CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATION NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9389	1	71-9389	USA/9389/B(U)F-96	1 OF	5

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.

c. ISSUED TO (Name and Address)

TN Americas LLC
7160 Riverwood Drive
Suite 200
Columbia, MD 21046

d. TITLE AND IDENTIFICATION OF REPORT OR APPLICATION

TN-40HT Transportation Package Safety Analysis Report, Revision No. 1, dated March 10, 2025

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: TN-40HT

(2) Description

The Model No. TN-40HT package, designed to transport up to 40 pressurized water reactor spent fuel assemblies, consists of a basket assembly, a containment vessel, a package body which also functions as the gamma shield and neutron shield, and impact limiters. A transport frame, which is not part of the packaging, is used for tie-down purposes.

The basket structure consists of an assembly of stainless steel cells joined by a fusion welding process and separated by aluminum and poison plates which form a sandwich panel. The panel consists of two aluminum plates separated by a poison plate. The aluminum plates provide the heat conduction paths from the fuel assemblies to the cask inner plate. The poison material provides the necessary criticality control. The opening of the cells is 8.05 in. x 8.05 in. which provides a minimum of 1/8 in. clearance around the fuel assemblies. The overall basket length (160.0 in.) is less than the cask cavity length to allow for thermal expansion and fuel assembly handling.

The containment vessel components consist of the inner shell and bottom inner plate, shell flange, lid outer plate, lid bolts, penetration cover plates and bolts (vent and drain), and the inner metallic seals of the lid seal and the vent and drain seals. The containment vessel prevents leakage of radioactive material from the cask cavity and also maintains an inert atmosphere (helium) in the cask cavity. The

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

overall containment vessel length is approximately 175.0 in. with a wall thickness of 1.5 in. The cylindrical cask cavity has a nominal diameter of 72.0 in. and a length of 163 in.

The carbon steel packaging body, which also functions as the gamma shielding, is around the inner shell and the bottom inner plate of the containment vessel. The 7.25 in. gamma shield completely surrounds the containment vessel shell and bottom plate, respectively. A 5.50 in. thick shield plate is also welded to the inside of the 4.50 in. thick lid outer plate.

Double metallic seals are used for the lid closure. To preclude air in-leakage, the cask cavity is pressurized with helium above atmospheric pressure. The cask cavity is accessed via draining and venting ports. Double metallic seals are utilized to seal these two lid penetrations. The over-pressure (OP) port provides access to the volumes between the double seals in the lid and cover plates for leak testing purposes. The OP port cover is not part of the containment boundary.

Radial neutron shielding is provided by a borated polyester resin compound surrounding the gamma shield shell. The total radial thickness of the resin and aluminum is 5.25 in. The array of resin-filled containers is enclosed within a 0.50 in. thick outer steel shell. The aluminum container walls also provide a path for heat transfer from the gamma shield shell to the outer shell. A pressure relief valve is mounted on top of the resin enclosure to limit the possible internal pressure increase under hypothetical accident conditions.

The impact limiters consist of balsa wood and redwood blocks encased in stainless steel plates. The impact limiters have an outside diameter of 144 in., and an inside diameter of 92 in. to accommodate the cask ends. The bottom limiter is notched to fit over the lower trunnions. The impact limiters are attached to each other using tie rods and attached to the outer shell of the cask with bolts. Each impact limiter is provided with fusible plugs that are designed to melt during a fire accident, thereby relieving excessive internal pressure. Each impact limiter has lifting lugs for handling, and support angles for holding the impact limiter in a vertical position during storage. An axial aluminum spacer is placed on the cask lid prior to mounting the top impact limiter to provide a smooth contact surface between the lid and the top impact limiter, and a radial aluminum spacer is placed on the inside of the top impact limiter recess to limit the radial gap between the axial aluminum spacer, the top of the cask OD, and the inner diameter of the impact limiter.

The nominal external dimensions of the package, with impact limiters, are 261 in. long by 144 in. wide. The total weight of the package is 275,000 lb.

5.(a)(3) Drawings

The package shall be constructed and assembled in accordance with the following TN Americas LLC, Drawing numbers:

TN40HT-71-1, Rev. 0, TN-40HT High Burnup Transport Cask Parts List and Notes

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

TN40HT-71-2, Rev. 0, TN-40HT High Burnup Transport Cask Transport Configuration

TN40HT-71-3, Rev. 0, TN-40HT High Burnup Transport Cask Shell Assembly

TN40HT-71-4, Rev. 0, TN-40HT High Burnup Transport Cask Lid Assembly and Details

TN40HT-71-5, Rev. 0, TN-40HT High Burnup Transport Cask Lid Details

TN40HT-71-6, Rev. 0, TN-40HT High Burnup Transport Cask Shell Assembly Details

TN40HT-71-7, Rev. 0, TN-40HT High Burnup Transport Cask Basket Assembly and Details

TN40HT-71-8, Rev. 0, TN-40HT High Burnup Transport Cask Basket Rails

TN40HT-71-9, Rev. 0, TN-40HT High Burnup Transport Cask Impact Limiter Radial Spacer

10421-71-7, Rev. 3, TN-40 and TN-40HT Transport Packaging Impact Limiter Spacer Details

10421-71-40, Rev. 2, TN-40 and TN-40HT Transport Packaging Impact Limiters General Arrangement

10421-71-41, Rev. 2, TN-40 and TN-40HT Transport Packaging Impact Limiters Parts List and Notes

10421-71-42, Rev. 1, TN-40 and TN-40HT Transport Packaging Impact Limiters Assembly

10421-71-43, Rev. 1, TN-40 and TN-40HT Transport Packaging Impact Limiters Details

10421-71-44, Rev. 1, TN-40 and TN-40HT Transport Packaging Impact Limiters Parts

5.(b) Contents of Packaging

(1) Type and Form of Material

(a) Unconsolidated Westinghouse 14X14 Standard, Westinghouse 14X14 OFA, Exxon 14X14 Standard (including high burn up standard), Exxon 14X14 TOPROD, with specifications in Table 1.2 of the application.

(b) The fuel assembly average burnup shall be ≤ 60,000 MWd/MTU.

(c) Fuel may include burnable poison rod assemblies (BPRAs) provided that the BPRAs have cooled for ≥ 18 years, and the average cumulative exposure of the fuel assembly(ies) where the BPRAs resided during reactor operation shall be ≤ 30,000 MWd/MTU.

(d) Fuel may include thimble plug assemblies (TPAs) provided that the TPAs have cooled for a minimum of 16 years, and the average cumulative exposure of the fuel assembly(ies) where the TPAs resided during reactor operation shall be ≤ 125,000 MWd/MTU, and that only TPAs that do not have water displacement rods extending into the active fuel may be loaded into the package.

(e) The combined weight of a fuel assembly and any BPRA or TPA shall not exceed 1330 lb.

(f) The fuel shall not be damaged or oxidized, i.e., (i) a partial fuel assembly from which fuel pins are missing unless dummy fuel pins are used to displace an amount of water equal to or greater than that displaced by the original pins; (ii) with known or is suspected to have gross cladding failures (other than pinhole leaks) or have structural defects sufficiently severe to adversely affect fuel handling and transfer capability; or (iii) has been exposed to air oxidation during storage, as indicated by maintenance or operating records.

(g) The minimum cooling time for various combinations of minimum assembly average enrichment and maximum assembly average burnup prior to transport shall be in accordance with Table 8-1 of the application.

(h) The maximum decay heat shall not be more than 0.80 kW per fuel assembly and 32.00 kW per package, including the BPRAs and TPAs.

(i) The boron-10 (B^{10}) in the neutron poison plates in the basket must be uniformly distributed in the plates with a minimum required B^{10} poison loading of 37.5 mg/cm^2 for enriched B-Al alloy or Metal Matrix Composite, or 45.0 mg/cm^2 for Boral.

(j) Integral Fuel Burnable Absorber is not an authorized content.

CERTIFICATE OF COMPLIANCE
FOR RADIOACTIVE MATERIAL PACKAGES

1. a. CERTIFICATION NUMBER	b. REVISION NUMBER	c. DOCKET NUMBER	d. PACKAGE IDENTIFICATION NUMBER	PAGE	PAGES
9389	1	71-9389	USA/9389/B(U)F-96	5 OF	5

(k) The nominal length of the assembly axial blankets shall not exceed 6.2 in. The maximum cooling time of the spent fuel shall not exceed 200 years.

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

(a) The combined weight of all fuel assemblies, BPRAs, and TPAs in a single package shall not exceed 52,000 lb.

(b) The number of assemblies in the package shall not exceed 40.

5.(c) Criticality Safety Index: 0.0

6. In addition to the requirements of Subpart G of 10 CFR Part 71, the TN-40HTpackage shall:

(a) Be prepared for shipment and operated in accordance with the Operating Procedures in Chapter 8.0 of the application, and

(b) Meet the Acceptance Tests and Maintenance Program of Chapter 9.0 of the application.

7. The personnel barrier shall be always installed during shipment of a loaded package.

8. Transport by air is not authorized.

9. The TN-40HT package authorized by this certificate are hereby approved for use under the general license provisions of 10 CFR 71.17.

10. Certificate of Compliance No. 9389, Revision 0, for the Model No. TN-40HT remains valid for a year from date of issuance for Revision 1.

11. Expiration Date: December 31, 2028.

REFERENCES

TN-40HT Transportation Package Safety Analysis Report, Revision No. 1, dated March 10, 2025, as supplemented on April 7, 2025.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Signed by Diaz-Sanabria, Yoira
on 04/17/25

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

Date: April 17, 2025

SAFETY EVALUATION REPORT

DOCKET NO. 71-9389

MODEL NO. TN-40HT PACKAGE

CERTIFICATE OF COMPLIANCE NO. 9389, REVISION NO. 1

1.0 SUMMARY

By letter dated April 25, 2024 (Agencywide Documents Access and Management System Accession No. ML24116A212), as supplemented by letter dated March 10, 2025 (ML25069A604), and April 7, 2025 (ML25098A122), TN Americas LLC (TN or the applicant) submitted an application, as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71, to the U.S. Nuclear Regulatory Commission (NRC) for revision to Certificate of Compliance (CoC) No. 9389 for the Model No. TN-40HT transport package. The proposed revision would add a new American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code alternative for TN-40HT fabrication. Previously, the NRC issued CoC No. 9389, Revision No. 0, for the Model No. TN-40HT package on December 27, 2023 (ML23360A006).

Specifically, the application requested a change to the CoC to allow the use of ASME B&PV Code, section III, alternative to the surface examination requirements of NB-5130 for the TN-40HT casks, which would be captured in the TN-40HT ASME Code Alternatives table in appendix 1.6.3 of the TN-40HT safety analysis report (SAR). The requirements in NB-5130 state that all full penetration weld edge preparation surfaces for joints in material that are 2 inches (50 millimeters) or more in thickness be examined by the magnetic particle or liquid penetrant method. In addition, NB-5130 includes acceptance standards for the evaluation of indications. The proposed alternate tests, in lieu of the surface examinations requirements of NB-5130, consist of a restricted radiographic testing examination (RT) with more restrictive acceptance criteria than the requirements of NB-5320, or a supplementary phased array ultrasonic testing (PAUT) examination. The SAR appendix 1.6.3, “ASME Code Alternatives,” table revisions incorporate the ASME B&PV Code, section III, alternative to the surface examination requirements.

The staff used the guidance in NUREG-2216, “Standard Review Plan for Transportation Packages for Spent Fuel and Radioactive Material,” to perform the review of the proposed packaging changes. Based on the statements and representations in the application and the conditions listed in the following evaluation, the staff concludes that the package meets the requirements of 10 CFR Part 71.

2.0 SAFETY EVALUATION

Description of Changes

The applicant stated that the proposed change is to allow the use of an ASME B&PV Code, Section III, alternative to the surface examination requirements of NB-5130 for the TN-40HT casks, which would be captured in the TN-40HT ASME Code Alternatives table in appendix 1.6.3 of the TN-40HT SAR. The proposed alternate tests consist of a RT with more restrictive acceptance criteria or a supplementary PAUT examination.

The applicant stated that the shell flange side of the shell flange to inner shell weld, if 2 inches (50 millimeters) or more in thickness at the time of welding, may be exempt from the magnetic particle or liquid penetrant examination required by NB-5130, provided Conditions 1 and 2 below are met:

1. The shell flange is produced from a forging.

2. The volumetric examination of the completed weld shall be modified or supplemented under option a or b below:

a. RT: The acceptance standard for RT of the completed weld joint shall be tightened (smaller allowance of defects). The criterion for elongated indications shall be NB-5320(b)(1) instead of NB-5320(b)(2). This tighter criterion shall be applied in addition to NB-5320(a), (c), (d), and (e), without change. In addition, tighter criteria for the selection of penetrometers per NB-5111(a) shall be applied. A 0.016-inch diameter source side image quality indicator wire shall be used as the essential wire. The area of interest shall cover the weld, the weld volume and 0.5 inches beyond the toe of the weld on the forging side.

b. PAUT: PAUT shall be performed on the completed weld joint with a defined area of examination of the weld surface and 0.5 inches beyond the toe of the weld on the forging side. The PAUT is in addition to completion of RT of the joint with acceptance standards of NB-5320 without modification. The acceptance standards of the PAUT shall be NB-5331(a)(1) and (b). Later editions of the ASME section V can be used for completion of the PAUT procedure and qualification.

The applicant noted that the use of this alternative is optional. The surface examination required by paragraph NB-5130 may still be used.

Staff Evaluation of Changes

As noted in NUREG-2216, section 7.4.4, applicants should identify the codes and standards for the design and construction of packages and verify that the application justifies the Code alternatives in order to enable an assessment of their acceptability. Paragraph NB-5130 of the ASME code requires that “all full penetration weld edge preparation surfaces for joint categories A, B, C, D, and similar joints in material two inches (50 millimeters) or more in thickness shall be examined by the magnetic particle or liquid penetrant method.” The purpose of the non-destructive examination (NDE) is to detect discontinuities on, near, or open to the surface of the material to be welded, that could propagate during welding and result in rejection of the weld in later weld examination.

The tests and examinations that are currently required by the ASME Code and the TN-40HT CoC to provide assurance of the final quality of the weld are as follows:

- MT or PT of the surface of the weld to the acceptance criteria of NB-5340 or NB-5350,

- Hydrostatic testing to 1.25 times the design pressure followed by MT or PT examination in accordance with NB-6200 and NB-5410, and

- Helium leak-testing per the American National Standards Institute N14.5 to the acceptance criteria of 10-7 reference cubic centimeters per second.

The applicant stated that laminar defects are the greatest concern as the types of discontinuities that could propagate during welding and would result in extensive repairs to the weld joint. The applicant also stated that non-laminar indications could exist in a machined surface of a weld preparation. To address this, the applicant proposed the alternatives in addition to the tests and examinations that are currently required by the ASME Code and TN-40HT CoC.

The alternative described below provides further assurance of the acceptability of the final weld, along with the following proposed changes to the NDE required of the final weld. The fabricator could select either of the two options in the second condition described below, which are found equivalent in terms of the final results of the weld:

As an alternative to the NDE required by paragraph NB-5130, the applicant proposed the following conditions:

1. The shell flange shall be made from forging material only. Plate material is not allowed.

2. Volumetric NDE of the final weld and 0.5 inches of base metal on the side of the forging shall include one of the following two options:

    a. Option 1, RT acceptance standard uses NB-5320(b)(1) instead of NB-5320(b)(2). NB-5320(a), (c), (d), and (e) apply without modification in addition to tightened penetrometer requirements of NB-5111(a). Reduce Max indication size from NB-5320(b)(2) requirement of 0.5 inches to 0.25 inches. Source Side Image Quality Indicator wire size for the 1.50 inches thick material reduced from NB-5111(a) requirement of 0.032 inches to 0.016 inches.

    b. Option 2, PAUT is performed on the completed weld joint with a defined area of examination of the weld surface with acceptance standard of NB-5331(a)(1) and (b) and 0.5 inches beyond the toe of the weld on the forging side after completion of RT with acceptance standard of NB-5320 without modification.

The NRC staff had previously approved the applicant's proposed ASME Code Alternative for the Prairie Island (PI) Independent Spent Fuel Storage Installation (ISFSI) TN-40HT cask (ML24008A131). The bases for acceptance in the PI ISFSI were that the proposed alternative NDE was consistent with the guidance of NUREG-2215, section 8.5.3, for welding processes that are not fully consistent with the ASME code; as a result the staff determined that either the enhanced RT or the PAUT, along with the existing tests and examinations contained in the license is sufficient to ensure the quality and structural integrity of the shell flange to inner shell welds for the TN-40HT design. In this application, the applicant has requested the alternatives be made available in the CoC for the TN-40HT transportation cask.

The NRC staff has reviewed the proposed alternatives in this application to the required NDE of paragraph NB-5130 and verified that the applicant has provided a sufficient description and technical basis for the proposed alternative NDE, consistent with the guidance of NUREG-2216, section 7.4.3, "Weld Design and Inspection," for welding processes that are not fully consistent with ASME code.

The NRC staff determined either the enhanced RT or the PAUT, along with the existing tests and examinations contained in the CoC, is sufficient to ensure the quality and structural integrity of the shell flange to inner shell welds, for the TN-40HT design. The staff finds that the applicant has demonstrated the proposed alternative provides an acceptable level of quality and safety.

The staff determined that the applicant has met the requirements in 10 CFR 71.31(c) because the applicant identified the applicable codes and standards for the design, fabrication, testing, and maintenance of the package and, in the absence of codes and standards, has adequately described controls for material qualification and fabrication.

3.0 CONDITIONS

The following conditions are added into CoC No. 9389:

Condition 10 states that CoC No. 9389, Revision 0, for the Model No. TN-40HT remains valid for a year from the date of issuance for CoC No. 9389, Revision 1.

Condition 11, previously listed as Condition 10 in CoC No. 9389, Revision 0, provides the expiration date of CoC No. 9389. The expiration remains the same as it was for CoC No. 9389, Revision 0.

4.0 CONCLUSION

Based on the review of the statements and representations in the application, the NRC staff concludes that the materials used in the transportation package are adequately described and evaluated, and that the Model No. TN-40HT package meets the requirements of 10 CFR Part 71.

Issued with CoC No. 9389, Revision No. 1, dated April 17, 2025