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**DEPARTMENT OF ENERGY**  
NATIONAL NUCLEAR SECURITY ADMINISTRATION  
1000 INDEPENDENCE AVENUE SW  
WASHINGTON DC 20585-1000

NR:RR:NSPlate G#C21-00922

March 23, 2021

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John Lubinski  
Director, Office of Nuclear Material Safety and Safeguards  
Nuclear Regulatory Commission  
Washington, DC 20555

M-140 SPENT FUEL SHIPPING CONTAINER - NUCLEAR REGULATORY  
COMMISSION CERTIFICATE OF COMPLIANCE USA/9793/B(U)F-85; REQUEST FOR  
RENEWAL

S3G CORE BASKET DISPOSAL CONTAINER - NUCLEAR REGULATORY  
COMMISSION CERTIFICATE OF COMPLIANCE USA/9786/B(U); REQUEST FOR  
CANCELLATION

**Background:**

a. M-140 shipping containers are used to ship the Navy's submarine spent nuclear fuel from servicing facilities to the Naval Reactors Facility on the Idaho National Laboratory. The M-140 shipping container is certified as a Type B package for shipment of fissile and highly radioactive material. Nuclear Regulatory Commission (NRC) Certificate of Compliance (CoC) USA/9793/B(U)F-85 for the M-140 shipping container expires on September 30, 2021.

b. The S3G Core Basket Disposal Container (CBDC) is used to make one-time shipments of irradiated core baskets and irradiated reactor components to disposal, where the container and its contents are buried. Naval Reactors has made a total of six loaded shipments of S3G CBDCs and owns one unused S3G CBDC. NRC CoC USA/9786/B(U) for the S3G CBDC expires on August 31, 2021.

**Discussion:**

a. This letter requests renewal of the NRC CoC for the M-140 shipping container. Naval Reactors has reviewed the safety and operational documentation for the fleet of 24 M-140 shipping containers, and there have been no operational experiences or container modifications that would preclude continued use of these containers. Enclosure (1) to this letter provides draft revision 16 of the DOE-NR CoC for your consideration.

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b. Since the previous NRC CoC renewal, Naval Reactors revised the D2W and S6W spent fuel in the M-140 safety analysis reports for packaging (SARPs) and associated DOE-NR CoC thermal restrictions. Changes to the SARPs and thermal restrictions support shipment of longer-lived D2W cores, use of a single thermal restriction criterion for each fuel type, and incorporation of a revised S6W grapple adapter design. In a conversation with Naval Reactors (N. Plate) on March 11, 2021, NRC (C. Allen) requested that the D2W and S6W M-140 SARP revisions be provided to the NRC for review and concurrence such that a single NRC CoC revision can be processed for both NRC CoC renewal and amendment of the NRC CoC thermal restrictions. Enclosures (2) and (3) provide the SARP revisions, along with a brief summary of the changes to the SARPs. Provisions in 10CFR71.38.b would be in effect to maintain the existing NRC CoC in an active state if technical review of the SARP revisions extends past the current expiration on September 30, 2021.

c. This letter also requests cancellation of the NRC CoC for the S3G CBDC. Naval Reactors has concluded there is no remaining use for the S3G CBDC.

**Request for NRC Action:**

a. NRC is requested to renew NRC CoC USA/9793/B(U)F-85 for the M-140 shipping container. NRC review and concurrence is also requested for the revisions to the D2W and S6W spent fuel in the M-140 shipping container SARPs provided in Enclosures (2) and (3).

b. NRC is requested to cancel NRC CoC USA/9786/B(U) for the S3G CBDC.

If you have any questions, please do not hesitate to call me at (202) 781-6034.



N. S. PLATE  
Naval Reactors

Copy to and Enclosures: see next page.

- Enclosure:
- (1) DOE-NR CERTIFICATE OF COMPLIANCE FOR THE M-140 SPENT FUEL SHIPPING CONTAINER, USA/9793/B(U)F-85 REVISION 16 (DRAFT)
  - (2) REVISION 8 OF THE D2W SPENT FUEL IN THE M-140 SHIPPING CONTAINER SARP
  - (3) REVISION 6 OF THE S6W SPENT FUEL IN THE M-140 SHIPPING CONTAINER SARP

Copy to:  
KAPLADSARS  
NRLFO  
NRLFO-Transportation Division [M. Salamon]

Director, Division of Fuel Management, NMSS, NRC [A. Kock]  
Chief, Storage and Transportation Licensing Branch, DFM, NMSS, NRC [J. McKirgan]  
Project Manager, STLB, DFM, NMSS, NRC [C. Allen]

General Manager, NNL [G. Lubinsky]  
Manager, Reactor Servicing, NNL [V. Pantloni]  
Manager, Reactor Servicing Systems, RS, NNL [M. Drewen]  
Manager, Shipping Containers, RSS, RS, NNL [S. Fiscus]  
Manager, Shipping Container Analysis, SC, RSS, RS, NNL [C. Haslett]

**ENCLOSURE (1)**

**DOE-NR CERTIFICATE OF COMPLIANCE FOR THE M-140 SPENT FUEL SHIPPING  
CONTAINER, USA/9793/B(U)F-85 REVISION 16 (DRAFT)**

Enclosure (1) to  
Ser 08G#C21-00922



U. S. DEPARTMENT OF ENERGY  
**CERTIFICATE OF COMPLIANCE**  
For Radioactive Materials PackagesOMB Approval  
No. 1910-2000

1a. Certificate Number USA/9793/B(U)F-85 (DOE-NR)	1b. Revision No. <u>4516 (draft)</u>	1c. Package Identification No. USA/9793/B(U)F-85 (DOE-NR)	1d. Page No. 1	1e. Total No. Pages 4
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## 2. PREAMBLE

2a. This certificate is issued under the authority of 49CFR Part 173.7(d).

2b. The packaging and contents described in item 5 below meets the safety standards set forth in subpart E, "Package Approval Standards," and subpart F, "Package, Special Form, and LSA-III Tests," Title 10, Code of Federal Regulations, Part 71.

2c. 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

(1) Prepared by (Name and address):

Naval Nuclear Laboratory  
P. O. Box 79  
West Mifflin, PA 15122-0079

(2) Title and Identification of report or application:

(See Contents List)  
Spent Fuel in the M-140 Shipping  
Container Safety Analysis Report for  
Packaging

(3) Date

February 1991

## 4. CONDITIONS

This certificate is conditional upon the fulfilling of the applicable Operational and Quality Assurance requirements of 49CFR Parts 100-199 and 10CFR Part 71, and the conditions specified in item 5 below.

## 5. Description of Packaging and Authorized Contents, Model Number, Criticality Safety Index, Other Conditions, and References:

M-140 Spent Fuel Shipping Containera. Description of Packaging

The M-140 Spent Fuel shipping container is a right circular cylinder with an overall height of 194 inches and a 126-inch maximum outer diameter. The container body consists of a 304 stainless steel forging with 14-inch-thick finned side walls and a 12-inch-thick bottom plate on which a 5-inch-high set of covered concentric cylinders (which act as an energy absorber) are welded. The 13-inch-thick (minimum) closure head is held in place by a wedge closure system consisting of 36 wedge assemblies and is sealed via concentric O-rings. The body has an inside diameter of 70 inches and an inside height of 146 inches. An access opening, closed by a bolted shield plug, is provided in the closure head for loading and unloading of spent fuel. During transport, a stainless steel protective dome, which fits into a groove in the upper body flange, covers the closure head. This dome is bolted to the container body.

Spent fuel is positioned within the M-140 shipping container by use of an internals assembly. The internals assembly is composed of stacked spacer plates, which have openings for the spent fuel modules. The internals assembly has a top plate or top plate subassembly which is preloaded by springs against a retaining ring fitted in a groove in the cask wall. Various internals assemblies are used to ship different types of spent fuel in the M-140 shipping container.

6a. Date of Issuance:

6b. Expiration Date: September 30, 2024

## FOR THE U. S. DEPARTMENT OF ENERGY

7a. Address (of DOE Issuing Office)

Naval Reactors  
U. S. Department of Energy  
Washington, DC 20585

7b. Signature, Name and Title (of DOE Approving Official)

S. J. Trautman  
C. W. Taylor  
Deputy Director, Naval Reactors

5. (Continued)

The M-140 vessel has penetrations for cooling water circulation, venting, and thermocouples. These penetrations are used only during loading and unloading operations and are sealed during shipment. The container is supported by a support ring mounted to the outside of the cooling fins. The support ring is bolted to a specially-designed well-type railcar. The shipping weight of a loaded M-140 container is about 375,000 pounds.

b. Authorized Contents

The contents of the container consist of fissile material, fission products, activated corrosion products, structural parts, and some residual water (about 6 gallons except as noted below) assumed to be contaminated with activated corrosion products. Maximum quantities per container for particular cores are as follows:

- (1) S3G-3: See applicable safety analysis report for maximum allowable quantity of fuel modules, control rods, and core structurals. Shipments of a different configuration other than that assumed in the SARP or of less than a full container worth of modules must be evaluated on a case basis.
- (2) S8G: See applicable safety analysis report for maximum allowable quantity of fuel modules and control rods.
- (3) D2W: See applicable safety analysis report for maximum allowable quantity of fuel modules and control rods. Shipments may contain up to 11 gallons of residual water.
- (4) S6W: See applicable safety analysis report for maximum allowable quantity of fuel modules and control rods.
- (5) S9G: See applicable safety analysis report for maximum allowable quantity of fuel modules and control rods.

c. Criticality Safety Index (CSI)

The minimum CSI for criticality control of an M-140 shipping container loaded with each authorized cargo is as follows:

- (1) S3G-3: CSI = 100
- (2) S8G: CSI = 0
- (3) D2W: CSI = 0
- (4) S6W: CSI = 0
- (5) S9G: CSI = 0

d. Restrictions

- (1) M-140 shipment is subject to shielding, thermal, and containment limits. The M-140 container shall not be shipped until the container is drained and the shielding hold time is satisfied. Container draining is governed by the thermal limits specified below. Based on containment assumptions, shipments shall be made no earlier than 150 days after shutdown. Other core specific restrictions are also listed.
- (2) Shipments shall be made in a dry condition, except for residual water.



5. (Continued)

(3) Transport by air of fissile material is not authorized.

(4) S3G-3

- a) Shielding: Shipment shall be made no earlier than 120 days after shutdown.
- b) Thermal: Container draining shall occur no earlier than 130 days after shutdown or at a time after shutdown as determined from applicable safety analyses. The decay heat level shall not exceed 62,300 BTU/hr per M-140 container at the time of container draining.
- c) Control rod holddown devices must be installed on defueling shipment cells which have control rods.
- d) The core age must be at least 4000 Logging Corrected Full Power Hours.

(5) S8G

- a) Shielding: Shipment shall be made no earlier than 89 days after shutdown.
- b) Thermal: Container draining shall occur no earlier than 105 days after shutdown or at a time after shutdown as determined from applicable safety analyses. The decay heat level shall not exceed 47,050 BTU/hr per M-140 container at the time of container draining.
- c) Full and partial fuel modules may be shipped in any combination, but all modules must be shipped with control rods.
- d) Control rod holddown devices must be installed on the cells. Module grapple adapters serve as control rod holddown devices.

(6) D2W

- a) Shielding: Shipment shall be made no earlier than 150 days after shutdown.
- b) Thermal: Container draining shall occur no earlier than 148 days after shutdown for middle-of-life shipboard cores or at a time after shutdown as determined from applicable safety analyses. For all other shipboard cores, container draining should occur no earlier than 163 days after shutdown or at a time after shutdown as determined from applicable safety analyses. The decay heat level shall not exceed 45,000 BTU/hr per M-140 container at the time of container draining.
- c) Control rod holddown devices must be installed on rodded modules. The universal grapple adapters serve as the rod holddown devices.

(7) S6W-Shipboard and Prototype

- a) Shielding: Shipment shall be made no earlier than 50 days after shutdown.
- b) Thermal: Container draining shall occur no earlier than 340 days after shutdown or at a time after shutdown as determined from applicable safety analyses. The decay heat level shall not exceed 41,712 BTU/hr per M-140 container at the time of container draining.

5. (Continued)

- c) All S6W spent fuel modules must have control rods, control rod restraints, and grapple adapters installed. A lower pedestal must be installed in each module holder port.

(8) S9G

- a) Shielding: Shipment shall be made no earlier than 100 days after shutdown.
- b) Thermal: Container draining shall occur no earlier than 164 days after shutdown or at a time after shutdown as determined from applicable safety analyses. The decay heat level shall not exceed 55,002 BTU/hr per M-140 container at the time of container draining.
- c) All S9G spent fuel modules must have control rods, control rod holddown devices, and grapple adapters installed.

e. References

None.

f. Additional Information

Nuclear Regulatory Commission review of the SARP for shipment of S3G-3 spent fuel in the M-140 shipping container is contained in their memorandum SGTB:NLO 71-9793 dated October 2, 1991.

Nuclear Regulatory Commission review of the SARP for shipment of S8G spent fuel (both shipboard and prototype) is contained in their memorandum SGTB:NLO 71-9793 dated April 30, 1992, and Docket No. 71-9793 dated November 4, 2014.

Nuclear Regulatory Commission review of the SARP for shipment of D2W spent fuel in the M-140 shipping container is contained in their memorandum Docket No. 71-9793 dated September 3, 1995 and Docket No. 71-9793 dated February 22, 2010.

Nuclear Regulatory Commission review of the SARP for shipment of S6W ~~prototype and shipboard~~ spent fuel in the M-140 shipping container is contained in their memorandum Docket No. 71-9793 dated August 10, 1998 and Docket No. 71-9793 dated September 26, 2017.

Nuclear Regulatory Commission review of the SARP for shipment of S9G spent fuel in the M-140 shipping container is contained in their memorandum Docket No. 71-9793 dated June 25, 2003.