Request for Additional Information
Holtec International
Docket No. 71-9325
HI-STAR 180 Transportation Package

By letter dated May 31, 2013, Holtec International (Holtec) submitted an amendment request for the Model No. HI-STAR 180 Transportation Package.

This request for additional information (RAI) identifies information needed by the U.S. Nuclear Regulatory Commission staff (the staff) in connection with its review of the HI-STAR 180 package application to confirm whether the applicant has demonstrated compliance with regulatory requirements. The requested information is listed by chapter number and title in the package application. NUREG-1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel," was used for this review.

Chapter 1 – General Information

Licensing Drawings

1-1 Clarify on licensing drawing 4845, sheet 2, Rev. 8, or in Appendix 4.A of the application which is incorporated by reference into the Certificate of Compliance (CoC), the following related to seal core materials, seal jacket materials, microfinish range, and seal option 1 and 2.

The spring-energized core material, seal jacket material, and microfinish range play a specific role for containment. Licensing drawing 4845, sheet 2, Rev. 8, note 41, includes multiple spring-energized core materials, as well as multiple seal outer jacket / plating materials, and note 15 includes a microfinish range.

a) Specify if some of the seal core materials are only associated with seal option 1 or seal option 2.
b) Specify if some of the seal jacket materials are only associated with seal option 1 or seal option 2.
c) Specify if a portion of the microfinish range is only associated with seal option 1 or seal option 2.
d) Specify if some of the seal core materials are only associated with a portion of the microfinish range.
e) Specify if some of the seal jacket materials are only associated with a portion of the microfinish range.
f) Specify if some of the seal core materials are only associated with some of the seal jacket materials.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33, 71.51(a)(1) and (2).

1-2 Clarify detail B and optional detail B on drawing 4847, sheet 4, Revision 6, and drawing 4848, sheet 4.

Per discussions with the applicant, the staff requests a clarification of the drawings with respect to the use of friction stir welding (FSW) for detail B. Currently, the drawing indicates that a conventional welding process is specified for this configuration rather than FSW. If the applicant intends on using FSW for this configuration, it must be properly specified on the licensing drawings.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33.

Chapter 2 – Structural Evaluation

2-1 Demonstrate that the use of structural corner welds (previously characterized as non-structural welds) utilized on the basket does not alter the structural performance under normal conditions of transport and hypothetical accident conditions with respect to deformation acceptance criteria.

Corner welds on the basket assembly were previously characterized as construction welds as opposed to structural welds. Furthermore, a new welding process is identified in this amendment request. Due to these changes, staff does not have reasonable assurance that the finite element analysis of the basket is sufficiently robust to demonstrate that the basket can meet stated deformation performance requirements.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.71 and 71.73.

2-2 Explain in more detail the proposed change (B5) relative to the brittle fracture acceptance criteria.

The applicant states, without any detailed explanation or justification, that the fracture initiation criteria, as presented in NUREG/CR-3826, is to be used.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii) and 71.39.

2-3 Explain further why yield strength and ultimate strength properties are being reduced and whether or not the fuel basket support shims are an important to safety (ITS) component.

The applicant does not provide any justification on the reduction of the strength properties of the fuel basket shims.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii) and 71.39.

2-4 Explain the difference between “useful spring-back” and “total spring-back,” and the meaning of “fix,” as used in the justification for change.

The application states that “useful spring-back” is now used instead of “total spring-back” to clarify the required seal performance and that the information presented in Appendix 4.A, as well as in the drawings, together “fix” the seal joint design.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii).

2-5 Explain what specification of Nickel Alloy is used and why there is a need for weld overlay of the cask sealing surfaces.

The application mentions, in Change C1, that there is an option for Nickel Alloy for weld overlay of cask sealing surfaces.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii).

2-6 Provide weld test results to support the weld strength requirements and to demonstrate that the minimum weld strength requirements are met.

Note 17 of drawings 4847 and 4848 specifies that the weld strength of the basket corner welds shall be greater than 60% of the minimum tensile strength of the Metamic-HT panel material. The applicant also states in page 2.3-3 of the application that “Actual weld qualification test results showed weld strengths significantly higher than the minimum required.”

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii).

2-7 Provide justifications for deviating from the American Society of Mechanical Engineers (ASME) code requirements and explain the rationale for using radiographic testing in lieu of bend testing for weld soundness.

The applicant states in HSP 630 “Requirements for Welding of Metamic-HT,” Section 6.1.2, that “Radiographic Testing shall be used for weld soundness in lieu of bend testing.” ASME Boiler & Pressure Vessel Code Section IX requires bend testing to assess the soundness of the weld.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii).

2-8 Provide inspection acceptance criteria for FSW weld joints and the standards used as a basis for such acceptance criteria.

Note 9 of the drawing requires visual examination. Additional non-destructive evaluation (NDE) inspections are noted where required. Acceptance criteria are governed by ASME Code Section V, as clarified in Chapter 8 of the application.

Paragraph 2.2.1.1.4 of the application states that all NDE specifications will comply with Section V of the ASME Code which establishes the NDE inspection content format, inspection qualification requirement (ASNT-TC-1A), and the inspection results minimum documentation.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii).

Chapter 4 – Containment Evaluation

4-1 Provide the following information relevant to the two seal options shown in Appendix 4.A, "Confinement Boundary Seal Data," of the application which is incorporated by reference into the CoC. The following should be addressed relevant to Appendix 4.A of the application.

a) Appendix 4.A of the application should indicate both the dimensions and tolerances, not nominal dimensions, of the containment boundary seals and grooves to ensure compression / springback of the seals. Nominal values do not ensure compression / springback of the seals in order to provide a leaktight seal.

b) Appendix 4.A should indicate the value for the seal seating load, not the nominal value. The seating load values for the inner lid and outer lid seas were arrived at by American Seal and Engineering to provide the needed recovery during a transient event. A nominal value does not ensure the needed recovery during a transient event.

c) Confirm that the seating load values and units in Appendix 4.A are in agreement. It appears that in Attachment C.A to HI-2063563 (ML073100307) which was provided for the Rev. 0 CoC, the seating load values are given in units of mass or mass/length. It appears that the values in Appendix 4.A are in units of force or force/length.

d) In Appendix 4.A, Table 4.A-3, "Inner Port Cover Seal," clarify the units and values for the inner seal seating load and the outer seal seating load. For example, 42 N is equal to 9.5 pounds-force, not 9.5 kip. Also, 165 N is equal to 37.1 pounds-force, not 942 kips. Although unlikely, consider that there is the unit of force known as the kilogram-force or kilopond (kp) when ensuring the numerical values are correct for the units given.

e) In Appendix 4.A, Table 4.A-4, "Outer Lid Access Port Plug Seal," clarify the seal part/drawing number 050333. Previous tables in Appendix 4.A included two values for American Seal and Engineering seal part/drawing numbers and the part/drawing number, 050333, appears to be for the "Inner Port Cover Seal."

f) In Appendix 4.A, Table 4.A-4, "Outer Lid Access Port Plug Seal," provide the seal seating load.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33, 71.51(a)(1) and (2).

4-2 Provide the sealing proposal for the American Seal & Engineering seal option 1 if it is different from what was provided for the Rev. 0 CoC. Provide the sealing proposal for the Technetics seal option 2.

Licensing drawing 4845, sheet 2, Rev. 8, note 15, includes a microfinish range, and note 41 includes a new spring-energized core material, as well as a new seal outer jacket / plating material. It therefore appears that the American Seal & Engineering seal option 1 may have changed from what was provided for the Rev. 0 CoC, in Attachment C.A to HI-2063563 (ML073100307). In addition, the Technetics seal option 2 is new to this application and the sealing proposal has not been provided. The basis for the seal design should be provided.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33 and 71.51.

4-3 Provide confirmation that the seal option 1 and 2 containment boundary groove designs will not plastically deform during hypothetical accident conditions.

Based on the change to the seal / groove design, the application did not address that the containment boundary groove designs will not plastically deform during hypothetical accident conditions based on the structural analysis.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33 and 71.51(a)(2).

4-4 Provide the basis for Table 2.2.12, “Containment Boundary Bolted Joint Data,” Item No. 5 containment boundary seal minimum “Useful” spring back definition and value, such as from manufacturer data sheets and structural analysis.

The value that was previously approved as the minimum spring back at complete decompression was equal to 0.030 inches and was necessary in order to ensure sealing capability during a transient event. The value is now described as the minimum “Useful” spring back to maintain leaktightness with a value of 0.010 inches.

It is not clear what prompted the change in definition / value and how the new definition / value will maintain a leaktight seal considering numerically, a minimum value of 0.010 inches is less than a minimum value of 0.030 inches.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33, 71.51(a)(1) and (2).

4-5 Provide adequate justification for both the Technetics and American Seal & Engineering seal and groove designs such that the ANSI N14.5 leaktight criterion is achieved.

The staff is aware that a Technetics seal / groove design did not meet the leaktight criterion during leakage rate testing on a scale model of the HI-STAR 180 in October 2012. A Technetics seal / groove design has been submitted for this amendment and the lessons learned from the scale model testing may be appropriate to consider for the Technetics, as well as for the American Seal & Engineering seal / groove design.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33 and 71.51(a)(1).

4-6 Address if the option of an aluminum jacket has any impact on the seal temperature limits presented in Table 3.2.12 of the application, "HI-STAR 180 Component Temperature Limits."

Table 3.2.12, note 1, states, "…the temperature limits tabulated herein bound the manufacturers recommended limits for the limiting material (stainless steel)." It was not clear if the jacket material also should be considered, including the addition of an aluminium jacket, for the limiting material.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33, 71.51(a)(1) and (2).

Chapter 5 – Shielding Evaluation

5-1 Demonstrate that the dose rates, calculated using MCNP, are conservative and have adequate safety margins with respect to the regulatory limits.

Tables 5.1.3 and 5.1.4 of the application show that the maximum dose rate at two meters from the point 5 of Figure 5.1.1 for the F-32 basket, and from points 2 and 5 from the F-37 basket, are 0.0861, 0.0882, and 0.0873 mSv/hr, respectively. Adding two standard deviations, these dose rates exceed the regulatory limit of 10 CFR 71.47.

The margin for safety also is very small for most of the other dose rates in the tables mentioned above. This is without considering the uncertainties in source terms calculations using SAS2H.

The applicant needs to demonstrate with code benchmarked results that the accumulated errors in the dose rates, including errors and uncertainties in source terms and dose rate calculations using the MCNP code, will not exceed regulatory limits.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.47 and 71.51.

Chapter 8 – Acceptance Tests and Maintenance Program

8-1 Describe the Heat Affected Zone (HAZ) as a result of the Friction Stir Welding (FSW) process used for joining the Metamic-HT material in terms of mechanical properties, residual stress and microstructure.

Chapter 8 of the application discusses welding of Metamic-HT using the FSW process and corresponding HAZ. The temperatures are lower than those in the Thermo-mechanically Affected Zone (TMAZ), but may still have a significant effect if the microstructure is thermally unstable.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii) and 71.39.

8-2 Describe all aspects from discovery to final NDE of how weld repair of defects will be performed on joints welded using the FSW process, both in-production and in-service.

Chapter 8, Section 8.1.2, of the application removes reference to the ASME code and American Welding Society (AWS) for the examination and repair of Metamic-HT basket welds. FSW is associated with a number of unique defects and may require repair.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii) and 71.39.

8-3 Describe why coupon testing for lot pass/rejection has been revised from meeting any of the seven properties to only the failed Minimum Guaranteed Value (MGV) property of an ITS component and whether this follows ASME code and/or American Society of Testing Materials (ASTM).

Chapter 8, Table 8.1.4, of the application revises notes regarding coupon testing for lot pass/rejection.

This information is needed for the staff to determine if the package design meets the regulatory requirements of 10 CFR 71.33(a)(5)(iii) and 71.39.