dross) or filter media, and have the same external dimensions of Yankee Class or Connecticut Yankee fuel assemblies.

The Yankee Class TSC is axially positioned in the cask cavity by two aluminum honeycomb spacers. The spacers, which are enclosed in a Type 6061-T651 aluminum alloy shell, position the canister within the cask during normal conditions of transport. The bottom spacer is 14 inches high and 70-inches in diameter, and the top spacer is 28 inches high and also 70 inches in diameter.

The Connecticut Yankee TSC is axially positioned in the cask cavity by one stainless steel spacer located in the bottom of the cask cavity.

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

WVDP-HLW Overpack and transport inserts. The WVDP-HLW Overpack measures 126.5 in. in length by 70.6 inches in diameter. The WVDP-HLW Overpack consists of three (3) principal components, namely the WVDP-HLW Overpack shell, basket, and closure lid. The HLW Overpack consists of an annular right circular shell closed at one end by a bottom plate.

The shell is constructed of 3/8-inch rolled dual certified Type 304/304L stainless steel plate. The edges of the rolled plates are joined with full penetration welds. The dual certified Type 304/304L stainless steel bottom plate is also attached to the shell by using a full penetration weld. The basket is an assembly of five vertical cylindrical cells held by supporting plates, all fabricated from 304 stainless steel. The basket's cells position up to five (5) HLW canisters, melter-evacuated canisters, or HLW debris canisters inside the Overpack. For shipments of less than 5 HLW canisters (i.e., partially loaded basket), transport inserts occupy the unused cylindrical cells. The material used for fabricating the transport insert is 304 stainless steel.

Spacer assemblies for WVDP-HLW Overpack. Two spacer assemblies serve for configuration control of the WVDP-HLW Overpack within the NAC-STC package. One spacer is positioned below the HLW Overpack and a second spacer is positioned above the HLW Overpack. Both spacer assemblies are constructed of concentric rings of 304 stainless steel welded to a stainless steel base plate.

5.(a)(3) Drawings

(i) The cask is constructed and assembled in accordance with the following Nuclear Assurance Corporation (now NAC International) Drawing Nos.:

423-800, sheets 1-3, Rev. 20P and 20NP
423-802, sheets 1-7, Rev. 26
423-803, sheets 1-2, Rev. 15
423-804, sheets 1-3, Rev. 12
423-805, sheets 1-2, Rev. 9
423-806, sheets 1-2, Rev. 14
423-807, sheets 1-3, Rev. 6
423-811, sheets 1-2, Rev. 13
423-812, Rev. 7
423-900, Rev. 9
423-209, Rev. 2
423-210, Rev. 2
423-901, sheets 1-2, Rev. 3
423-927, Rev. 1P & 2NP

(ii) For the directly loaded configuration, the basket is constructed and assembled in accordance with the following Nuclear Assurance Corporation (now NAC International) Drawing Nos.:

423-870, Rev. 8
423-871, Rev. 5
423-872, Rev. 7
423-873, Rev. 2
423-874, Rev. 3
423-875, sheets 1-2, Rev. 11
423-878, sheets 1-2, Rev. 5
423-880, Rev. 3P and Rev 1NP

5.(a)(3) Drawings

(iii) For the Yankee Class TSC configuration, the canister, and the fuel and GTCC waste baskets are constructed and assembled in accordance with the following NAC International Drawing Nos.:

455-800, sheets 1-2, Rev. 2
455-801, sheets 1-2, Rev. 4
455-820, sheets 1-2, Rev. 3
455-870, Rev. 5
455-871, sheets 1-2, Rev. 8
455-871, sheets 1-3, Rev. 7P2[1]
455-872, sheets 1-2, Rev. 12
455-872, sheets 1-2, Rev. 11P1[1]
455-873, Rev. 4
455-881, sheets 1-3, Rev. 8
455-887, sheets 1-3, Rev. 4
455-901, Rev. 0P0[1]
455-888, sheets 1-2, Rev. 8
455-891, sheets 1-2, Rev. 1
455-891, sheets 1-3, Rev. 2P0[1]
455-892, sheets 1-2, Rev. 3
455-892, sheets 1-3, Rev. 3P0[1]
455-893, Rev. 3
455-894, Rev. 2
455-895, sheets 1-2, Rev. 5
455-895, sheets 1-2, Rev. 5P0[1]
455-902, sheets 1-5, Rev. 0P4[1]
455-919, Rev. 2

(iv) For the Yankee Class TSC configuration, RFAs are constructed and assembled in accordance with the following Yankee Atomic Electric Company Drawing Nos.:

YR-00-060, Rev. D3
YR-00-061, Rev. D4
YR-00-062, sheet 1, Rev. D4
YR-00-062, sheet 2, Rev. D2
YR-00-062, sheet 3, Rev. D1
YR-00-063, Rev. D4
YR-00-064, Rev. D4
YR-00-065, Rev. D2
YR-00-066, sheet 1, Rev. D5
YR-00-066, sheet 2, Rev. D3

(v) The Balsa Impact Limiters are constructed and assembled in accordance with the following NAC International Drawing Nos.:

423-257, Rev. 3
423-258, Rev. 3
423-843, Rev. 6
423-859, Rev. 1

[1] Drawing defines the alternate configuration that accommodates the Yankee-MPC damaged fuel can.

5.(a)(3) Drawings (Continued)

(vi) For the Connecticut Yankee TSC configuration, the canister and the fuel and GTCC waste baskets are constructed and assembled in accordance with the following NAC International Drawing Nos.:

414-801, sheets 1-2, Rev. 2
414-820, Rev.0
414-870, Rev.3
414-871, sheets 1-2, Rev.6
414-872, sheets 1-3, Rev.6
414-887, sheets1-4, Rev. 4
414-893, sheets 1-2, Rev. 3
414-894, Rev. 0
414-895, sheets 1-2, Rev. 4
414-873, Rev.2
414-874, Rev.0
414-875, Rev.0
414-881, sheets 1-2, Rev. 4
414-882, sheets 1-2, Rev.4
414-888, sheets 1-2, Rev 4
414-889, sheets 1-3, Rev. 7
414-891, Rev. 3
414-892, sheets 1-3, Rev. 3

(vii) For the Connecticut Yankee TSC configuration, DFCs and RFAs are constructed and assembled in accordance with the following NAC International Drawing Nos.:
414-901, Rev. 1
414-902, sheets 1-3, Rev. 3
414-903, sheets 1-2, Rev. 1
414-904, sheets 1-3, Rev. 0

(viii) For the Dairyland Power Cooperative LaCrosse BWR transport package and TSC configuration, the TSC, fuel basket, and DFCs are constructed and assembled in accordance with the following NAC International Drawing Nos.:

630045-800, sheets 1-2, Rev. 0
630045-870, Rev. 2
630045-872, sheets 1-2, Rev. 1
630045-877, Rev. 1
630045-881, sheets 1-2, Rev. 1
630045-894, Rev. 1
630045-901, Rev. 0
630045-820, Rev. 0
630045-871, sheets 1-4, Rev. 2
630045-873, Rev. 1
630045-878, Rev. 1
630045-893, Rev. 1
630045-895, sheets 1-3, Rev. 1
630045-902, sheets 1-2, Rev. 1

(ix) For the West Valley Demonstration Project High-Level Waste, the HLW Overpack (shell, basket, and closure lid), overpack spacers, and transport inserts are constructed and assembled in accordance with the following NAC International Drawing Nos.:

630087-501, sheets 1-2, Rev. 1
630087-504, Rev. 0
630087-505, Rev. 0
630087-510, Rev. 1
630087-511, Rev. 1
630087-512, Rev. 1
630087-513, sheets 1-3, Rev. 1
630087-514, Rev. 0

5.(b) Contents

(1) Type and form of material

(i) Irradiated PWR fuel assemblies with uranium oxide pellets.

(1) For low burnup fuel assemblies, the maximum burnup is 45 GWd/MTU. The minimum fuel cool time is defined in the Fuel Cool Time Table (Table 2), below. The maximum heat load per assembly is 850 watts. Prior to irradiation, the fuel assemblies must be within the dimensions and specifications in Table 1:

Table 1 – Fuel Assembly Characteristics

Assembly Type	14×14	15×15	16×16	17×17	17×17 (OFA)	Framatome -Cogema 17×17
Cladding Material	Zirconium Alloy	Zirconium Alloy	Zirconium Alloy	Zirconium Alloy	Zirconium Alloy	Zirconium Alloy
Maximum Initial Uranium Content (kg/assembly)	407	469	402.5	464	426	464
Maximum Initial Enrichment (wt% ^{235}U)	4.2	4.2	4.2	4.2	4.2	4.5
Minimum Initial Enrichment (wt% ^{235}U)	1.7	1.7	1.7	1.7	1.7	1.7
Assembly Cross- Section (inches)	7.76 to 8.11	8.20 to 8.54	8.10 to 8.14	8.43 to 8.54	8.43	8.425 to 8.518
Number of Fuel Rods per Assembly	176 to 179	204 to 216	236	264	264	264(1)
Fuel Rod OD (inch)	0.422 to 0.440	0.418 to 0.430	0.382	0.374 to 0.379	0.360	0.3714 to 0.3740
Minimum Cladding Thickness (inch)	0.023	0.024	0.025	0.023	0.023	0.0204
Pellet Diameter (inch)	0.344 to 0.377	0.358 to 0.390	0.325	0.3225 to 0.3232	0.3088	0.3224 to 0.3230
Maximum Active Fuel Length (inches)	146	144	137	144	144	144.25

Note:
(1) Fuel rod positions may also be occupied by solid poison shim rods or solid zirconium alloy or stainless steel fill rods that displace an amount of water greater than or equal to that displaced by the original fuel rod(s).
(2) Fuel acceptability for loading is not restricted to the vendor indicated in Table 1, provided that the fuel assembly meets the fuel assembly characteristics in Table 1.

5.(b)(1)(i) Contents - Type and Form of Material - Irradiated PWR fuel assemblies (Continued)

Table 2 - FUEL COOL TIME TABLE
Minimum Fuel Cool Time in Years

	Fuel Assembly Burnup (BU)															
Uranium Enrichment (wt% ^{235}U)	**BU ≤ 30 GWD/MTU**				**30 < BU ≤ 35 GWD/MTU**				**35 < BU ≤ 40 GWD/MTU**				**40 < BU ≤ 45 GWD/MTU**			
Fuel Type	14x14	15x15	16x16	17x17	14x14	15x15	16x16	17x17	14x14	15x15	16x16	17x17	14x14	15x15	16x16	17x17
1.7≤E<1.9	8	7	6	7	10	10	7	9	--	--	--	--	--	--	--	--
1.9≤E<2.1	7	7	5	7	9	9	7	8	12	13	9	11	--	--	--	--
2.1≤E<2.3	7	7	5	6	9	8	6	8	11	11	8	10	--	--	--	--
2.3≤E<2.5	6	6	5	6	8	8	6	7	10	10	8	9	14	15	12	14
2.5≤E<2.7	6	6	5	6	8	7	6	7	10	9	7	9	13	14	10	12
2.7≤E<2.9	6	6	5	5	7	7	5	6	9	9	7	8	12	12	9	11
2.9≤E<3.1	6	5	5	5	7	7	5	6	9	8	6	8	11	11	8	10
3.1≤E<3.3	5	5	5	5	7	6	5	6	8	8	6	7	10	10	8	9
3.3≤E<3.5	5	5	5	5	6	6	5	6	8	7	6	7	10	10	7	9
3.5≤E<3.7	5	5	5	5	6	6	5	6	7	7	6	7	9	9	7	9
3.7≤E<3.9	5	5	5	5	6	6	5	6	7	7	6	7	9	9	7	9
3.9≤E<4.1	5	5	5	5	6	6	5	6	7	7	6	7	8	9	7	9
4.1≤E≤4.2	5	5	5	5	5	6	5	6	6	7	6	7	8	8	7	9
4.2≤E<4.3	--	--	--	5(1)	--	--	--	6(1)	--	--	--	7(1)	--	--	--	9(1)
4.3≤E≤4.5	--	--	--	5(1)	--	--	--	6(1)	--	--	--	7(1)	--	--	--	8(1)

Note:
(1) Framatome-Cogema 17x17 fuel only.

5.(b)(1)(i) Contents - Type and Form of Material - Irradiated PWR fuel assemblies (Continued)

(2) Undamaged 17x17 Advanced Fuel Assembly PWR high burnup (i.e., assembly average burnup exceeding 45 GWd/MTU) fuel assemblies that meet the fuel assembly criteria for Framatome-Cogema 17x17 fuel listed in Table 1 for content 5.(b)(1)(i)(1). The maximum assembly decay heat may not exceed 1.71 kW, and the maximum burnup may not exceed 55 GWd/MTU, provided the loading pattern meets the requirements of configuration A, B or C, as shown in NAC International Drawing No. 423-800. Only Zirc-4 and M5® Zirconium alloy cladding may be loaded for any shipment, with a maximum of 4 Zirc-4 fuel assemblies per shipment. Gadolinium based integral fuel burnable absorber rods (IFBAs) are permitted, but boron-based IFBAs are not. The minimum fuel assembly cool time is determined from Tables 3 through 5, depending on loading configuration. The fuel assemblies shall not have been previously stored in an independent spent fuel storage installation licensed under 10 CFR Part 72.

(3) Undamaged 17x17 Advanced Fuel Assembly PWR low burnup (i.e., assembly average burnup less than or equal to 45 GWd/MTU) fuel assemblies that meet the fuel assembly criteria for Framatome-Cogema 17x17 fuel listed in Table 1 for content 5.(b)(1)(i)(1). The maximum heat load per assembly is 850 watts and the maximum burnup may not exceed 45 GWd/MTU. The minimum fuel assembly cool time is determined from Table 6. The use of the shield ring assembly, as configured in NAC International Drawing No. 423-927, is required.

(4) Undamaged 17x17 Advanced Fuel Assembly PWR high burnup (i.e., assembly average burnup exceeding 45 GWd/MTU) fuel assemblies that meet the fuel assembly criteria for Framatome-Cogema 17x17 fuel listed in Table 1 for content 5.(b)(1)(i)(1). The maximum assembly decay heat may not exceed 1.71 kW, and the maximum burnup may not exceed 55 GWd/MTU, provided the loading pattern meets the requirements of configuration A, B or C as shown in NAC International Drawing No. 423-800. Only Zirc-4 and M5® Zirconium alloy cladding may be loaded for any shipment, with a maximum of four Zirc-4 fuel assemblies per shipment. Gadolinium based integral fuel burnable absorber rods (IFBAs) are permitted, but boron-based IFBAs are not. The minimum fuel assembly cool time is determined from Tables 7 through 9, depending on loading configuration. The fuel assemblies shall not have been previously stored in an independent spent fuel storage installation licensed under 10 CFR Part 72.

Table 3 - Fuel Cool Time Table
(Configuration A 17x17 PWR HBU)
Minimum Fuel Cool Time in Years

Cobalt [g/kg]	Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
		45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
0.4	2.9 ≤ E < 3.1	4.0	4.0	4.3	4.9	5.6	6.3	7.0	7.8	8.7	–
	3.1 ≤ E < 3.3	4.0	4.0	4.0	4.1	4.7	5.3	6.0	6.8	7.5	8.3
	3.3 ≤ E < 3.5	4.0	4.0	4.0	4.0	4.1	4.5	5.1	5.8	6.5	7.2
	3.5 ≤ E < 3.7	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.9	5.5	6.2
	3.7 ≤ E < 3.9	4.0	4.0	4.0	4.0	4.0	4.2	4.3	4.4	4.7	5.3
	3.9 ≤ E < 4.1	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.4	4.5
	4.1 ≤ E < 4.3	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.4	4.5
	4.3 ≤ E ≤ 4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.4
0.8	2.9 ≤ E < 3.1	6.9	7.4	8.0	8.6	9.1	9.8	10.4	11.1	11.8	–
	3.1 ≤ E < 3.3	6.2	6.7	7.2	7.8	8.3	8.9	9.5	10.1	10.8	11.5
	3.3 ≤ E < 3.5	5.6	6.0	6.5	7.0	7.6	8.1	8.7	9.3	9.9	10.6
	3.5 ≤ E < 3.7	5.0	5.4	5.9	6.4	6.8	7.4	7.9	8.5	9.0	9.7
	3.7 ≤ E < 3.9	4.5	4.9	5.3	5.7	6.2	6.7	7.2	7.7	8.3	8.8
	3.9 ≤ E < 4.1	4.0	4.4	4.7	5.2	5.6	6.0	6.5	7.0	7.5	8.1
	4.1 ≤ E < 4.3	4.0	4.0	4.3	4.6	5.0	5.5	5.9	6.4	6.9	7.4
	4.3 ≤ E ≤ 4.5	4.0	4.0	4.0	4.2	4.5	4.9	5.4	5.8	6.3	6.7
1.2	2.9 ≤ E < 3.1	9.4	9.9	10.4	11.0	11.5	12.0	12.6	13.3	13.8	–
	3.1 ≤ E < 3.3	8.8	9.2	9.7	10.2	10.7	11.3	11.8	12.4	13.0	13.6
	3.3 ≤ E < 3.5	8.1	8.6	9.0	9.5	10.0	10.5	11.1	11.6	12.1	12.7
	3.5 ≤ E < 3.7	7.6	8.0	8.4	8.9	9.3	9.8	10.3	10.9	11.4	11.9
	3.7 ≤ E < 3.9	7.0	7.4	7.9	8.3	8.7	9.2	9.6	10.1	10.7	11.2
	3.9 ≤ E < 4.1	6.6	6.9	7.3	7.7	8.1	8.6	9.0	9.5	10.0	10.5
	4.1 ≤ E < 4.3	6.1	6.5	6.8	7.2	7.6	8.0	8.4	8.9	9.3	9.8
	4.3 ≤ E ≤ 4.5	5.7	6.0	6.4	6.7	7.1	7.5	7.9	8.3	8.8	9.2

Table 4 - Fuel Cool Time Table
(Configuration B 17x17 PWR HBU)
Minimum Fuel Cool Time in Years

Cobalt [g/kg]	Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
		45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
0.4	2.9 ≤ E < 3.1	4.4	5.0	5.7	6.5	7.3	8.2	9.1	10.0	11.0	–
	3.1 ≤ E < 3.3	4.3	4.4	4.8	5.5	6.2	7.0	7.9	8.8	9.7	10.7
	3.3 ≤ E < 3.5	4.3	4.4	4.5	4.6	5.2	6.0	6.7	7.6	8.4	9.4
	3.5 ≤ E < 3.7	4.2	4.3	4.4	4.5	4.7	5.0	5.7	6.5	7.3	8.2
	3.7 ≤ E < 3.9	4.2	4.3	4.4	4.5	4.6	4.8	4.9	5.5	6.3	7.0
	3.9 ≤ E < 4.1	4.1	4.2	4.3	4.5	4.6	4.7	4.8	5.0	5.3	6.1
	4.1 ≤ E < 4.3	4.1	4.2	4.3	4.4	4.5	4.6	4.8	4.9	5.0	5.2
	4.3 ≤ E ≤ 4.5	4.0	4.1	4.3	4.4	4.5	4.6	4.7	4.9	5.0	5.2
0.8	2.9 ≤ E < 3.1	8.0	8.6	9.2	9.9	10.6	11.4	12.1	12.9	13.7	–
	3.1 ≤ E < 3.3	7.2	7.8	8.4	9.0	9.7	10.4	11.1	11.8	12.6	13.4
	3.3 ≤ E < 3.5	6.5	7.0	7.6	8.1	8.8	9.4	10.1	10.8	11.5	12.3
	3.5 ≤ E < 3.7	5.8	6.3	6.8	7.4	8.0	8.6	9.2	9.9	10.6	11.3
	3.7 ≤ E < 3.9	5.2	5.7	6.1	6.7	7.2	7.8	8.4	9.0	9.6	10.3
	3.9 ≤ E < 4.1	4.7	5.1	5.6	6.0	6.5	7.0	7.6	8.2	8.8	9.4
	4.1 ≤ E < 4.3	4.2	4.6	5.0	5.4	5.9	6.4	6.9	7.5	8.0	8.6
	4.3 ≤ E ≤ 4.5	4.0	4.2	4.5	4.9	5.3	5.8	6.3	6.8	7.3	7.9
1.2	2.9 ≤ E < 3.1	10.4	11.0	11.6	12.1	12.8	13.5	14.1	14.8	15.6	–
	3.1 ≤ E < 3.3	9.6	10.2	10.8	11.3	11.9	12.5	13.2	13.8	14.5	15.3
	3.3 ≤ E < 3.5	9.0	9.5	10.0	10.6	11.1	11.7	12.3	12.9	13.6	14.2
	3.5 ≤ E < 3.7	8.3	8.8	9.3	9.8	10.4	10.9	11.5	12.0	12.7	13.4
	3.7 ≤ E < 3.9	7.8	8.2	8.7	9.1	9.6	10.2	10.7	11.3	11.9	12.5
	3.9 ≤ E < 4.1	7.2	7.6	8.1	8.5	9.0	9.5	10.0	10.6	11.1	11.7
	4.1 ≤ E < 4.3	6.7	7.1	7.5	8.0	8.4	8.9	9.4	9.9	10.4	11.0
	4.3 ≤ E ≤ 4.5	6.3	6.6	7.0	7.4	7.9	8.3	8.8	9.2	9.7	10.2

Table 5 - Fuel Cool Time Table
(Configuration C 17x17 PWR HBU)
Minimum Fuel Cool Time in Years

Cobalt [g/kg]	Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
		45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
0.4	2.9 ≤ E < 3.1	8.0	9.1	10.3	11.6	12.9	14.2	15.6	17.0	18.4	–
	3.1 ≤ E < 3.3	6.9	7.8	8.8	10.0	11.2	12.5	13.8	15.2	16.5	17.9
	3.3 ≤ E < 3.5	5.8	6.7	7.5	8.5	9.7	10.9	12.1	13.4	14.8	16.1
	3.5 ≤ E < 3.7	5.3	5.7	6.5	7.3	8.3	9.4	10.6	11.8	13.1	14.4
	3.7 ≤ E < 3.9	5.3	5.4	5.6	6.3	7.1	8.0	9.1	10.2	11.5	12.7
	3.9 ≤ E < 4.1	5.2	5.4	5.6	5.8	6.1	6.9	7.8	8.9	10.0	11.2
	4.1 ≤ E < 4.3	5.1	5.3	5.5	5.7	5.9	6.0	6.8	7.6	8.6	9.7
	4.3 ≤ E ≤ 4.5	5.1	5.3	5.5	5.6	5.8	6.0	6.2	6.6	7.5	8.5
0.8	2.9 ≤ E < 3.1	11.4	12.2	13.1	14.0	15.1	16.2	17.4	18.6	19.8	–
	3.1 ≤ E < 3.3	10.4	11.2	11.9	12.8	13.7	14.7	15.8	17.0	18.1	19.4
	3.3 ≤ E < 3.5	9.4	10.2	10.9	11.7	12.5	13.4	14.4	15.5	16.6	17.7
	3.5 ≤ E < 3.7	8.6	9.3	10.0	10.7	11.5	12.3	13.2	14.1	15.1	16.2
	3.7 ≤ E < 3.9	7.8	8.5	9.1	9.8	10.5	11.3	12.0	12.9	13.8	14.8
	3.9 ≤ E < 4.1	7.4	7.7	8.3	9.0	9.6	10.4	11.1	11.9	12.7	13.6
	4.1 ≤ E < 4.3	7.1	7.3	7.6	8.2	8.8	9.5	10.2	10.9	11.7	12.5
	4.3 ≤ E ≤ 4.5	6.8	7.0	7.2	7.5	8.1	8.7	9.4	10.0	10.8	11.5
1.2	2.9 ≤ E < 3.1	13.6	14.3	15.1	15.9	16.7	17.7	18.7	19.8	20.9	–
	3.1 ≤ E < 3.3	12.7	13.4	14.0	14.8	15.6	16.4	17.3	18.3	19.4	20.5
	3.3 ≤ E < 3.5	11.8	12.5	13.1	13.8	14.6	15.3	16.1	17.0	17.9	19.0
	3.5 ≤ E < 3.7	11.2	11.7	12.3	12.9	13.6	14.3	15.1	15.9	16.7	17.7
	3.7 ≤ E < 3.9	10.8	11.1	11.5	12.1	12.8	13.4	14.1	14.9	15.6	16.5
	3.9 ≤ E < 4.1	10.4	10.7	11.0	11.4	11.9	12.6	13.3	13.9	14.7	15.4
	4.1 ≤ E < 4.3	10.1	10.3	10.6	10.8	11.2	11.8	12.4	13.1	13.8	14.5
	4.3 ≤ E ≤ 4.5	9.9	10.1	10.2	10.5	10.7	11.1	11.7	12.3	12.9	13.6

Table 6 - Fuel Cool Time Table
(17x17 PWR LBU)
Minimum Fuel Cool Time in Years
Cobalt content limited to ≤1.2 g/kg

Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]													
	B≤10	10<B≤15	15<B≤20	20<B≤25	25<B≤30	30<B≤ 32.5	32.5<B≤ 35	35<B≤ 37.5	37.5<B≤ 40	40<B≤41	41<B≤42	42<B≤43	43<B≤44	44<B≤45
1.7 ≤ E < 1.9	4.0	4.0	4.0	4.5	5.9	7.2	9.8	-	-	-	-	-	-	-
1.9 ≤ E < 2.1	4.0	4.0	4.0	4.4	5.5	6.4	8.3	11.4	15.3	-	-	-	-	-
2.1 ≤ E < 2.3	4.0	4.0	4.0	4.3	5.2	5.9	7.2	9.7	13.2	-	-	-	-	-
2.3 ≤ E < 2.5	4.0	4.0	4.0	4.2	4.9	5.6	6.6	8.4	11.4	12.8	14.3	15.9	17.6	19.2
2.5 ≤ E < 2.7	4.0	4.0	4.0	4.1	4.8	5.3	6.0	7.4	9.8	11.1	12.5	13.9	15.5	17.1
2.7 ≤ E < 2.9	4.0	4.0	4.0	4.0	4.7	5.0	5.7	6.7	8.5	9.6	10.8	12.1	13.6	15.1
2.9 ≤ E < 3.1	4.0	4.0	4.0	4.0	4.6	5.0	5.6	6.2	7.6	8.4	9.4	10.6	11.9	13.3
3.1 ≤ E < 3.3	4.0	4.0	4.0	4.0	4.6	5.0	5.5	6.0	6.9	7.6	8.3	9.2	10.4	11.7
3.3 ≤ E < 3.5	4.0	4.0	4.0	4.0	4.6	4.9	5.4	6.0	6.7	7.0	7.5	8.2	9.1	10.2
3.5 ≤ E < 3.7	4.0	4.0	4.0	4.0	4.5	4.9	5.4	5.9	6.6	6.9	7.2	7.6	8.2	9.0
3.7 ≤ E < 3.9	4.0	4.0	4.0	4.0	4.5	4.9	5.3	5.9	6.5	6.8	7.1	7.5	7.9	8.4
3.9 ≤ E < 4.1	4.0	4.0	4.0	4.0	4.5	4.8	5.3	5.8	6.5	6.8	7.0	7.4	7.8	8.3
4.1 ≤ E < 4.3	4.0	4.0	4.0	4.0	4.5	4.8	5.3	5.8	6.4	6.7	7.0	7.4	7.7	8.1
4.3 ≤ E < 4.5	4.0	4.0	4.0	4.0	4.4	4.8	5.2	5.8	6.4	6.6	6.9	7.3	7.7	8.1

Table 7 - Fuel Cool Time Table
(Configuration A 17x17 PWR HBU)
Minimum Fuel Cool Time in Years
Cobalt content limited to ≤1.2 g/kg

Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
	45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
2.9 ≤ E < 3.1	4.0	4.0	4.5	5.0	5.7	6.3	6.9	7.6	8.4	-
3.1 ≤ E < 3.3	4.0	4.0	4.0	4.3	4.8	5.4	6.0	6.7	7.4	8.1
3.3 ≤ E < 3.5	4.0	4.0	4.0	4.1	4.2	4.7	5.2	5.8	6.4	7.1
3.5 ≤ E < 3.7	4.0	4.0	4.0	4.0	4.1	4.2	4.5	5.0	5.6	6.2
3.7 ≤ E < 3.9	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.4	4.8	5.4
3.9 ≤ E < 4.1	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.5	4.7
4.1 ≤ E < 4.3	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.3	4.4	4.5
4.3 ≤ E ≤ 4.5	4.0	4.0	4.0	4.0	4.0	4.0	4.1	4.2	4.4	4.5

Table 8 - Fuel Cool Time Table
(Configuration B 17x17 PWR HBU)
Minimum Fuel Cool Time in Years
Cobalt content limited to ≤1.2 g/kg

Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
	45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
2.9 ≤ E < 3.1	4.4	4.9	5.5	6.1	6.8	7.6	8.3	9.1	10.0	-
3.1 ≤ E < 3.3	4.4	4.5	4.7	5.3	5.9	6.6	7.3	8.0	8.8	9.7
3.3 ≤ E < 3.5	4.3	4.4	4.5	4.7	5.1	5.7	6.3	7.0	7.8	8.6
3.5 ≤ E < 3.7	4.2	4.4	4.5	4.6	4.7	4.9	5.5	6.1	6.8	7.5
3.7 ≤ E < 3.9	4.2	4.3	4.4	4.5	4.7	4.8	4.9	5.3	5.9	6.6
3.9 ≤ E < 4.1	4.1	4.3	4.4	4.5	4.6	4.8	4.9	5.0	5.2	5.7
4.1 ≤ E < 4.3	4.1	4.2	4.3	4.4	4.5	4.7	4.8	5.0	5.1	5.3
4.3 ≤ E ≤ 4.5	4.0	4.2	4.3	4.4	4.5	4.6	4.8	4.9	5.0	5.2

Table 9 - Fuel Cool Time Table
(Configuration C 17x17 PWR HBU)
Minimum Fuel Cool Time in Years
Cobalt content limited to ≤1.2 g/kg

Min. initial Assembly Avg. Enr. [wt. %]	Assembly Average Burnup [GWd/MTU]									
	45<B≤46	46<B≤47	47<B≤48	48<B≤49	49<B≤50	50<B≤51	51<B≤52	52<B≤53	53<B≤54	54<B≤55
2.9 ≤ E < 3.1	7.4	8.2	9.1	10.0	11.0	12.0	13.1	14.3	15.5	-
3.1 ≤ E < 3.3	6.4	7.1	7.9	8.8	9.7	10.7	11.6	12.7	13.9	15.1
3.3 ≤ E < 3.5	5.5	6.2	6.9	7.7	8.5	9.4	10.4	11.3	12.4	13.5
3.5 ≤ E < 3.7	5.4	5.6	6.0	6.7	7.5	8.3	9.2	10.1	11.0	12.0
3.7 ≤ E < 3.9	5.3	5.5	5.7	5.9	6.6	7.3	8.1	8.9	9.8	10.8
3.9 ≤ E < 4.1	5.2	5.4	5.6	5.8	6.0	6.4	7.1	7.9	8.7	9.6
4.1 ≤ E < 4.3	5.2	5.4	5.6	5.7	5.9	6.1	6.4	7	7.7	8.5
4.3 ≤ E ≤ 4.5	5.1	5.3	5.5	5.7	5.9	6.0	6.3	6.6	6.8	7.6

5.(b)(1) Contents - Type and Form of Material (Continued)

(ii) Irradiated intact Yankee Class PWR fuel assemblies or RFAs within the TSC. The maximum initial fuel pin pressure is 315 psig. The fuel assemblies consist of uranium oxide pellets with the specifications, based on design nominal or operating history record values, listed below:

Table 10 - Yankee Class Fuel Assembly Characteristics

Assembly Manufacturer/Type	UN 16×16	CE [1] 16×16	West. 18×18	Exxon [2] 16×16	Yankee RFA	Yankee DFC
Cladding Material	Zircaloy	Zircaloy	SS	Zircaloy	Zirc/SS	Zirc/SS
Maximum Number of Rods per Assembly	237	231	305	231	64	305
Maximum Initial Uranium Content (kg/assembly)	246	240	287	240	70	287
Maximum Initial Enrichment (wt% ^{235}U)	4.0	3.9	4.94	4.0	4.94	4.97 [3]
Minimum Initial Enrichment (wt% ^{235}U)	4.0	3.7	4.94	3.5	3.5	3.5 [3]
Maximum Assembly Weight (lbs)	≤ 950	≤ 950	≤ 950	≤ 950	≤ 950	≤ 950
Maximum Burnup (MWD/MTU)	32,000	36,000	32,000	36,000	36,000	36,000
Maximum Decay Heat per Assembly (kW)	0.28	0.347	0.28	0.34	0.11	0.347
Minimum Cool Time (yrs)	11.0	8.1	22.0	10.0	8.0	8.0
Maximum Active Fuel Length (in)	91	91	92	91	92	N/A

Notes:
1. Combustion Engineering (CE) fuel with a maximum burnup of 32,000 MWD/MTU, a minimum enrichment of 3.5 wt. % ^{235}U, a minimum cool time of 8.0 years, and a maximum decay heat per assembly of 0.304 kW is authorized.
2. Exxon assemblies with stainless steel in-core hardware shall be cooled a minimum of 16.0 years with a maximum decay heat per assembly of 0.269 kW.
3. Stated enrichments are nominal values (fabrication tolerances are not included).

5.(b)(1) Contents - Type and Form of Material (Continued)

(iii) Solid, irradiated, and contaminated hardware and solid, particulate debris (dross) or filter media placed in a GTCC waste container, provided the quantity of fissile material does not exceed a Type A quantity, and does not exceed the mass limits of 10 CFR 71.15.

(iv) Irradiated intact and damaged Connecticut Yankee (CY) Class PWR fuel assemblies (including optional stainless steel rods inserted into the CY intact and damaged fuel assembly reactor control cluster assembly (RCCA) guide tubes that do not contain RCCAs), RFAs, or DFCs within the TSC. The maximum initial fuel pin pressure is 475 psig. The fuel assemblies consist of uranium oxide pellets with the specifications, based on design nominal or operating history record values, listed below:

Table 11 – Connecticut Yankee Fuel Assembly Characteristics

Assembly Manufacturer/Type Cladding Material	PWR [1] 15×15 SS	PWR [2] 15×15 Zircaloy	PWR [3] Zircaloy	CY-MPC RFA [4] Zirc/SS	CY-MPC DFC [5] Zirc/SS
Maximum Number of Assemblies	26	26	24	4	4
Maximum Initial Uranium Content (kg/assembly)	433.7	397.1	390	212	433.7
Maximum Initial Enrichment (wt% ^{235}U)	4.03	3.93	4.61	4.61[6]	4.61[6]
Minimum Initial Enrichment (wt% ^{235}U)	3.0	2.95	2.95	2.95	2.95
Maximum Assembly Weight (lbs)	≤ 1,500	≤ 1,500	≤ 1,500	≤ 1,600	≤ 1,600
Maximum Burnup (MWD/MTU)	38,000	43,000	43,000	43,000	43,000
Maximum Decay Heat per Assembly (kW)	0.654	0.654	0.654	0.321	0.654
Minimum Cool Time (yrs)	10.0	10.0	10.0	10.0	10.0
Maximum Active Fuel Length (in)	121.8	121.35	120.6	121.8	121.8

Notes:
1. Stainless steel assemblies manufactured by Westinghouse Electric Co., Babcock & Wilcox Fuel Co., Gulf Gen. Atomics, Gulf Nuclear Fuel, & Nuclear Materials & Man. Co.
2. Zircaloy spent fuel assemblies manufactured by Gulf Gen. Atomics, Gulf Nuclear Fuel, & Nuclear Materials & Man. Co., and Babcock & Wilcox Fuel Co.
3. Westinghouse Vantage 5H Zircaloy clad spent fuel assemblies have an initial uranium enrichment > 3.93 % wt. U^{235}.
4. Reconfigured Fuel Assemblies (RFA) must be loaded in one of the 4 oversize fuel loading positions.
5. Damaged Fuel Cans (DFC) must be loaded in one of the 4 oversize fuel loading positions.
6. Enrichment of the fuel within each DFC or RFA is limited to that of the basket configuration in which it is loaded.

5.(b)(1) Contents - Type and Form of Material (Continued)

(v) Irradiated undamaged and damaged Dairyland Power Cooperative LACBWR fuel assemblies based on design nominal or operating history record values listed below. Fuel assemblies may contain zirconium alloy shroud compaction debris.

Table 12 – LACBWR Fuel Assembly Characteristics

Parameter	Units	Allis Chalmers	Exxon
Number of Assemblies per Canister[1]	---	32	68
Maximum Assembly Weight[6]	lbs	400	400
Assembly Length	In	103	103
Fuel Rod Cladding	---	Stainless Steel	Stainless Steel
Maximum Initial Uranium Mass[2]	kgU	121.4	111.9
Maximum Initial Enrichment	wt% ^{235}U	3.64/3.94[5]	3.71[3]
Minimum Initial Enrichment	wt% ^{235}U	3.6	3.6
Maximum Burnup	MWd/MTU	22,000	21,000
Maximum Assembly Decay Heat	W	63	62
Minimum Cool Time	Yr	28	23
Assembly Array Configuration	---	10X10	10X10
Number of Fuel Rods	---	100	96
Maximum Active Fuel Length	in	83	83
Rod Pitch	in	0.565	0.557
Rod Diameter	in	0.396	0.394
Pellet Diameter	in	0.350	0.343
Clad Thickness	in	0.020	0.0220
Number of Inert Rods[4]	---	0	4
Inert Rod OD	in	N/A	0.3940

1. Maximum 68 assemblies per canister. Allis Chalmers fuel is restricted to Damaged Fuel Cans (DFCs). Therefore, Allis Chalmers fuel is limited to 32 assemblies per canister.
2. DFCs have been evaluated for 2% additional fuel rod mass.
3. Represents planar average enrichment.
4. Inert rods comprised of stainless steel clad tube containing zirconium alloy slug. Inert rods not required for fuel assemblies located in DFC.
5. Two Allis Chalmers fuel types: Type 1 at an enrichment of 3.64 wt% ^{235}U and Type 2 at 3.94 wt% ^{235}U.
6. Not including weight of DFC. DFCs may contain optional inner container subject to maximum weight and fissile material limits in this table.

5.(b)(1) Contents - Type and Form of Material (Continued)

(vi) West Valley Demonstration Project (WVDP) High Level Waste (HLW) stainless steel canisters containing HLW vitrified in borosilicate glass. A WVDP-HLW Overpack may contain HLW canisters, melter-evacuated canisters partially filled with HLW glass or HLW debris. The contents of a package containing the WVDP-HLW are limited to up five HLW canisters, up to two evacuated canisters and one debris canister, in any combination. All canisters are closed with a permanent welded closure, and have a nominal height of ≤ 118 inches and an outside diameter of ≤ 24 inches, approximately. The heat load shall be ≤ 0.300 kW per HLW canister. The maximum gross weight allowed per canister is 5,500 lbs. The following are the applicable design limits for the HLW:

WVDP-HLW Canisters	
Maximum HLW Mass (kg)	2,200
Maximum Ci Content HLW	
^{137}Cs	42,000
^{137m}Ba	40,000
^{90}Sr	23,000
^{90}Y	23,000
^{60}Co	0.2

The quantity of fissile material in the WVDP-HLW Overpack shall not exceed the limits of 10 CFR 71.15.

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

(i) For the contents described in Item 5.(b)(1)(i): 26 PWR fuel assemblies with a maximum total weight of 39,650 lbs.

(1) Low burnup fuel assemblies, as described in 5.(b)(1)(i)(1), shall have a maximum decay heat not to exceed 22.1 kW per package.

(2) For high burnup fuel assemblies, as described in 5.(b)(1)(i)(2), the number and the positioning of the fuel assemblies and shielded thermal shunts shall meet the requirements as shown in Configurations A, B or C of NAC International Drawing No. 423-800 and shall have a maximum decay heat not to exceed 24 kW per package. A maximum of four Zirc-4 fuel assemblies may be loaded per shipment. Low burnup fuel assemblies described in Item 5.(b)(1)(i)(1) may be comingled with high burnup fuel assemblies describe in 5.(b)(1)(i)(2), however, the requirements for contents described in Item 5.(b)(1)(i)(2) regarding assembly and thermal shunt numbers and positions apply to packages containing the comingled loadings.

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

(3) Low burnup assemblies, as described in 5.(b)(1)(i)(3), shall have a maximum decay heat not to exceed 22.1 kW per package. The use of the shield ring assembly, as configured in NAC International Drawing No. 423-927, is required.

(4) For high burnup fuel assemblies, as described in 5.(b)(1)(i)(4), the number and the positioning of the fuel assemblies and shielded thermal shunts shall meet the requirements as shown in Configuration A, B or C of NAC International Drawing No. 423-800 and shall have a maximum decay heat not to exceed 24 kW per package. A maximum of four Zirc-4 fuel assemblies may be loaded per shipment. The use of the shield ring assembly, as configured in NAC International Drawing No. 423-927, is required.

Low burnup fuel assemblies described in Item 5.(b)(1)(i)(3) may be comingled with high burnup fuel assemblies described in 5.(b)(1)(i)(4), however, the requirements for contents described in Item 5.(b)(1)(i)(4) regarding assembly and thermal shunt numbers and positions apply to package containing the comingled loads. The use of the shield ring assembly, as configured in NAC International Drawing No. 423-927, is required.

(ii) For the contents described in Item 5.(b)(1)(ii): Up to 36 intact fuel assemblies to the maximum content weight limit of 30,600 lbs. with a maximum decay heat of 12.5 kW per package. Intact fuel assemblies shall not contain empty fuel rod positions and any missing rods shall be replaced by a solid Zircaloy or stainless steel rod that displaces an equal amount of water as the original fuel rod. Mixing of intact fuel assembly types is authorized.

(iii) For intact fuel rods, damaged fuel rods and fuel debris of the type described in Item 5.(b)(1)(ii): up to 36 RFAs, each with a maximum equivalent of 64 full length Yankee Class fuel rods and within fuel tubes. Mixing of directly loaded intact assemblies and damaged fuel (within RFAs) is authorized. The total weight of damaged fuel within RFAs or mixed damaged RFA and intact assemblies shall not exceed 30,600 lbs. with a maximum decay heat of 12.5 kW per package.

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

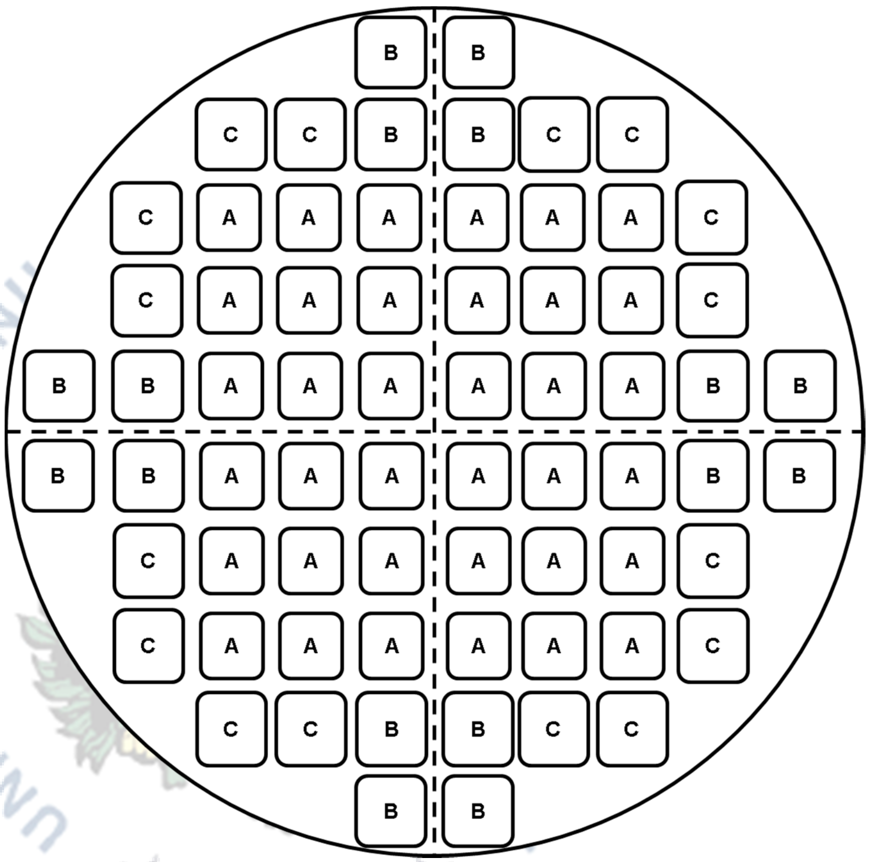
(iv) For the contents described in Item 5.(b)(1)(iii): for Connecticut Yankee GTCC waste up to 24 containers of GTCC waste. The total cobalt-60 activity shall not exceed 196,000 curies. The total weight of the waste containers shall not exceed 18,743 lbs. with a maximum decay heat of 5.0 kW. For all others, up to 24 containers of GTCC waste. The total cobalt-60 activity shall not exceed 125,000 curies. The total weight of the waste and containers shall not exceed 12,340 lbs. with a maximum decay heat of 2.9 kW.

(v) For the contents described in Item 5.(b)(1)(iv): up to 26 Connecticut Yankee fuel assemblies, RFAs or damaged fuel in CY-MPC DFCs for stainless steel clad assemblies enriched up to 4.03 wt. percent and Zirc-clad assemblies enriched up to 3.93 wt. percent. Westinghouse Vantage 5H fuel and other Zirc-clad assemblies enriched up to 4.61 wt. percent must be installed in the 24-assembly basket, which may also hold other Connecticut Yankee fuel types. The construction of the two basket configurations is identical except that two fuel loading positions of the 26 assembly basket are blocked to form the 24 assembly basket. The total weight of damaged fuel within RFAs or mixed damaged RFAs and intact assemblies shall not exceed 35,100 lbs. with a maximum decay heat of 0.654 kW per assembly for a canister of 26 assemblies. A maximum decay heat of 0.321 kW per assembly for Connecticut Yankee RFAs and of 0.654 kW per canister for the Connecticut Yankee DFCs is authorized.

(vi) For the contents described in 5.(b)(1)(v): Up to 68 LACBWR assemblies, including up to 32 damaged fuel assemblies contained in DFCs, may be transported in the MPC-LACBWR TSCs.

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

Total weight of contents within the MPC-LACBWR TSC is 28,870 lbs., including the weight of 32 DFCs. The maximum decay heat is 4.5 kW per package. LACBWR undamaged fuel assemblies and LACBWR DFCs must be loaded in accordance with the following loading pattern:



Slot A: Undamaged Exxon fuel maximum planar average enrichment 3.71 wt% ^{235}U.

Slot B: Undamaged or damaged Exxon fuel maximum planar average enrichment 3.71 wt% ^{235}U, up to four slots maximum, B and C combined. Damaged Allis Chalmers fuel maximum enrichment 3.64 wt% ^{235}U.

Slot C: Undamaged or damaged Exxon fuel maximum planar average enrichment 3.71 wt% ^{235}U, up to four slots maximum, B and C combined. Damaged Allis Chalmers fuel maximum enrichment 3.94 wt% ^{235}U.

LACBWR DFCs are allowed to contain an additional 2% fissile material to account for loose pellets, not necessarily associated with the as-built fuel assembly.

NOTE: The above sketch is not to scale. It is a depiction of the loading pattern.

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

(vii) For the contents Described in 5.(b)(1)(vi): Up to five (5) HLW canisters may be transported in the WVDP-HLW Overpack, including melter-evacuated canisters partially filled with HLW glass or canisters with HLW debris. A single WVDP-HLW Overpack is limited to a load of up to five (5) HLW canisters, two (2) melter-evacuated canisters, and one (1) HLW debris canister, in any combination. For a WVDP-HLW Overpack loaded with less than 5 canisters, a transport insert shall be loaded in all empty basket cell locations.

The NAC-STC content weight shall be ≤ 45,800 lbs. in the WVDP-HLW Overpack configuration. The WVDP-HLW Overpack heat load shall be ≤ 1.5 kW. Top and bottom spacers are used for axial positioning of the WVDP-HLW Overpack within the NAC-STC cavity.

5.(c) Criticality Safety Index (CSI):

(1) CSI=0.0 for contents described in 5.(b)(1)(i), 5.(b)(1)(ii), 5.(b)(1)(iii), 5.(b)(1)(iv) (i.e., Yankee Class and CY Fuel and GTCC Waste), and 5.(b)(1)(vi).

(2) CSI=100 for contents described in 5.(b)(1)(v) (i.e., LACBWR fuel).

6. Known or suspected damaged fuel assemblies or rods (fuel with cladding defects greater than pin holes and hairline cracks) are not authorized, except as described in Items 5.(b)(2)(iii), 5.(b)(2)(v), and 5.b(2)(vi).

7. For contents placed in a GTCC waste container and described in Item 5.(b)(1)(iii), and which contain organic substances which could radiolytically generate combustible gases, a determination must be made by tests and measurements or by analysis that the following criteria are met over a period of time that is twice the expected shipment time:

The hydrogen generated must be limited to a molar quantity that would be no more than 4% by volume (or equivalent limits for other inflammable gases) of the TSC gas void if present at STP (i.e., no more than 0.063 g-moles/ft^3 at 14.7 psia and 70°F). For determinations performed by analysis, the amount of hydrogen generated since the time that the TSC was sealed shall be considered.

8. For damaged fuel rods and fuel debris of the quantity described in Item 5.(b)(2)(iii) and 5.(b)(2)(v): if the total damaged fuel plutonium content of a package is greater than 20 Ci, all damaged fuel shall be enclosed in a TSC which has been leak tested at the time of closure. For the Yankee Class TSC the leak test shall have a test sensitivity of at least 4.0×10^{-8} cm^3/sec (helium) and shown to have a leak rate no greater than 8.0×10^{-8} cm^3/sec (helium). For the Connecticut Class TSC the leak test shall have a test sensitivity of at least 1.0×10^{-7} cm^3/sec (helium) and shown to have a leak rate no greater than 2.0×10^{-7} cm^3/sec (helium).

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

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

   (b) Each packaging must be acceptance tested and maintained in accordance with the Acceptance Tests and Maintenance Program in Chapter 8 of the application, as supplemented, except that the thermal testing of the package (including the thermal acceptance test and periodic thermal tests) must be performed as described in the NAC-STC Safety Analysis Report.

   (c) For packaging Serial Numbers STC-1 and STC-2, only one of these two packagings must be subjected to the thermal acceptance test as described in Section 8.1.6 of the NAC-STC Safety Analysis Report. Only one thermal acceptance test needs to be performed. A separate acceptance test does not need to be performed for each of the contents described in 5.(b)(1), above.

   (d) For multiple packages being fabricated at the same time, at the same facility, using essentially identical fabrication methods, only the first package must be subjected to the thermal acceptance test described in Section 8.1.6 of the NAC-STC Safety Analysis Report. Separate thermal acceptance tests do not need to be performed for each of the contents described in 5.(b)(1), above.

10. Prior to transport by rail, the Association of American Railroads must have evaluated and approved the railcar and the system used to support and secure the package during transport.

11. Prior to marine or barge transport, the National Cargo Bureau, Inc., must have evaluated and approved the system used to support and secure the package to the barge or vessel, and must have certified that package stowage is in accordance with the regulations of the Commandant, United States Coast Guard.

12. For shipment of high burnup fuel assemblies, as described in content 5.(b)(1)(i)(2) and 5.(b)(1)(i)(4) and limited in 5.(b)(2)(i)(2) and 5.(b)(2)(i)(4) respectively, the maximum time duration from the time the package breaks the surface of the spent fuel pool until the package is placed in the horizontal orientation is limited to 72 hours. If this time limit cannot be met, the package may be re-flooded. HBU fuel assemblies subjected to a package re-flood are not authorized for shipment. High burnup fuel shipments are limited to a total duration of 6 months from the time package loading is complete until the package arrives at its final destination. These time limits also apply to packages containing commingled loadings of high burnup fuel and low burnup fuel as described in 5.(b)(2)(i).

13. For casks fabricated and accepted using the gamma shielding integrity acceptance criteria described in Chapter 8, Section 8.1.5.1.1 of the NAC-STC Safety Analysis Report for the upper 10.18 inches of the cask upper lead region, which only applies for directly loaded fuel, the cask user shall use the shield plate for the basket top weldment as detailed in license drawing 423-872.

14. Transport by air is not authorized.

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

16. Expiration date: May 31, 2019.

REFERENCES

NAC International application dated: June 7, 2018.

NAC International supplements dated: August 16, 2018, December 18, 2018, and February 1, 2019.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

/RA/

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

Date: 2/1/19