

Request for Additional Information  
Holtec International  
Docket No. 71-9261  
HI-STAR 100 Transportation Package

By letter dated February 5, 2010, Holtec International (Holtec) submitted an amendment request to the U.S. Nuclear Regulatory Commission for Certificate of Compliance No. 9261.

This Request for Additional Information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission staff in connection with its review of the amendment for the Model No. HI-STAR 100 package application. NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," was used for this review.

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

### **Chapter 1 – General Information**

- 1.1 Revise the application to correct an apparent typographical error in Table 1.2.3 regarding the minimum Metamic neutron absorber  $^{10}\text{B}$  loading for the MPC-32.

Drawing No. 3927, sheet 2, Revision 16, shows a minimum  $^{10}\text{B}$  loading of  $0.0310 \text{ g/cm}^2$  for Metamic neutron absorber plates, while Table 1.2.3 of the application shows a  $^{10}\text{B}$  loading of  $0.0106 \text{ g/cm}^2$ .

This information is needed to determine compliance with 10 CFR 71.55.

### **Chapter 2 – Structural Evaluation**

- 2.1 Clarify Licensing Drawings depicting layout and crush orientation for the single type of aluminum honeycomb.

The existing drawings and explanation in the revised sections of the application are insufficient for describing the layout and crush orientations for the modified impact limiter design. Specifically, the staff requests that Drawing C1765, sheet 2, Rev. 4; sheet 3, Rev. 5; sheet 4, Rev. 5; and sheet 6, Rev. 4 be modified to reflect the design change requested in the current licensing action. If the referenced sheets are to be maintained, then provide an additional drawing representative of the new design for the views depicted in C1765 for the original impact limiter design.

This information is needed to determine compliance with 10 CFR 71.33.

- 2.2 Provide input and output files for the 9-meter end drop case and 9-meter slapdown case.

The applicant provided no representative input and output files.

This information is needed to determine compliance with 10 CFR 71.73 (c) (1).

- 2.3 Provide overlay plots of the deceleration time histories for all corresponding drop orientations for the original impact limiter design and the modified impact limiter design.

The applicant provided no detailed deceleration time history information.

This information is needed to determine compliance with 10 CFR 71.73(c)(1).

- 2.4 Provide additional justification that the change in impact limiter aluminum honeycomb material will not adversely affect the performance of the impact limiter attachment and ancillary structures.

Changing the impact limiter aluminum honeycomb may introduce an unanalyzed condition for the impact limiter attachment. Staff confirmatory analysis indicated sensitivities in the behavior of the impact limiter and performance of the attachment depending on the arrangement of ancillary structural components such as the shims used to position the impact limiter skirt. Such sensitivities have the potential to be excited adversely by a significant design change such as the one being considered in this licensing action.

This information is needed to determine compliance with 10 CFR 71.73.

- 2.5 Provide the evaluation from Reference 2.6.5 "Structural Calculation Package for MPC," HI-2012787, Rev. 12, which supports the results shown in Tables 2.6.8 and 2.7.4 of the revised SAR for the optional design of the basket supports.

The applicant provided no detailed calculations/evaluations to support the optional design of the basket supports.

This information is needed to determine compliance with 10 CFR 71.71(c)(7) and 10 CFR 71.73(c)(1).

- 2.6 Provide the evaluation from Reference 2.1.5.1 "Miscellaneous Calculations for the HI-STAR 100 HB," HI-2033042, Rev. 4, which supports the safety factor reported for lifting of the HB Damaged Fuel Container in Section 2.1.5.4 of the revised SAR.

The applicant provided no detailed calculations/evaluations to support the revised safety factor for lifting the HB Damaged Fuel Container.

This information is needed to determine compliance with 10 CFR 71.45(a).

- 2.7 Explain the use of change bars in Section 2.1.6.1.1 and the last paragraph of page 2.I-13 of Section 2.1.7.1.

The changes described in these sections of Appendix I are not indicated in the Summary of Propose Changes and staff is unclear if these revised sections are intended for review.

This information is needed to determine compliance with 10 CFR 71.71 and 10 CFR 71.73.

- 2.8 If the applicant intends for Section 2.1.6.1.1 to be reviewed, provide the calculations and/or evaluations, which provide the basis for conclusions i) and ii) presented on page 2.1.9.

The applicant provided no detailed calculations/evaluations to support this change.

This information is needed to determine compliance with 10 CFR 71.71 and 10 CFR 71.73.

- 2.9 If the last paragraph of page 2.1-13 of Section 2.1.7.1 is intended to be reviewed, provide the calculations and/or evaluations from Reference 2.1.5.1 which provide the basis for the conclusion presented with respect to the 60g end drop.

The applicant provided no detailed calculations/evaluations to support this change.

This information is needed to determine compliance with 10 CFR 71.73(c)(1).

## **Chapter 8 – Acceptance Tests and Maintenance Program**

- 8.1 Clarify the constituent materials of METAMIC® in Section 8.1.5.5.2 of the application.

It is the staff's understanding that METAMIC® is produced from 6061 aluminum alloy and Type 1 ASTM C-750 B<sub>4</sub>C powder.

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii) and 71.55(b).

- 8.2 Clarify the basic processing steps used to manufacture METAMIC®.

It is the staff's understanding that METAMIC® has been manufactured using the same methodology since the initial qualifying EPRI study.<sup>1</sup> This basic methodology was described in Section No. 8.1.5.4.1 of the Model No. HI-STAR 60 package application, which was approved by the staff.<sup>2</sup>

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii) and 71.55(b).

---

<sup>1</sup> "Qualification of METAMIC® for Spent-Fuel Storage Application" EPRI Report No. 1003137. October 2001.

<sup>2</sup> Safety Analysis Report on the HI-STAR 60 Transport Package, Revision 2. Holtec International Report No. HI-207371. May 15, 2009.

- 8.3 Quantify the nominal particle size distribution of the boron carbide particles in METAMIC®.

The term “small” in Section 8.1.5.4.2 of the application is a relative term. A nominal particle size such as an “average particle size of 25 microns, with all particles less than 50 microns” was approved by the staff on the Model No. HI-STAR 60 package application.<sup>2</sup>

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii) and 71.55(b).

- 8.4 Specify the percentage of test coupons taken from panels of METAMIC® which will undergo neutron attenuation to verify the B-10 areal density during production runs.

An acceptance testing program which tested 10% of the test coupons with neutron attenuation was approved by the staff on the Model No. HI-STAR 60 package application.<sup>2</sup>

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii) and 71.55(b).

- 8.5 Clarify the specific procedural steps taken to verify the dimensional tolerances of the METAMIC® plates.

The percentage of METAMIC® panels which underwent neutron attenuation during production runs was stated in Section 8.1.5.4.3 of the Model No. HI-STAR 60 package application, which was approved by the staff.<sup>2</sup>

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii) and 71.55(b).

- 8.6 State the maximum temperature of the epoxy-bonded aluminum crush material during Normal Conditions of Transportation (NCT) and provide justification that the crush material’s properties will not be affected by the decay heat of the spent nuclear fuel.

Section 2.A-1 requires that the crush material be equally effective from -20°F to 100°F, but Table No. 3.4.10 of the application states that the highest temperature of the exposed impact limiter is 121°F. Therefore the temperature of the crush material within the impact limiter and closest to the package contents may be significantly higher than 100°F.

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii).

- 8.7 Justify the assumption that the thermal properties of Boral bound those of METAMIC® and that the aluminum cladding will not exceed those temperatures listed in Table No. 3.5.4 of the application.

The thermal conductivity of the core of Boral is lower than bulk METAMIC® (assuming a 40% B<sub>4</sub>C loading). However, the thermal conductivity of aluminum cladding in Boral is substantially higher than bulk METAMIC®. Boral is also thermally anisotropic.

The staff recognizes that the METAMIC® used in the Model No. HI-STAR 100 package does not have boron carbide loading of 40%, but no data for the thermal conductivity of METAMIC® with a 33% loading was provided, nor were the cladding-to-core dimensions of Boral given for comparison.

This information is needed to determine compliance with 10 CFR 71.73(c)(4).

- 8.8 Explicitly state that at least three layers of the Multi-Purpose Canister lid-to-shell weld be examined using the liquid penetrant method.

The sixth criterion of the “Helium Leakage Test - Large Weld Exception Criteria” in Interim Staff Guidance document No. 15, Rev. No. 1, states that at least three layers of the lid-to-shell weld shall be examined using the liquid penetrant method.

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii).

- 8.9 Discuss how qualification of the ultrasonic non-destructive examination (UT) of the Multi-Purpose Canister (MPC) lid-to-shell is conducted, or remove the reference to UT from Section 8.1.2 of the package application.

Ultrasonic examination of thick-sectioned austenitic stainless steel is problematic. Therefore, a higher level of qualification, above that required in Section IX of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code should be implemented for UT inspection of the (MPC) lid-to-shell weld. This qualification should include a comprehensive performance-based demonstration.

This information is needed to determine compliance with 10 CFR 71.33(a)(5)(iii).

- 8.10 Clarify the reference that is cited for the thermal conductivity of 5052 aluminum alloy for the impact limiters at temperatures above 400°F.

The proposed amendment states that solid aluminum is used to estimate the thermal properties of the aluminum honeycomb. However, the source of the listed thermal properties is not clear. Section II-D of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code lists the thermal conductivity of 5052 aluminum alloy no higher than 400°F.

This information is needed to determine compliance with 10 CFR 71.73(c)(4).