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

By letter dated May 31, 2013, Holtec International (Holtec) submitted an amendment request for the Model No. HI-STAR 180 package. On September 18, 2013, Holtec responded to a request for additional information (RAI) letter dated August 29, 2013.

This second RAI letter 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 2 – Materials Evaluation

2.1 Provide an engineering analysis to prove that friction stir welding (FSW) weld joint ductility is not critical to the "important to safety" classification of the weld joint. Provide tensile tests of the base metal and of the weld joint to demonstrate that the welding is equal to or greater than 60% of the base metal. Provide elongation tests on the base metal and the weld test coupon to demonstrate that the elongation is not exceeding 3%.

This RAI is a follow-up to RAI 2-7, dated August 29, 2013. Staff had previously asked the applicant to justify the deviations 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 took the position that radiographic testing shall be used for weld soundness in lieu of bend testing, whereas the ASME Boiler & Pressure Vessel Code Section IX requires bend testing to assess the soundness of the weld. The ASME Section IX Code provides the qualification requirements for both weld procedures and welders, when performing welding activities for items governed by other sections of the ASME Code. Staff recognizes that Metamic-HT is not an ASME material and has unique structural characteristics, as well as thermo-physical properties, but waiving the bend test requirement of ASME Section IX is not acceptable because the purpose of the bend test is to prove weld joint ductility

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

2.2 Provide inspection acceptance criteria for FSW weld joints and the standards used as a basis for such acceptance criteria. Explain clearly the methodology used to identify

atypical FSW welding defects, using volumetric or non-volumetric inspection processes reviewed and approved by NDT Level III.

This RAI is a follow-up to RAI 2-8, dated August 29, 2013. The applicant had stated that ASME Section V references the techniques and methods to conduct VT; however, the acceptance criteria are not stated in this section. Rather, ASME Section V, paragraph T-980.1, states that one should follow the applicable code which, in this case, is Holtec's Standard Procedure, HSP-638, and the Quality Control Procedure, QCP 9.1, for inspection qualification, which references and follows ASNT-TC-1a.

The staff finds the response regarding acceptance criteria for FSW weld joints, and standards used, not acceptable. HSP-638 references the applicable code as being ASME Section III, Division 1, Subsection NG 5362, 2007. FSW was not recognized by the ASME Section III until the issuance of the 2013 edition; therefore, the 2007 Code criteria cannot be used as visual inspection criteria because the welding fabrication anomalies occurring in the FSW process are unique to that process. Some of these welding fabrication anomalies are also discussed throughout HSP-638; however, in order for these anomalies to be used, Holtec needs to meet the requirements of ASME Section V, 2007 edition, and of Article 14 "Examination System Qualification for qualifying the VT and/or NDE examination procedures and NDE personnel qualifications." These examinations and NDE personnel procedures shall be evaluated by Holtec's ASNT –TC 1a Tested Level III in the respective NDE disciplines. Also, the "Acceptance Standards for Visual Examination for Weld Surface Integrity" (paragraph 5362) are for established traditional welding processes such as SMAW, GTAW, and GMAW, but not for FSW. Therefore, such criteria cannot be used unless the requirements of ASME Section V, T-921.2, "Procedure Qualification," and T-992, "Performance Documentation," are completed, when required, by referencing the Code Section.

The applicant also stated that it follows its Quality Control Procedure, QCP 9.1, which references and follows ASNT-TC-1a. Staff notes that ASNT-1C-1a is only a recommended practice to qualify NDE inspection personnel to three levels of inspection based on their training experience in a specific discipline. ASNT-1C-1a shall not be used for the qualification of inspection requirements.

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

2.3 Remove, from the application, all statements pertaining to the following sentence: "The concept of equivalent materials is fully developed and gained NRC acceptance in the HI-STORM FW SAR."

Staff disagrees with this statement and has always been opposed to vague wording, such as "equivalent" or "similar," in safety analysis reports (SARs). What is "equivalent" to one applicant may not be "equivalent" for another applicant. All materials must have specified characteristics in accordance with recognized Codes and Standards, particularly for "important to safety" components. Defining "equivalency" by some critical characteristics meeting or exceeding those specified for the designated material is not acceptable for staff because it does not provide the means to determine how "equivalency" will be confirmed.

The HI-STORM FW SAR was reviewed against the requirements of 10 CFR Part 72. The flexibility for evaluation of changes contained in 10 CFR 72.48 is not included in the regulatory framework for transportation, 10 CFR Part 71. Therefore, these statements could lead to an incorrect conclusion that something other than a material specified in the licensing drawings could be used. Any packaging component which does not comply with the licensing drawings referenced in the certificate is not acceptable for shipment.

This information is needed by the staff to determine compliance with 10 CFR 71.43.

Chapter 4 – Containment Evaluation

4.1 Remove all language from the application stating or indicating that each of the seals in the American Seal & Engineering "Seal option 1" seals and the Technetics "Seal option 2" can be changed without NRC approval.

The staff identified several areas throughout the application that make reference to the ability of a user to make changes to seal options 1 and 2 without NRC approval (e.g., Appendix 4A of the SAR). The seal / groove design is an important to safety component. Therefore the staff expects to review a unique design for each of the seals in the American Seal & Engineering "Seal option 1" and the Technetics "Seal option 2" based on the design drawings for the associated seal part/drawing number. The SAR, licensing drawings, and any information incorporated by reference in the licensing drawings should be written to reflect this. Any language implying that the seal designs can be changed without NRC review and approval should be removed from the application.

This information is needed by the staff to determine compliance with 10 CFR 71.33, 71.51(a)(1) and (2).

4.2 Provide minimum and maximum dimensional values, or dimensions with tolerances for the following parameters in Appendix 4.A (this would also necessitate the removal of the word "Nominal" for each parameter):

a. Nominal Inner Seal Groove OD "Dg"
b. Nominal Inner Seal Seal OD "Ds"
c. Nominal Outer Seal Groove ID "Dg"
d. Nominal Outer Seal Seal ID "Ds"
e. Nominal Groove Width "W"
f. Nominal Seal Groove OD "Dg"
g. Nominal Seal OD "Ds"

The information in Appendix 4.A, "Confinement boundary seal data," should provide the location of the containment boundary components through the use of dimensions with tolerances. This information is necessary to ensure sufficient clearance between the seal and the cavity to prevent the seal from binding and not deforming properly in the cavity.

This information is needed by the staff to determine compliance with 10 CFR 71.33, 71.51(a)(1) and (2).

4.3 Provide minimum and maximum values, or values with tolerances for the nominal seal seating load in Appendix 4.A. This would also necessitate the removal of the word "Nominal" from the nominal seal seating load.

The American Seal & Engineering "Seal option 1" seal design drawings stated that the seating load was 850 lbs/in +/- 10% or 3200 lbs/in +/- 10%, depending on the seal. The Technetics "Seal option 2" seal design drawings stated that the seating load was ~942 lbs/in circumference or ~2284 lbs/in circumference, depending on the seal. The tolerance should be included for this value, or a minimum and maximum value should be given.

This information is needed by the staff to determine compliance with 10 CFR 71.33, 71.51(a)(1) and (2).

4.4 Revise the SAR Appendix 4A to ensure clarity that the seal manufacturer, seal part / drawing number, seal core, jacket, and lining materials, as well as specific material combinations of those materials, surface finish range, and minimum and maximum seal and groove dimensions (or dimensions with tolerances) are seal parameters that are subject to NRC approval.

Appendix 4A of the SAR states that the seal cross section diameter, groove depth, seating load, and spring-back are the only critical seal parameters and that all other seal properties are representative and may vary with seal manufacturer recommendations. Each seal manufacturer proposed specific seal designs to meet the reliability, sealing requirements, and life and recovery of the HI-STAR 180 seals. Specific seal materials and combinations of seal materials ensure there will be no chemical, galvanic, or other reactions. In addition, the surface finish can impact the performance of the seal. These parameters, as well as the seal and groove dimensions (see RAI 4.2), are all part of the seal / groove design which is an important to safety component not subject to change without NRC approval. The SAR should be revised to ensure that these parameters will not be changed by a future user without NRC approval.

This information is needed by the staff to determine compliance with 10 CFR 71.33, 71.43(d), 71.51(a)(1) and (2).

4.5 Clarify the seal part / drawing number "TBD" for the American Seal & Engineering "Seal option 1" in Table 4.A-4 "Outer Lid Access Port Plug Seal."

Clarify if the seal part / drawing number for the American Seal & Engineering "Seal option 1" in Table 4.A-4 "Outer Lid Access Port Plug Seal" is 050415 / 050415 CAV.

This information is needed by the staff to determine compliance with 10 CFR 71.33, 71.51(a)(1) and (2).

4.6 Describe how the information below has been verified for each of the seals in the Technetics "Seal option 2."

The "Notes" section of the Technetics "Seal option 2" states that for each seal:

1. Customer to verify that the bolting and hardware can generate the required seating load without warping or distorting.

2. Customer to verify material compatibility.

3. Customer to test and verify that seal meets all performance and safety requirements.

The SAR does not explain how these notes in the Technetics "Seal option 2" have been verified by the customer in order for the NRC to consider approval of the seal design.

Warping or distorting of the bolting hardware could impact containment capability during normal or accident conditions. Material compatibility is necessary to ensure there are no significant chemical, galvanic, or other reactions among the packaging components, or between the packaging components and the packaging contents. The staff acknowledges that the seals are leakage rate tested to the leaktight criterion in accordance with ANSI N14.5, as described in Chapters 7 and 8 of the SAR. If there are any additional tests that are being performed to verify that the seals meet all performance and safety requirements, those tests should be described.

This information is needed by the staff to determine compliance with 10 CFR 71.43(d), 71.51(a)(1) and (2).

4.7 Address the following relative to the "useful" spring-back in association with the seal design and the ability of the closure lid seals to remain leaktight under all hypothetical accident events.

a. Define the "useful" spring-back to maintain leaktight closure lid seals in the SAR.

b. Provide justification for the numerical value of 0.01 inches for "useful" spring-back. Address how the spring-back of 0.03 inches that was used in the American Seal & Engineering "Seal option 1" design does not meet the definition of "useful" spring-back.

c. Provide clear and complete documentation in Section 2.7 of the SAR to show that, based on the structural analysis, the closure lid seals for the American Seal & Engineering "Seal option 1" and the Technetics "Seal option 2" will remain leaktight under all hypothetical accident events based on the "useful" spring-back, as well as the associated margin for these analyses.

d. Explain how the closure lid seals in the American Seal & Engineering "Seal option1" and Technetics "Seal option 2" have been designed to provide the minimum "Useful" spring-back required in Table 2.2.12 of the SAR and how this can be concluded from the design drawings provided.

"Useful" spring-back has not been defined in the SAR, although it is a required characteristic in Table 2.2.12 of the SAR. Attachment C.A to HI-2063563 (ML073100307) states, "Based on input from analysis performed by Holtec it was determined that the seal must have the capability of recovering 0.030 inches minimum without the loss of sealing capability during a transient event." This appears to meet the definition of "useful" spring-back provided in the Holtec RAI 4-4 response, therefore it appears the "useful" spring-back should be 0.030 inches. Yet in this amendment request, the wording was changed from "Spring Back at Complete Decompression" to

"Minimum Useful Spring Back to maintain leaktightness," and the numerical value was changed from 0.03 inches to 0.01 inches in Table 2.2.12 of the SAR. A justification for this value, in association with the definition of "useful" spring-back, was not provided.

Section 2.7 of the SAR does not tie the numerical value for "useful" spring-back to the analysis results for each of the hypothetical accident events. Nor does it show the margin associated with each of these analysis. Holtec's response to RAI 4-4, dated September 18, 2013, states that, "… in all cases, the maximum predicted spring-back in the wake of the accident event is less than the minimum "useful" spring-back of 0.010 inches, indicating that the leaktight seals are maintained," but does not provide a clear justification for that statement.

The design drawings provided for the Technetics "Seal option 2" closure lid seals do not tie the "useful" spring-back to the design of the Technetics "Seal option 2" closure lid seals. It is not clear if the design drawings provided for the American Seal & Engineering "Seal option 1" tie the "useful" spring-back or "Spring-back at complete decompression" to 0.03 inches and how that value and associated definition is conservative compared to the required value of "useful" spring-back of 0.010 inches in Table 2.2.12 of the SAR. Holtec response to RAI 4-4 states, "useful" spring-back is the more appropriate (and conservative) measure for evaluating whether the leaktight seal is maintained following a hypothetical accident condition," but a justification for this statement was not provided.

This information is needed by the staff to determine compliance with 10 CFR 71.51(a)(2).