

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

By letter dated January 29, 2016, Holtec International (Holtec, or the applicant) submitted an amendment request for Certificate of Compliance No. 9261, Revision No. 10, for the Model No. HI-STAR 100 package. Staff issued a first request for additional information (RAI) letter dated May 18, 2016. Holtec provided RAI responses by letter dated August 22, 2016.

This second RAI letter identifies information needed by the U.S. Nuclear Regulatory Commission staff (the staff) in connection with its review of the Model No. HI-STAR 100 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 – Licensing Drawings**

1-1 Clarify, both in the application and on the licensing drawings, the criteria to determine what could be an "equivalent" or "better" material in lieu of those materials originally called for in the application for the trunnions and the GTCC overpack. The criteria should specify the minimum yield strength, minimum rupture strength, minimum rupture strain, and material standard/grade. The criteria should also describe how galvanic or chemical reactions will be precluded, and how material fracture toughness criteria will be met.

In its response to RAI 1-2, dated May 18, 2016, the applicant stated some of the criteria that will be used to in determining material equivalency for the trunnions, shown on sheet 3 of drawing 3913, and "substitutable" material for the HB GTCC overpack, described in note E on sheet 1 of drawing 10315 but did not include this information in the SAR or licensing drawings. The RAI response is not complete and does not appear to have been updated and included either in the drawings or in the application.

The staff notes that, while ISG-20 is intended to allow a degree of flexibility, it also states: "*Certificate holders and shippers need to provide sufficiently detailed information in these parts for NRC staff to perform an adequate technical review.*" All applications should meet the specified material characteristics in accordance with the Codes and Standards for important to safety (ITS) components.

This information is required by the staff to determine compliance with 10 CFR 71.31(c).

- 1-2 Clarify the torque load to be applied to the lift holes in the MPC enclosure vessel lid.

In the RAI letter dated May 18, 2016, it was observed that Note 8 on Sheet 4 of licensing drawing 3923 specified a torque test that may be used to qualify lift holes threads; however, the bolt torque was not specified. In its RAI response, the applicant stated that the torque load will be in accordance with Holtec's Quality Assurance (QA) program. However, this information should be placed on the licensing drawings, contained in the operating procedures, and/or in the acceptance tests and maintenance program chapters of the application. See Section 1.5.3 of NUREG 1617 for further information.

This information is required by the staff to determine compliance with 10 CFR 71.45, 71.111, and 71.123

- 1-3 Indicate on the drawings the weld filler material specifications and the electrode classification that will be used for the welds specified on the plans.

In the RAI letter dated May 18, 2016, the staff noted that "*Calculations in the application have assumed base material mechanical properties for welds. However, weld filler material and welding process have not been provided. Reference to the ASME codes alone is insufficient.*" The applicant responded that material tensile strength is indicated in the application. This material property is described in the electrode classification and should be placed on the drawings along with the weld filler specification for the staff to perform its inspection to identify material conditions regarding unintended galvanic or corrosive reactions, embrittlement, diminished structural performance, and ensures that proper NDE techniques are applied for QA purposes.

Additionally, the applicant stated: "*The weld process is not specified, since this would limit the possibility to make process improvements as improved technology becomes available. We believe that this approach meets the intent of ISG-20.*" While ISG-20 is intended to allow a degree of flexibility it also states: "*Certificate holders and shippers need to provide sufficiently detailed information in these parts for NRC staff to perform an adequate technical review.*"

The staff notes that new processes and technology have to have adequate supporting information to ensure adequate structural performance, fabrication, and inspection especially if the welding technique/process is not contained in the code of interest (ASME code). Such welding information should also be placed on the licensing drawings.

This information is required by the staff to determine compliance with 10 CFR 71.31(c).

- 1-4 Clarify the weld information specified in the licensing drawings for the GTCC overpack assembly.

In the RAI letter dated May 18, 2016, the staff noted that Note 2 on sheet 1 of drawing 10315 states that "*all weld sizes are minimums*" and that the applicant had stated "*additional welds may be added by the fabricator as deemed necessary, except where specified by Holtec.*" The staff asked the applicant to (i) describe what codes will be used with non-minimum weld sizes and to what extent they will be increased, (ii) clarify where additional welds will be made and their size. The staff noted that (i) increased/extra welds can alter the load path of the package and affect its performance

with respect to normal conditions of transport and hypothetical accident conditions, (ii) it was unclear how quality control measures, from a QA point of view, can be ensured if the location of additional welds are unidentified. This comment also pertains to the GTCC waste container (note 7 on sheet 1 of drawing 10316).

The applicant responded to this RAI by stating that *“Additional welds are fully evaluated by Holtec engineering to confirm that unintended consequences are avoided, with additional analysis if required”*. Such justification should be provided in the application and noted in the engineering drawings as part of package description, to support that the package will be able to meet the requirements of normal conditions of transportation and hypothetical accident conditions. NDE techniques for these additional welds should be noted on the licensing drawings per ASME Code requirements for inspection and pertinent NDE.

This information is required by the staff to determine compliance with 71.33(a)(5), 71.71, and 71.73.

- 1-5 Provide tolerances specified in the licensing drawings of the GTCC overpack assembly.

In the RAI letter dated May 18, 2016, the staff requested clarification of Note F, sheet 1, of Drawing 10315 which stated in part that *“dimensions indicated as nominal will vary to the extent typical in applicable fabrication operations”*. The staff indicated that it was unclear what the maximum and minimum values were for dimensions denoted as “nominal” based on the above description. The staff requested that the applicant clarify the tolerances on components which are neither dimensioned as nominal, minimum, maximum or reference and noted that the shells shown in Section CB-CB sheet 3 of drawing 10315 do not fall in any of the categories mentioned above as the drawing itself has no tolerance specified for such a case.

In response, the applicant stated that not providing this information was consistent with the intent of ISG-20. While ISG-20 is intended to provide some degree of flexibility in package design, it does not preclude the need for sufficient detailed information for an adequate technical review. Excessively large tolerances in material thickness and size could appreciably alter the performance of the package with respect to the drop tests specified in 10 CFR 71.71 and 71.73, as well as shielding, and so this information is requested. ISG-20 states that *“The reviewer should ensure that reasonable tolerances for dimensions and weights are specified, because packaging features may be subject to some variability in fabrication”*.

While it is clear that tolerances allow for variability in fabrication, it is unclear what those tolerances are and their impact to package performance. Additional information regarding tolerances can be found in NUREG CR-5502, page 2, which states: *“All dimensions indicated on drawings should include tolerances that are consistent with the package evaluation. Tolerances may be addressed by a drawing note that defines a general tolerance applicable to many features. If a design feature needs a more (or less) restrictive tolerance than indicated by the note, the appropriate tolerance should be specified explicitly in the dimensioning of that feature.”*

Therefore, the applicant is requested to specify nominal tolerances on the engineering drawings.

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

## Chapter 2 – Structural and Materials Evaluation

- 2-1 Justify the use of non-code compliant NDE examination for welds at the containment boundary of the HI-STAR 100 overpack or clarify how non-code compliant NDE will meet the NDE requirements of the ASME Code requirements. The licensing drawings should be updated accordingly.

In response to RAI 1-2 dated May 18, 2016, the applicant stated that the containment boundary welds for items such as “gamma shells” in Detail A, Detail B etc. on sheet 2 of Drawing 3913 are: (1) not part of the pressure retaining boundary, (2) are non-containment boundary, and (3) are non-structural welds. However, Figure 4.1.1 (primary containment boundary components), in Chapter 4 of the application, indicates that the bottom plate and top flange are part of the primary containment boundary. These welds structurally attach gamma shell layers to the pressure retaining boundary, and therefore, the welds should be in compliance with ASME Section III, Subsection NB, article 5262 (Structural Attachment Welded Joints) which states: “*Structural attachment welded joints made to pressure retaining material shall be examined by either the magnetic particle or liquid penetrant method.*”

This information is required by the staff to determine compliance with 10 CFR 71.31(b) and 71.31(c).

- 2-2 Specify the optional screw material indicated in the plug weld call-out for the MPC enclosure vessel drawing.

In the RAI letter dated May 18, 2016, it was noted that Note 6 on sheet 3 of Drawing 3923 indicated optional set screws to be used for penetrations contained within the closure ring of the MPC vessel. The RAI response did not indicate any material specifications. The staff does not have reasonable assurance that galvanic or corrosive reactions will not occur between dissimilar materials or from the operating environment.

This information is required by the staff to determine compliance with 10 CFR 71.33(a)(5) and 71.43(d).

- 2-3 Clarify the weight of the HI-STAR HB GTCC waste container (GWC) in the application.

The applicant described the shorter GWC canister (as compared to the MPC-HB) shown in Table 2.II.2.1 as weighing 26,000 lb empty while the MPC-HB weighs approximately 27,000 lb (not including 32,000 lb of fuel). In its RAI response, the applicant described the fuel basket as not being included in the MPC-HB weight (27,000 lb) and that it was included in the GWC canister weight (26,000 lb). This information however, was not included in the latest revision of the application (Table 2.I.2.1 and Table 2.II.2.1 for the MPC-HB and GWC canister respectively). The weights of the canisters, with or without fuel baskets, should be clearly indicated in tables Table 2.I.2.1 and Table 2.II.2.1.

This information is required by the staff to determine compliance with 10 CFR 71.33(a)(2).

- 2-4 Revise the application to provide acceptance criteria for the GWC-HB vessel integrity that clearly define allowable degraded conditions prior to transport. The acceptance criteria should demonstrate containment integrity during hypothetical accident conditions. Discuss methods, e.g., transport inspections, used to ensure that the GWC-HB meets the proposed acceptance criteria. This is applicable to GWC-HB canisters that may be in dry storage under a 10 CFR Part 72 license for greater than 20 years:

The response to RAI 7-2, dated August 22, 2016, addressed GWC-HB canisters that provide the containment function for greater than class C waste during transportation. The response stated that concerns about potential aging mechanisms are eliminated by limiting transportation to those canisters that are stored in a non-ventilated enclosure or overpack, and that the GWC-HBs must be leak-tested prior to transportation. The response also stated that the aging management program under 10 CFR Part 72 shall confirm that the GWC-HBs are free of degradation that could significantly reduce the packaging effectiveness.

The staff notes that there are no proposed activities to verify the ability of the GWC-HB canisters to fulfill their containment function during hypothetical accident conditions. The application does not define acceptance criteria for credible degraded conditions (e.g. loss of material due to localized corrosion pits, etching, crevice corrosion; presence of corrosion products) that ensures that cracks will not develop during transport, which could compromise the validity of the leak-tightness criterion during transport. The structural evaluation of the GWC-HBs does not consider potential degraded conditions of the GWC-HB during dry storage under a Part 72 license. In addition, leak testing prior to transportation is not capable of verifying the absence of flaws that may propagate through-wall during a hypothetical accident. Therefore, the application should describe the methods used to ensure that the acceptance criteria for the GWC-HB enclosure vessel integrity are met.

The staff also notes that the reliance on a future, undefined, aging management program for storage is not an adequate approach. The staff has no assurance that a storage program will include activities to confirm that the non-ventilated enclosure prevented ingress of moisture and environmental contaminants, or will include inspections that are capable of identifying and responding to degradation specifically relevant to maintaining confinement during transportation accidents. Therefore, reliance on a 10 CFR Part 72 aging management program, to ensure compliance with the HI-STAR GWC-HB structural safety analyses, is not adequate.

This information is required by the staff to determine compliance with 10 CFR 71.55(e), 71.73 and 71.85(a).

#### **Chapter 4 – Containment Evaluation**

- 4-1 Commit to state that personnel approving the leakage test procedures and performing the leakage tests are qualified.

The response to RAI 4-16 provided some information on qualifications related to the leakage (non-pressure) tests, such as being in accordance with a written quality assurance program. However, the description provided in Chapter 8 does not clearly state that the leakage tests will be written, approved, or performed by qualified personnel for the GWC-HB and the HI-STAR 100 for the Diablo Canyon MPC-32.

This information is required by the staff to determine compliance with 10 CFR 71.33.

- 4-2 Clarify the containment leakage rate acceptance criterion for the HI-STAR 100 Diablo Canyon MPC-32.

According to ANSI N14.5, the allowable leakage rate is the ratio of the allowable release rate and the activity per unit volume. The response to RAI 4-8 stated that the release rates for the Diablo Canyon MPC-32 content is calculated by applying the free volume ratio to reflect the differences in canister volume between a nominal MPC-32 and the Diablo Canyon MPC-32. It is not clear when the free volume ratio was applied, considering that Supplement 8.III refers to the main section of Chapter 8, which only lists one leakage rate criterion in Table 8.1.1.

This information is required by the staff to determine compliance with 10 CFR 71.33, and 71.51.

- 4-3 Demonstrate that the GWC lid-to-shell weld has been adequately leak tested.

The response to RAI 4-16 and the text in Table 8.II.2 of the application appear to indicate that the GWC lid-to-shell weld, which is part of the containment boundary, is not leak tested. Rather, the response states that the weld is examined by volumetric testing, ultrasonic testing, or progressive multi-layer liquid penetrant examination.

The staff notes that the subject of ISG-18, which discusses examinations of closure welds, is for the closure of storage confinement boundaries and not for transportation containment boundaries.

This information is required by the staff to determine compliance with 10 CFR 71.33.

- 4-4 Clarify the limit for the amount of flammable gas within a canister during transportation.

The response to RAI 7-2 indicated that the Section 7.0 "Introduction" includes the sentence: "The dryness criteria under the Part 72 CoC shall be considered acceptable for use in transport under Part 71 [7.1.2], [7.1.6];" a similar sentence was provided in Supplement 7.II and Supplement 7.III for the HI-STAR 100 package with Diablo Canyon MPC-32.

The narrative in the application should state explicitly whether the concentration of flammable gas is less than 5% volume, when transported, for both NCT and HAC.

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

- 4-5 Demonstrate that the condition of a GWC-HB or Diablo Canyon MPC-32 will be reviewed, prior to transport, if stored on a pad for less than 20 years.

The response to RAI 7-2 indicated that the GWC-HB would be leak tested within a test chamber prior to transport if it has been on the storage pad for more than 20 years. However, this test was not mentioned for the Diablo Canyon MPC-32. In addition, there was no justification to show that the GWC-HB, MPC-32, or their content, would be in an appropriate condition for transport if stored on a pad for less than 20 years.

This information is required by the staff to determine compliance with 10 CFR 71.33 and 71.51, 71.87.

- 4-6 Demonstrate that the loading procedures will ensure that the source term conditions, specified in the CoC, will be satisfied.

The response to RAI 4-4 described the non-dispersible and dispersible solid content and their activity. However, there was no clear procedure in Chapter 7, or any mention of detailed procedures even in lower tier documents, that would ensure the varied content would satisfy the source terms in the CoC.

This information is required by the staff to determine compliance with 10 CFR 71.33.

- 4-7 Clarify the classification category, as defined in NUREG/CR-6407, of the containment boundary for the HI-STAR 100 with Diablo Canyon MPC-32 and the containment boundary for the GWC-HB.

The category of the containment boundaries were not clearly stated in the response to RAI 1-3 and RAI 4-17; thus, a determination could not be made.

This information is required by the staff to determine compliance with 10 CFR 71.33.

## **Chapter 6 – Criticality Evaluation**

Refer to proprietary enclosure.