CERTIFICATE OF COMPLIANCE FOR SPENT FUEL STORAGE CASKS

The U.S. Nuclear Regulatory Commission is issuing this Certificate of Compliance pursuant to Title 10 of the *Code of Federal Regulations*, Part 72, "Licensing Requirements for Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste" (10 CFR Part 72). This certificate is issued in accordance with 10 CFR 72.238, certifying that the storage design and contents described below meet the applicable safety standards set forth in 10 CFR Part 72, Subpart L, and on the basis of the Final Safety Analysis Report (FSAR) of the cask design. This certificate is conditional upon fulfilling the requirements of 10 CFR Part 72, as applicable, and the conditions specified below.

Certificate No.	Effective Date	Expiration Date	Docket No.	Amendment No.	Amendment Effective Date	Package Identification No.
1014	05/31/2000	05/31/2020	72-1014	14	12/17/2019	USA/72-1014
	Renewed Effective Date	Renewed Expiration Date		Revision No.	Revision Effective Date	
	08/02/2023	05/31/2060		0	N/A	

Issued To: (Name/Address)

Holtec International
Holtec Technology Campus
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Safety Analysis Report Title

Holtec International Inc.,
Final Safety Analysis Report for the
HI-STORM 100 Cask System

CONDITIONS

This certificate is conditional upon fulfilling the requirements of 10 CFR Part 72, as applicable, the attached Appendix A (Technical Specifications) and Appendix B (Approved Contents and Design Features) for aboveground systems or the attached Appendix A-100U (Technical Specifications) and Appendix B-100U (Approved Contents and Design Features) for underground systems, and the conditions specified below:

1. CASK

   a. Model No.: HI-STORM 100 Cask System

   The HI-STORM 100 Cask System (the cask) consists of the following components: (1) interchangeable multi-purpose canisters (MPCs), which contain the fuel; (2) a storage overpack (HI-STORM), which contains the MPC during storage; and (3) a transfer cask (HI-TRAC), which contains the MPC during loading, unloading and transfer operations. The cask stores up to 32 pressurized water reactor fuel assemblies or 68 boiling water reactor fuel assemblies.

   b. Description

   The HI-STORM 100 Cask System is certified as described in the Final Safety Analysis Report (FSAR) and in the U.S. Nuclear Regulatory Commission's (NRC) Safety Evaluation Report (SER) accompanying the Certificate of Compliance (CoC). The cask comprises three discrete components: the MPC, the HI-TRAC transfer cask, and the HI-STORM storage overpack.

   The MPC is the confinement system for the stored fuel. It is a welded, cylindrical canister with a honeycombed fuel basket, a baseplate, a lid, a closure ring, and the canister shell. All MPC components that may come into contact with spent fuel pool water or the ambient environment are made entirely of stainless steel or passivated aluminum/aluminum alloys such as the neutron absorbers. The canister shell, baseplate, lid, vent and drain port cover plates, and closure ring are the main confinement boundary components. All confinement boundary components are made entirely of stainless steel. The honeycombed basket, which contains neutron absorbing material, provides criticality control.

1. b. Description (continued)

There are nine types of MPCs: the MPC-24, MPC-24E, MPC-24EF, MPC-32, MPC-32F, MPC-68, MPC-68F, MPC-68FF, and MPC-68M. The number suffix indicates the maximum number of fuel assemblies permitted to be loaded in the MPC. All nine MPC models have the same external diameter.

The HI-TRAC transfer cask provides shielding and structural protection of the MPC during loading, unloading, and movement of the MPC from the spent fuel pool to the storage overpack. The transfer cask is a multi-walled (carbon steel/lead/carbon steel) cylindrical vessel with a neutron shield jacket attached to the exterior. All transfer cask sizes have identical cavity diameters. The higher weight HI-TRAC transfer casks have thicker shielding and larger outer dimensions than the lighter HI-TRAC transfer casks.

Above Ground Systems

The HI-STORM 100 or 100S storage overpack provides shielding and structural protection of the MPC during storage. The HI-STORM 100S is a variation of the HI-STORM 100 overpack design that includes a modified lid which incorporates the air outlet ducts into the lid, allowing the overpack body to be shortened. The overpack is a heavy-walled steel and concrete, cylindrical vessel. Its side wall consists of plain (un-reinforced) concrete that is enclosed between inner and outer carbon steel shells. The overpack has air inlets at the bottom and at the top to allow air to circulate naturally through the cavity to cool the MPC inside. The inner shell has supports attached to its interior surface to guide the MPC during insertion and removal, provide a medium to absorb impact loads, and allow cooling air to circulate through the overpack. A loaded MPC is stored within the HI-STORM 100 or 100S storage overpack in a vertical orientation. The HI-STORM 100A and 100SA are variants of the HI-STORM 100 family and are outfitted with an extended baseplate and gussets to enable the overpack to be anchored to the concrete storage pad in high seismic applications.

Underground Systems

The HI-STORM 100U System is an underground storage system identified with the HI-STORM 100 Cask System. The HI-STORM 100U storage Vertical Ventilated Module (VVM) utilizes a storage design identified as an air-cooled vault or caisson. The HI-STORM 100U storage VVM relies on vertical ventilation instead of conduction through the soil, as it is essentially a below-grade storage cavity. Air inlets and outlets allow air to circulate naturally through the cavity to cool the MPC inside. The subterranean steel structure is seal welded to prevent ingress of any groundwater from the surrounding subgrade, and it is mounted on a stiff foundation. The surrounding subgrade and a top surface pad provide significant radiation shielding. A loaded MPC is stored within the HI-STORM 100U storage VVM in the vertical orientation.

2. OPERATING PROCEDURES

Written operating procedures shall be prepared for cask handling, loading, movement, surveillance, and maintenance. The user's site-specific written operating procedures shall be consistent with the technical basis described in Chapter 8 of the FSAR.

3. ACCEPTANCE TESTS AND MAINTENANCE PROGRAM

Written cask acceptance tests and maintenance program shall be prepared consistent with the technical basis described in Chapter 9 of the FSAR. At completion of welding the MPC shell to baseplate, an MPC confinement weld helium leak test shall be performed using a helium mass spectrometer. This test shall include the base metals of the MPC shell and baseplate. A helium leak test shall also be performed on the base metal of the fabricated MPC lid. In the field, a helium leak test shall be performed on the vent and drain port confinement welds and cover plate base metal. The confinement boundary leakage rate tests shall be performed in accordance with ANSI N14.5 to "leaktight" criteria. If a leakage rate exceeding the acceptance criteria is detected, then the area of leakage shall be determined and the area repaired per ASME Code Section III, Subsection NB requirements. Re-testing shall be performed until the leakage rate acceptance criterion is met.

4. QUALITY ASSURANCE

Activities in the areas of design, purchase, fabrication, assembly, inspection, testing, operation, maintenance, repair, modification of structures, systems and components, and decommissioning that are important to safety shall be conducted in accordance with a Commission-approved quality assurance program which satisfies the applicable requirements of 10 CFR Part 72, Subpart G, and which is established, maintained, and executed with regard to the cask system.

5. HEAVY LOADS REQUIREMENTS

Each lift of an MPC, a HI-TRAC transfer cask, or any HI-STORM overpack must be made in accordance to the existing heavy loads requirements and procedures of the licensed facility at which the lift is made. A plant-specific review (under 10 CFR 50.59 or 10 CFR 72.48, if applicable) is required to show operational compliance with existing plant specific heavy loads requirements. Lifting operations outside of structures governed by 10 CFR Part 50 must be in accordance with Section 5.5 of Appendix A and Sections 3.4.6 and 3.5 (if applicable) of Appendix B, for above ground systems, section 5.5 of Appendix A-100U for the underground systems.

6. APPROVED CONTENTS

Contents of the HI-STORM 100 Cask System must meet the fuel specifications given in Appendices B for aboveground systems or B-100U for underground systems to this certificate.

7. DESIGN FEATURES

Features or characteristics for the site, cask or ancillary equipment must be in accordance with Appendices B for aboveground systems or B-100U for underground systems to this certificate.

8. CHANGES TO THE CERTIFICATE OF COMPLIANCE

The holder of this certificate who desires to make changes to the certificate, which includes Appendices A and A-100U (Technical Specifications) and Appendices B and B-100U (Approved Contents and Design Features), shall submit an application for amendment of the certificate.

9. SPECIAL REQUIREMENTS FOR FIRST SYSTEMS IN PLACE

a. For the storage configuration, each user of a HI-STORM 100 Cask and HI-STORM 100U Cask with a heat load equal to or greater than 20 kW shall perform a thermal validation test in which the user measures the total air mass flow rate through the cask system using direct measurements of air velocity in the inlet vents. The user shall then perform an analysis of the cask system with the taken measurements to demonstrate that the measurements validate the analytic methods described in Chapter 4 of the FSAR. The thermal validation test and analysis results shall be submitted in a letter report to the NRC pursuant to 10 CFR 72.4 within 180 days of the user's loading of the first cask with a heat load equal to or greater than 20 kW. To satisfy condition 9(a) for casks of the same system type (i.e., HI-STORM 100 casks, HI-STORM 100U casks), in lieu of additional submittals pursuant to 10 CFR 72.4, users may document in their 72.212 report a previously performed test and analysis submitted by letter report to the NRC that demonstrates validation of the analytic methods described in Chapter 4 of the FSAR.

b. For the transfer configuration, each user of the HI-STORM 100 Cask and HI-STORM 100U Cask shall procure, if necessary, a Supplemental Cooling System (SCS) capable of providing the thermal-hydraulic characteristics (coolant temperature at the annulus inlet, coolant temperature located at the annulus outlet, and coolant flow rate) that will ensure that thermal limits (described in Appendix 2.C of the FSAR) are not exceeded during transfer operations. The thermal-hydraulic characteristics of the SCS shall be determined using the analytical methods described in Chapter 4 for the transfer configuration. For the transfer configuration, each first time user shall measure the SCS thermal-hydraulic characteristics to validate the performance of the SCS. The SCS analysis and validation shall be documented in an update to the 72.212 report within 180 days of the user's first transfer operation with the SCS. Condition 9(b) does not apply to the MPC-68M.

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10. PRE-OPERATIONAL TESTING AND TRAINING EXERCISE

A dry run training exercise of the loading, closure, handling, unloading, and transfer of the HI-STORM 100 Cask System shall be conducted by the licensee prior to the first use of the system to load spent fuel assemblies. The training exercise shall not be conducted with spent fuel in the MPC. The dry run may be performed in an alternate step sequence from the actual procedures, but all steps must be performed. The dry run shall include, but is not limited to the following:

a. Moving the MPC and the transfer cask into the spent fuel pool or cask loading pool.

b. Preparation of the HI-STORM 100 Cask System for fuel loading.

c. Selection and verification of specific fuel assemblies to ensure type conformance.

d. Loading specific assemblies and placing assemblies into the MPC (using a dummy fuel assembly), including appropriate independent verification.

e. Remote installation of the MPC lid and removal of the MPC and transfer cask from the spent fuel pool or cask loading pool.

f. MPC welding, NDE inspections, pressure testing, draining, moisture removal (by vacuum drying or forced helium dehydration, as applicable), and helium backfilling. (A mockup may be used for this dry-run exercise.)

g. Operation of the HI-STORM 100 SCS or equivalent system, if applicable.

h. Transfer cask upending/downending on the horizontal transfer trailer or other transfer device, as applicable to the site's cask handling arrangement.

i. Transfer of the MPC from the transfer cask to the overpack/VVM.

j. Placement of the HI-STORM 100 Cask System at the ISFSI, for aboveground systems only.

k. HI-STORM 100 Cask System unloading, including flooding MPC cavity, removing MPC lid welds. (A mockup may be used for this dry-run exercise.)

11. The NRC has approved an exemption request by the CoC applicant from the requirements of 10 CFR 72.236(f), to allow a Supplemental Cooling System to provide for decay heat removal in accordance with Section 3.1.4 of Appendices A and A-100U.

12. FSAR UPDATE FOR RENEWED CoC

The CoC holder shall submit an updated FSAR to the Commission, in accordance with 10 CFR 72.4, within 90 days after the effective date of the renewal. The updated FSAR shall reflect the changes resulting from the review and approval of the renewal of the CoC, including the HI-STORM 100 FSAR supplement, as documented in Appendix D of the HI-STORM 100 CoC renewal application, Revision 1, dated April 23, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21113A203). The CoC holder shall continue to update the FSAR pursuant to the requirements of 10 CFR 72.248.

13. 10 CFR 72.212 EVALUATIONS FOR CoC USE DURING THE PERIOD OF EXTENDED OPERATION

Any general licensee that initiates spent fuel dry storage operations with the HI-STORM 100 Cask System after the effective date of the renewal of the CoC and any general licensee operating a HI-STORM 100 Cask System as of the effective date of the renewal of the CoC, including those that put additional storage systems into service after that date, shall:

a. As part of the evaluations required by 10 CFR 72.212(b)(5), include the evaluations related to the terms, conditions, and specifications of this CoC amendment as modified (i.e., changed or added) as a result of the renewal of the CoC.

b. As part of the document review required by 10 CFR 72.212(b)(6), include a review of the FSAR changes resulting from the renewal of the CoC and the NRC Safety Evaluation Report related to the renewal of the CoC.

c. Ensure that the evaluations required by 10 CFR 72.212(b)(7) and determinations required by 10 CFR 72.212(b)(8) capture the evaluations and review described in (a.) and (b.) of this CoC condition.

d. Complete this condition prior to entering the period of extended operation or no later than 365 days after the effective date of the renewal of the CoC, whichever is later.

14. AMENDMENTS AND REVISIONS FOR RENEWED CoC

All future amendments and revisions to this CoC shall include evaluations of the impacts to aging management activities (i.e., time-limited aging analyses and aging management programs) to ensure they remain adequate for any changes to structures, systems, and components within the scope of renewal.

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Supplemental Sheet

15. AUTHORIZATION

The HI-STORM 100 Cask System, which is authorized by this certificate, is hereby approved for use under the general license issued pursuant to 10 CFR 72.210, subject to the conditions specified by 10 CFR 72.212, this certificate, and the attached Appendices A, B, A-100U, and B-100U, as applicable. The HI-STORM 100 Cask System may be fabricated and used in accordance with any approved amendment to CoC No. 1014 listed in 10 CFR 72.214. Each of the licensed HI-STORM 100 System components (i.e., the MPC, overpack, and transfer cask), if fabricated in accordance with any of the approved CoC Amendments, may be used with one another provided an assessment is performed by the CoC holder that demonstrates design compatibility.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Yoira K. Diaz-Sanabria

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Date: 2023.06.29 07:58:33 -04'00'

Yoira K. Diaz-Sanabria, Chief
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
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Washington, DC 20555

Dated: June 29, 2023

Attachments:
1. Appendix A
2. Appendix B
3. Appendix A-100U
4. Appendix B-100U