

April 23, 2004

Mr. Brian Gutherman, Licensing Manager
Holtec International
Holtec Center
555 Lincoln Drive West
Marlton, NJ 08053

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - HOLTEC HI-STAR 100
AMENDMENT - CERTIFICATE OF COMPLIANCE NO. 9261

Dear Mr. Gutherman:

By application dated September 16, 2003, as supplemented by the letter dated March 23, 2004, Holtec International (Holtec) requested approval of an amendment to Certificate of Compliance No. 71-9261, Revision 2, for the HI-STAR 100 Transportation Cask System. The enclosed request for additional information (RAI) identifies additional information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the application for the amendment. The requested information is listed by chapter number, title, and section number in the applicant's safety analysis report. NUREG 1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," was used by the staff in its review of the application.

Each individual RAI describes information needed by the staff to complete its review of the application and/or the SAR and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

As agreed in the letter dated October 30, 2003, those portions of the submittal indicated by Holtec that contain proprietary materials have been withheld from public disclosure pursuant to 10 CFR 2.390. The RAIs generated as a result of the review of those proprietary materials are also considered proprietary and are placed in Enclosure 2 which is withheld from public disclosure.

You may contact me at 301-415-2947 if you have any questions regarding the attached RAIs.

Sincerely,

/RA/

Meraj Rahimi, Project Manager
Licensing Section
Spent Fuel Project Office
Office of Nuclear Material Safety
and Safeguards

Docket No.: 71-9261
TAC No.: L23651
Enclosures:
1. RAI (non-proprietary)
2. RAI (proprietary)

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**SUBJECT: REQUEST FOR ADDITIONAL INFORMATION - HOLTEC HI-STAR 100
 AMENDMENT 9261 - CERTIFICATE OF COMPLIANCE NO. 9261**

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**HI-STAR 100 TRANSPORT SYSTEM
DOCKET NO. 71-9261
TAC NO. L23651**

REQUEST FOR ADDITIONAL INFORMATION

By application dated September 16, 2003, as supplemented by letter dated March 23, 2004, Holtec International (Holtec) requested approval of an amendment to Certificate of Compliance No. 71-9261, Revision 2, for the HI-STAR 100 Transportation Cask System. The enclosed request for additional information (RAI) identifies additional information needed by the U.S. Nuclear Regulatory Commission (NRC) staff in connection with its review of the application for the amendment. The requested information is listed by chapter number, title, and section number in the applicant's safety analysis report. NUREG 1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," was used by the staff in its review of the application.

Each individual RAI describes information needed by the staff to complete its review of the application and/or the SAR and to determine whether that applicant has demonstrated compliance with the regulatory requirements.

Chapter 1 - Introduction

- 1-1 Revise the SAR definition of damaged fuel to match the currently approved CoC which incorporates the latest staff guidance contained in ISG-1, Rev. 1. Also, revise the definition of intact fuel accordingly.

This editorial change updates the SAR to match currently approved CoC, dated Sept. 24, 2003.

- 1-2 Specify whether or not ISG-11, Rev. 3, is desired rather than the presently referenced Rev. 2.

The staff has noted an inconsistency between the ongoing HI-STORM amendment and this Hi-STAR amendment with respect to the versions of ISG-11 that are referenced. The applicant must determine whether or not this apparent inconsistency has any material impact on the operation of the HI-STAR versus the HI-STORM.

- 1-3 Label the table on Page 1.2-51 in the SAR.

This table is referred to on Page 1.2-2 in Chapter 1 of the SAR as Table 1.2.18. The same table number with a description needs to be provided on Page 1.2-51.

- 1-4 Clarify the difference in the proposed CoC minimum pitch allowed of 9.158 inches and Drawing 3927, sheet 3, Rev. 6 allowed pitch of 9.218 +/- 0.06 inches.

This information is needed to assure compliance with 10 CFR 71.47 and 71.51.

Chapter 2 - Structural

No additional information is needed.

Chapter 3 - Thermal

- 3-1 Explain why in the MPC-32 ANSYS thermal model (and other MPC types), the internal basket panels surrounding any given fuel cell are represented by a single material (e.g., defined material no. 2 in the MPC-32 ANSYS model).

According to the SAR, the internal basket panel are modeled as orthotropic material with along-panel and through-panel defined thermal conductivities. As specified in the applicant's ANSYS thermal model, a material oriented in the X-direction would be using the correct associated thermal conductivities (along-panel for the X-direction and through-panel in the Y-direction). However, the same material oriented in the Y-direction would be incorrectly using these thermal conductivities (i.e., along-panel thermal conductivity would be used instead of through-panel thermal conductivity, etc.) Based on the applicant's ANSYS thermal model defined coordinate system, different materials should be used for the internal panels to correctly capture the orthotropic nature of this material.

This information is needed to assure compliance with 10 CFR 71.7 and 71.33.

- 3-2 Clarify whether the Rayleigh effect is credited in the thermal analysis of the HI-STAR 100 system.

Page 3.4-13 of the SAR states that for conservatism, the heat dissipation enhancement due to Rayleigh effect is ignored. However, page 3.4-30 of the SAR states that the Rayleigh effect thermal conductivity multipliers are unchanged in this analysis, giving the impression that in fact, helium gas conductivity was modified using some kind of multipliers. If Rayleigh effect is considered in the thermal analysis, justification and validation should be provided.

This information is needed to assure compliance with 10 CFR 71.7 and 71.33.

- 3-3 Correct the apparent referencing errors in the SAR as described below.

- a. Page 3.4-31 states that low heat emitting fuel characteristics (including burnup and cooling time limits imposed on this class of fuel) are presented in Table 2.1.6. Table 2.1.6 does not contain this information.
- b. In Section 3.4.4.1, references are made to Tables 4.4.6 and 4.4.7 which do not exist.
- c. In Page 3.4-34, a reference is made to Holtec Drawing 1809 which does not exist.

This information is needed to assure compliance with 10 CFR 71.7 and 71.33.

- 3-4 Provide the maximum and allowable temperatures of other devices and/or equipment (namely, personnel barrier, tie-down system, support cradle, etc.) installed on the HI-STAR 100 system under normal conditions of transport.

The use of this equipment may have an adverse impact in the calculated temperatures by adding additional resistance to the dissipation of heat from the transport overpack to the environment.

This information is needed to assure compliance with 10 CFR 71.7, 71.33, and 71.43(g).

Chapter 4 - Containment

4-1 Provide the references for both the normal transport conditions and the hypothetical accident conditions for the following parameters listed in Table 4.2.12 of the SAR:

- Upstream pressure
- Downstream pressure
- Temperature

This information is needed to assure compliance with 10 CFR 71.51.

4-2 Clarify how the normal transport condition temperature listed in Table 4.2.12 of the SAR was determined.

This temperature appears to be inconsistent with assumption 15 on page 4.2-3 of the SAR, which states:

“The average cavity temperature for all analyses is conservatively assumed to be the design basis peak cladding temperature.”

In Chapter 3 of the SAR, the design basis peak cladding temperature for normal transport conditions is listed as 752 degrees Fahrenheit. (Reference Table 3.4.10). This value was not used for the containment analysis. Explain this discrepancy.

This information is needed to assure compliance with 10 CFR 71.51.

4-3 Clarify how the normal transport condition upstream pressure listed in Table 4.2.12 of the SAR was determined.

This pressure appears to be inconsistent with assumption 14 on page 4.2-3 of SAR, which states:

“... the internal pressure of the overpack is conservatively assumed to be larger than the maximum internal pressure of all MPC types determined in Chapter 3.”

In Chapter 3 of the SAR, the maximum internal pressure for MPC-32 is listed as 89.3 psig (104 psia). Table 4.2.12 states the upstream pressure for normal conditions is 104 psia, which is not larger than the value stated in Chapter 3. Explain this discrepancy.

This information is needed to assure compliance with 10 CFR 71.51.

- 4-4 Revise the statement “Isotopes which contribute greater than 0.01% but have a radiological half-life less than 10 days are neglected” on Page 4.2-5 of the SAR.

The analysis in Holtec Report No: HI-971780, “*Containment Analysis for the HI-STAR 100*,” shows that the parent isotopes of the short-lived radionuclides (e.g., Ba-137m and Rh-106) are accounted for in the A2 calculations. Isotopes that have half-lives less than (1) 10 days, and (2) the half-life of their parent isotope may be considered to be in secular equilibrium with their parents. According to 10 CFR 71, Appendix A, III, isotopes in secular equilibrium with their parent isotopes may be treated as a single radionuclide, and the A2 value to be taken into account should correspond to the parent nuclide (e.g. Cs-137 and Ru-106) of the decay chain. Since the parent isotopes are accounted for in the A2 determinations, the short-lived isotopes are **not** neglected, as Page 4.2-5 indicates.

This information is needed to assure compliance with 10 CFR 71, Appendix A, III.

- 4-5 Revise the column headings in Table 4.2.2 (Pages 4.2-16 through 4.2-20 of the SAR) for consistency.

On Page 4.2-16, the second column is titled “PWR MPCs;” on Pages 4.2-17 through 4.2-20, it is titled “MPC-24.”

Chapter 5- Shielding

- 5-1 Provide detailed justification for not explicitly analyzing the MPC-32 for azimuthal peaking as stated on page 5.4-3.

This information is needed to assure compliance with 10 CFR 71.47 and 71.51.

- 5-2 Figures 5.3.4 and 5.3.5 show the MPC-32 basket cell as modeled in MCNP, one with boral on all sides and one with boral on no sides. Clarify why there is no model with the boral on two sides or one side as shown in Drawing 3927, Sheet 3, Rev. 6.

This information is needed to assure compliance with 10 CFR 71.47 and 71.51.

- 5-3 Figure 5.3.9 displays a detailed cross sectional view of the HI-STAR 100 overpack with the MPC-24 (showing the thickness of the MPC shell and overpack as modeled in MCNP). Provide a similarly detailed view of the HI-STAR 100 with the MPC-32 on Figure 5.3.1.

This information is needed to assure compliance with 10 CFR 71.47 and 71.51.

Chapter 7 - Operating Procedures

Pending the resolution of burnup verification measurements, additional information may be needed.

Chapter 8 - Acceptance Criteria Maintenance Procedures

- 8-1 Provide an addition to the Acceptance Criteria to include the Holtec QA/QC requirements for the testing of neutron absorber material(s). The appropriate procedures may be incorporated by reference as was recently proposed for the Hi-Storm Amendment 2, Rev. 2 (presently under review by the NRC staff). In that amendment, Hi-Storm SAR Section 9.1.5.3 was incorporated into the Technical specifications by reference.

The basis for this change is the recognition that neutron absorber materials are proprietary materials. As such, these materials are not subject to the uniform production and quality control standards that exist for ASME Code materials. Additionally, that there is no reasonable manner in which to verify the performance of these materials during service. The function they perform is of high importance; eliminating the possibility of an inadvertent criticality. Consequently, the NRC staff finds that the production and quality control methods and requirements of these materials need to be better formalized. In this manner, therefore, no changes to the materials production methods may occur unless such (proposed) changes are first subjected to an independent review.