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August 11, 2010

Mr. Pierre Saverot
c/o U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Reference: Docket No. 71-9261, TAC No. L24418
USNRC Docket No. 72-27 (Humboldt Bay ISFSI FSAR)
Holtec Project 5014
[1] NRC Letter (Saverot) to (Morin) dated June 10, 2010
[2] Holtec Letter 5014696, dated February 5, 2010

Subject: Transmittal of Response to Request for Additional Information on HI-STAR 100 Transport Cask License Amendment Request 9261-8

Dear Mr. Saverot:

The following letter transmits Holtec's responses to the request for additional information [1] on licensing amendment request 9261-8 for the HI-STAR 100 transport cask [2]. Attachment A provided with this letter contains the responses to the request for additional information (RAI).

Attachment B contains the sections of the Safety Analysis Report (SAR), Holtec Report HI-951251 Revision 15 and licensing drawing (C1765 Sheet 6, Revision 5), updated to support the responses. These are provided here as draft. Prior to the issuance of the Certificate of Compliance, Holtec will provide complete copies of both the proprietary and non-proprietary versions of Revision 15 of the SAR.

Attachments C through E contain the proprietary calculations supporting the response to the RAI. The proprietary input and output files requested in the RAI are included on the set of DVDs enclosed with this letter.

Attachment F contains an affidavit written in accordance with 10 CFR 2.390 to request withholding of the proprietary information transmitted with this letter.

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Thank you for your prompt attention to this application. Please call me at 856-797-0900 x687 if you have any questions with regards to this submittal.

Sincerely,

Tammy Morin
Licensing Manager
Holtec International

Attachments: [A] Response to Request for Additional Information
[B] Holtec Report HI-951251, Draft Revision 15 (Updated Sections Only) with drawing C1765 Sheet 6, Revision 5 (Proprietary)
[C] Excerpt from Supplement 43 of Holtec Report HI-2012787, Rev. 12 (Proprietary)
[D] Supplement 1 of Holtec Report HI-2033042, Rev. 4 (Proprietary)
[E] Attachment 1 of Holtec Supplier Manufacturing Deviation Report (SMDR) 1783 (Proprietary)
[F] Affidavit for withholding of information in accordance with 10 CFR 2.390

Enclosure: Set of DVDs labeled as "Response to RAI#1, HI-STAR 100 LAR 9261-8" (Proprietary)

cc: Mr. Eric Benner, Branch Chief, SFST, USNRC (Cover Letter Only – via email)
Mr. Douglas Weaver, Deputy Director, SFST, USNRC (Cover Letter Only – via email)

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 10B loading for the MPC-32.

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

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

Holtec Response to 1.1: Table 1.2.3 has been corrected to indicate a minimum ^{10}B loading of 0.0310 g/cm^2 for the METAMIC neutron absorber plates in the MPC-32.

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, Sht. 2 Rev. 4, Sht. 3 Rev. 5, Sht. 4 Rev. 5, Sht. 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

Holtec Response to 2.1: Sheet 6 of drawing C1765 and Table 2.3.7 of the SAR have been revised to clarify the layout and crush orientation of the aluminum honeycomb material used for the HI-STAR 100 impact limiter.

As shown on sheets 2 and 4 of drawing C1765, the top and bottom impact limiter designs are comprised of 4 section types of aluminum honeycomb. The general layout of the section types is the same for both the HI-STAR 100 and HI-STAR HB impact limiter designs. For the HI-STAR HB impact limiters, the 4 section types have differing allowable crush strengths, and they consist of both uni-directional and bi-directional aluminum honeycomb material as indicated in SAR Table 2.3.7. Conversely, for the HI-STAR 100 impact limiters, all 4 sections types have same allowable crush strength, and they use only bi-directional aluminum honeycomb material (see Table 2.3.7). To clarify the drawing and eliminate any confusion, sheet 6 of drawing C1765 has been revised to explicitly show the 4 section types (including the crush orientation) for both the HI-STAR 100 and HI-STAR HB impact limiter designs. In addition, Table 2.3.7 of the SAR has been revised to specify the allowable crush strengths for each section type more clearly.

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).

Holtec Response to 2.2: The input and output files for the 9-meter end drop case and 9-meter slapdown case are provided on the enclosed dual layer DVDs.

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).

Holtec Response to 2.3: The requested overlay plots have been added to Appendix 2.C of the SAR as Figures 2.C.1 through 2.C.12.

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.

Holtec Response 2.4: The change in impact limiter aluminum honeycomb material does not adversely affect the performance of the impact limiter attachment and ancillary structures for the following reasons:

a) the new impact limiter design uses the same steel "backbone" and the same attachment method as the original impact limiter design;

b) the shimming requirements for the new impact limiter design are identical to the shimming requirements for the original impact limiter design (see note 6 on sheet 2 of drawing C1765);

c) the deceleration time histories predicted by LS-DYNA for the original impact limiter design and the new impact limiter design (using the same analysis approach) are in close agreement with respect to their overall shape and peak deceleration level (see SAR Figures 2.C.1 through 2.C.12).

Based on the above, the loading on the impact limiter attachment bolts and ancillary structures is virtually unaffected by the change in the impact limiter aluminum honeycomb material.

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).

Holtec Response to 2.5: The reason that revision bars appear to the right of Tables 2.6.8 and 2.7.4 in SAR Revision 14 is not because of the optional design of the fuel basket supports. Rather it is because the safety factors for the MPC-68 were adjusted downward by a factor of 1.001 to account for a very slight increase in the fuel basket weight due to the proposed change in neutron absorber (Metamic) thickness. However, for completeness the calculations to support the optional design of the basket supports are discussed below.

The results shown in Tables 2.6.8 and 2.7.4 are based on the ANSYS finite element solutions for the 1-foot side drop and 30-foot side drop, respectively. The finite element models for the MPC-32 and the MPC-68, which are depicted in SAR Figures 2.6.7 and 2.6.8 for the zero degree drop orientation, are two-dimensional, and they include the fuel basket, the fuel basket supports, and the MPC shell. The fuel basket supports, as shown in the licensing drawings, are welded plate structures having two compressive load supporting members. In the MPC finite element models, some dual path members are simulated as single column members for conservatism. Therefore, as stated in Subsection 2.6.1.3.1.1, the calculated stress intensities in the fuel basket supports from the ANSYS finite element solutions are conservatively overestimated in some locations. In other words, the fuel basket supports are not modeled in exact detail in ANSYS; they are modeled only to the extent that they transfer the load properly from the fuel basket to the MPC shell without overestimating their section properties. For this reason, the results shown in Tables 2.6.8 and 2.7.4 are valid for both the standard and optional constructions of the fuel basket supports since both constructions support the fuel basket in exactly the same manner.

To supplement the ANSYS finite element solutions and resolve the stresses in the fuel basket supports and their connecting welds more precisely, independent strength of materials calculations have been performed for both fuel basket support constructions (standard and optional). The independent calculations for the optional fuel basket support construction are documented in Supplement 43 of HI-2012787 Rev. 12. A copy of the excerpt from Supplement 43 which contains the calculation for the fuel basket supports is provided as Attachment C to this RAI submittal. Note that the results calculated in Supplement 43 correspond to a lateral cask deceleration of 45g, which is the design basis limit for the HI-STORM non-mechanistic tip over event. To adjust for a 60g impact load, the stress results must be increased by a factor of 1.33, and the reported safety factors must be divided by 1.33. The minimum safety factors for the MPC-32 and MPC-68 optional basket supports (after adjusting to 60g) are 1.63 and 2.63, respectively.

2.6 Provide the evaluation from Reference 2.I.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.I.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).

Holtec Response to 2.6: The safety factor reported for lifting of the HB Damaged Fuel Container in Section 2.I.5.4 of the revised SAR is calculated in Supplement 1 of HI-2033042 Rev 4. A copy of Supplement 1 is provided as Attachment D in this RAI submittal.

2.7 Explain the use of change bars in sections 2.I.6.1.1 and the last paragraph of page 2.I-13 of section 2.I.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.

Holtec Response to 2.7: These sections indicated above are part of the proposed changes for this LAR and are intended for Staff review.

The change in Section 2.I.6.1.1 was a result of the change to drawing 4082 (Revision 6 changes 5 and 6) and was indicated in the "detailed changes to the licensing drawings", Attachment 2 to 5014696.

The change in the last paragraph of 2.I.7.1 is a result of the specific analysis performed for the Humboldt Bay Damaged fuel container in an accident condition. This change was not referenced in the Summary of Proposed Changes and Holtec apologizes for any confusion.

2.8 If the applicant intends for section 2.I.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.I.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.

Holtec Response to 2.8: Section 2.I.6.1.1 is intended for Staff review (see response to RAI 2.7). The conclusions presented in Section 2.I.6.1.1 are based on the calculations documented in Attachment 1 to Holtec Supplier Manufacturing Deviation Report (SMDR) No. 1783. A copy of Attachment 1 to SMDR No. 1783 is provided as Attachment E in this RAI submittal.

2.9 If the last paragraph of page 2.I-13 of section 2.I.7.1 is intended to be reviewed, provide the calculations and/or evaluations from Reference 2.I.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).

Holtec Response to 2.9: The last paragraph of Section 2.I.7.1 is intended for Staff review (see response to RAI 2.7). The safety factor reported for the 60g end drop of the HB Damaged Fuel Container in Section 2.I.7.1 of the revised SAR is calculated in Supplement 1 of HI-2033042 Rev 4. A copy of Supplement 1 is provided as Attachment D in this RAI submittal.

Chapter 8 – Acceptance Tests and Maintenance Program

8.1 Clarify the constituent materials of METAMIC® in Section No. 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 B4C powder.

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

Holtec Response to 8.1: The description of the constituent materials for the METAMIC® neutron absorber plates has been added to the SAR in paragraph 8.1.5.5.2.1.

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[1] study. 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[2].

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

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[1] "Qualification of METAMIC® for Spent-Fuel Storage Application" EPRI Report No. 1003137. October 2001.
[2] Safety Analysis Report on the HI-STAR 60 Transport Package, Revision 2. Holtec International Report No. HI-207371. May 15, 2009.

Holtec Response to 8.2: The description of the basic processing steps used to manufacture METAMIC® neutron absorber plates has been added to the SAR in paragraph 8.1.5.5.2.1. This mimics the text from the HI-STAR 60 SAR.

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 application1.

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

Holtec Response to 8.3: The term small has been replaced with a more definitive acceptance criterion for the B_4C particle size in paragraph 8.1.5.5.2.2 of the SAR.

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 application1

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

Holtec Response to 8.4: The percentage of test coupons, taken from panels of METAMIC®, that will undergo neutron attenuation testing to verify the ^{10}B areal density and continued acceptability of the manufacturing process has been added to paragraph 8.1.5.5.2.3 of the SAR under the subheading "Testing of Production Runs".

8.5 Clarify the specifc 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 staff1.

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

Holtec Response to 8.5: The description of the process to verify the dimensional tolerances of panels has been added to paragraph 8.1.5.5.2.3 of the SAR under the subheading "Testing of Production Runs".

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 No. 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).

Holtec Response to 8.6: First, we would clarify that the reference to temperatures from -20°F to 100°F in Section 2.A.1 of the HI-STAR SAR does not refer to impact limiter temperatures, but rather to normal condition ambient temperatures. As stated in the first paragraph on the top of page 2.A-2 (*emphasis added*):

"... the package design must satisfy all criteria in *ambient* temperature conditions ranging from -20° to 100°F, and with humidity ranging from 0 to 100%. Therefore, the impact limiter design must be functionally insensitive to temperature and environmental conditions."

Item iv in Section 2.A.1 will be corrected to state that the temperature and humidity ranges apply to the ambient.

The RAI is correct, however, that impact limiter crush material temperatures are not reported in the SAR. This is because the thermal analysis scenario presented in the SAR conservatively assumed a bounding low thermal conductivity for the impact limiter during normal conditions. The intent of this was to conservatively maximize fuel cladding and containment boundary temperatures. This is described in the last paragraph of SAR Subsection 3.4.1 as follows:

"To conservatively maximize the calculated internal temperatures, the thermal conductivity of the impact limiters is set essentially equal to zero."

As a result of this conservative assumption being applied computed impact limiter temperatures are non-physically elevated, which is why they were not presented in the SAR.

To more realistically determine impact limiter temperatures, for the purposes of responding to this RAI, another calculation was performed with a more realistic thermal conductivity assigned to the impact limiters. This calculation was performed by taking the normal condition model for the MPC-24 (the case summarized in SAR Table 3.4.10) and replacing the extremely conservative impact limiter thermal conductivity with a lower-bound realistic value. This more realistic thermal conductivity is obtained from the crush material manufacturer's literature (Hexcel TSB 120, dated 11/99). The minimum ambient temperature value reported by the manufacturer was used, increased by 13% as recommended in that literature to account for an increase in operating temperature to 130°F. No other changes of any kind were made to the analysis model. We note that the use of more realistic impact limiter thermal properties has already been approved by the Staff on Holtec HI-STAR 60 application (Docket 71-9336).

The analysis model modified as just described was solved to obtain the temperature field throughout the cask, with key results summarized in the following table.

Component	Temperature with Realistic Impact Limiter Conductivity	Temperature with Bounding Low Impact Limiter Conductivity
Fuel Cladding	696°F	701°F (SAR Table 3.4.10)
Containment Boundary (Overpack) Inner Shell	285°F	291°F (SAR Table 3.4.10)
Containment Boundary Base (Overpack Bottom Plate)	224°F	295°F (SAR Table 3.4.10)
Containment Boundary Top (Overpack Closure Plate)	152°F	163°F (SAR Table 3.4.10)
Bottom Impact Limiter Peak Temperature	190°F	Not Reported
Bottom Impact Limiter Average Temperature at Interface with Overpack	179°F	Not Reported
Top Impact Limiter Peak Temperature	145°F	Not Reported
Top Impact Limiter Average Temperature at Interface with Overpack	143°F	Not Reported

The results summarized in this table demonstrate that the use of the bounding low impact limiter thermal conductivity did indeed yield conservatively higher fuel cladding and containment boundary temperatures. This is not unexpected, as choking any heat rejection pathway out of the cask will always increase the temperatures within it. More importantly for this RAI response, they provide impact limiter temperatures that can be compared to impact limiter crush material data.

As the impact limiters are designed to be loaded over their entire contact area with the overpack, the appropriate values for comparison with material data are the average temperatures at the interfaces with the overpack. The highest of these values is for the interface of the bottom impact limiter, which is 179°F.

In 1998, testing of the impact limiter crush material was performed by Holtec to determine whether or not the material's crush strength was dependent on temperature. This testing encompassed a temperature range of -20°C to 80°C (-4°F to 176°F) and was performed at the University of Pennsylvania under the control of Holtec's NRC-approved QA program. A Holtec Proprietary test report (HI-981979, Revision 0) documents the testing and its results. According to the results of this testing, the crush material was demonstrated to be essentially insensitive to temperature over the range of temperatures examined. Although the new calculation (using what is still a bounding lower impact limiter thermal conductivity) gives a temperature of 179°F for comparison, it is unlikely that an increase in temperature of 3°F would result in any deviation from the conclusions of the test report.

Nevertheless, it is prudent to ensure that even such a minor extrapolation will not result in a sudden reduction in crush strength. More recent testing performed at the behest of Holtec on the impact limiter crush material was performed up to 220°F, in support of our HI-STAR 60 and HI-STAR 180 applications (Dockets 71-9336 and 71-9325, respectively). This more recent testing was performed in April 2009 and January 2010 (Alcore test reports 904 and 09-324, respectively). These tests are for an epoxy-bonded aluminum honeycomb material that is intended to be used in the HI-STAR 100 (described in SAR Appendix 2.C) and is similar to the previously tested material. According to the results of these newer tests, the crush material was demonstrated to be essentially insensitive to temperature even up to 220°F. This tested upper temperature exceeds even the highest local maximum calculated temperatures for the impact limiters.

Based on these considerations, it is concluded that the maximum temperatures that will be experienced by the impact limiter crush material will not result in reductions in the crush strength that would cause the results of the drop tests and simulations to be invalidated.

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% B4C loading). The thermal conductivity of aluminum cladding in Boral is substantially higher than those of bulk METAMIC®, however. 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).

Holtec Response to 8.7: As stated in the second paragraph of Section 3.2 in Proposed Revision 14 of the HI-STAR SAR:

> "The neutron absorber materials are made of aluminum powder and boron carbide powder. Although their manufacturing processes differ, from a thermal standpoint, their ability to conduct heat is virtually identical."

In order to obtain equivalent criticality control performance from both materials, it is necessary to have the same ^{10}B areal density regardless of which material is used. Since the amount of ^{10}B isotope in boron carbide is constant, it is therefore apparent that the ratio of boron carbide to aluminum in both materials must also be the same. As both materials have the same boron carbide to aluminum ratio, it is therefore reasonable to expect them to have essentially the same thermal conduction performance.

We do not suggest that this expectation is, by itself, sufficient to conclude the proper performance of the HI-STAR System. Rather, the expectation of equivalence must be supported by data. As pointed out in the RAI, however, Boral is an anisotropic material while Metamic is an isotropic one. In order to compare the thermal conductivities of these two materials, it is necessary to obtain an equivalent isotropic thermal conductivity of Boral. This can be done via a Square Root of the Mean Sum of Squares (SRMSS) combination of the through-thickness and in-plane thermal conductivities of Boral.

We note that such an SRMSS-based comparison of Boral and Metamic has been performed previously for the HI-STORM 100 System and that, since our MPCs are intended to be both storable in the HI-STORM and transportable in the HI-STAR, the same comparison would apply equally to both systems. To ensure coherence between the two systems, we extract the following comparison from the HI-STORM 100 FSAR that supported an NRC-approved amendment request to add Metamic to the MPCs (FSAR Revision 3, dated 26 May 2005):

> "The equivalent conductivity of a Boral panel, defined as the Square Root of the Mean Sum of Squares (SRMSS) conductivity in two principal directions (through thickness and width) is closely matched by METAMIC‡. Therefore the two materials are considered equivalent in their heat transfer performance.
>
> ‡ For example, at 482°F, the through-thickness and width direction conductivities of Boral (B_4C thickness fraction = 0.82) are computed as 52.9 and 58.2 Btu/hr-ft-°F respectively. The SRMSS conductivity = $[(52.9^2 + 58.2^2)/2]^{0.5}$ is 55.61 Btu/ hr-ft-°F compared to a lowerbound METAMIC conductivity (Figure 4.2.3) of 55.68 Btu/ hr-ft-°F (at 482°F)."

This comparison supports the above-quoted statement from Section 3.2 of the HI-STAR SAR.

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).

Holtec Response to 8.8: The HI-STAR 100 transportation package, as approved in CoC 9261 Amendment 6, does not take credit for the MPC as a containment boundary. This license amendment does not propose any changes the containment boundary; therefore Holtec considers the MPC welding details to be inapplicable to this application.

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).

Holtec Response to 8.9: The HI-STAR 100 transportation package, as approved in CoC 9261 Amendment 6, does not take credit for the MPC as a containment boundary. This license amendment does not propose any changes the containment boundary; therefore Holtec considers the MPC welding details to be inapplicable to this application.

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. The source of the thermal properties which are listed is not clear, however. 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).

Holtec Response to 8.10: Although it is not very clearly stated in SAR Table 3.2.1, the reference for the thermal conductivity of 5052 aluminum alloy continues to be Section II-Part D of the ASME Code (1995). This amendment does not change the values used for the impact limiter thermal conductivity. Rather it changes the title of this entry in the table and adds the clarifying Note 1. Note 1 to SAR Table 3.2.1 is expanded further to more clearly explain the source of the thermal conductivity values being used.

Holtec is aware that the values of thermal conductivity of alloy 5052 aluminum are not specified in the Code for temperatures above 400°F. These values at 450°F and 700°F were linearly extrapolated to the higher temperatures for use only in the fire analysis of the HI-STAR 100 transportation package. These values conservatively input the greatest amount of heat into the package during the fire event.

It is important to note that these values have not changed since the original transportation license for HI-STAR 100 transportation package was issued. The SER for CoC 9261, Amendment 2 discusses the fire event as follows:

> "The impact limiter is assumed to be crushed to the bounding maximum condition of a solid block of highly conducting aluminum, resulting in increased heat input to the overpack ends through the reduced impact limiter thickness during the duration of the fire."

We further note that the use of a solid aluminum thermal conductivity is intended to bound the theoretical maximum crushing of the impact limiters during the drop event. It is important to remember that only a portion of the impact limiters is crushed during a drop event and that a large portion of the impact limiters will remain uncrushed. Applying the "solid aluminum" thermal conductivity to the entire impact limiter volume is quite conservative, since the highest thermal conductivity listed by the material manufacturer is only 12.875 Btu/hr-ft-F (from Hexcel TSB 120, including the maximum temperature effect multiplier Q of 1.5). For these uncrushed areas, the "solid aluminum" conductivity used in the analysis overestimates the conductivity by *at least* a factor of 6.5. Also, it should be recalled that the post-fire condition assumes essentially insulating impact limiters with an extremely low thermal conductivity, to the fire heat that entered through the impact limiters during the fire cannot flow back out the way it came in. Holtec considers the values for thermal conductivity listed in Table 3.2.2 to be conservative and appropriate for the fire event analysis.

AFFIDAVIT PURSUANT TO 10 CFR 2.390

I, Tammy S. Morin, being duly sworn, depose and state as follows:

(1) I have reviewed the information described in paragraph (2) which is sought to be withheld, and am authorized to apply for its withholding.

(2) The information sought to be withheld are Attachments B through E to Holtec Letter 5014704 and the DVDs provided in Enclosure 1 to Holtec letter 5014704, all of which contain Holtec Proprietary information.

(3) In making this application for withholding of proprietary information of which it is the owner, Holtec International relies upon the exemption from disclosure set forth in the Freedom of Information Act ("FOIA"), 5 USC Sec. 552(b)(4) and the Trade Secrets Act, 18 USC Sec. 1905, and NRC regulations 10CFR Part 9.17(a)(4), 2.390(a)(4), and 2.390(b)(1) for "trade secrets and commercial or financial information obtained from a person and privileged or confidential" (Exemption 4). The material for which exemption from disclosure is here sought is all "confidential commercial information", and some portions also qualify under the narrower definition of "trade secret", within the meanings assigned to those terms for purposes of FOIA Exemption 4 in, respectively, Critical Mass Energy Project v. Nuclear Regulatory Commission, 975F2d871 (DC Cir. 1992), and Public Citizen Health Research Group v. FDA, 704F2d1280 (DC Cir. 1983).

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(4) Some examples of categories of information which fit into the definition of proprietary information are:

a. Information that discloses a process, method, or apparatus, including supporting data and analyses, where prevention of its use by Holtec's competitors without license from Holtec International constitutes a competitive economic advantage over other companies;

b. Information which, if used by a competitor, would reduce his expenditure of resources or improve his competitive position in the design, manufacture, shipment, installation, assurance of quality, or licensing of a similar product.

c. Information which reveals cost or price information, production, capacities, budget levels, or commercial strategies of Holtec International, its customers, or its suppliers;

d. Information which reveals aspects of past, present, or future Holtec International customer-funded development plans and programs of potential commercial value to Holtec International;

e. Information which discloses patentable subject matter for which it may be desirable to obtain patent protection.

The information sought to be withheld is considered to be proprietary for the reasons set forth in paragraphs 4.a and 4.b above.

(5) The information sought to be withheld is being submitted to the NRC in confidence. The information (including that compiled from many sources) is of a sort customarily held in confidence by Holtec International, and is in fact so held. The information sought to be withheld has, to the best of my knowledge and belief, consistently been held in confidence by Holtec International. No public disclosure has been made, and it is not available in public sources. All

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disclosures to third parties, including any required transmittals to the NRC, have been made, or must be made, pursuant to regulatory provisions or proprietary agreements which provide for maintenance of the information in confidence. Its initial designation as proprietary information, and the subsequent steps taken to prevent its unauthorized disclosure, are as set forth in paragraphs (6) and (7) following.

(6) Initial approval of proprietary treatment of a document is made by the manager of the originating component, the person most likely to be acquainted with the value and sensitivity of the information in relation to industry knowledge. Access to such documents within Holtec International is limited on a "need to know" basis.

(7) The procedure for approval of external release of such a document typically requires review by the staff manager, project manager, principal scientist or other equivalent authority, by the manager of the cognizant marketing function (or his designee), and by the Legal Operation, for technical content, competitive effect, and determination of the accuracy of the proprietary designation. Disclosures outside Holtec International are limited to regulatory bodies, customers, and potential customers, and their agents, suppliers, and licensees, and others with a legitimate need for the information, and then only in accordance with appropriate regulatory provisions or proprietary agreements.

(8) The information classified as proprietary was developed and compiled by Holtec International at a significant cost to Holtec International. This information is classified as proprietary because it contains detailed descriptions of analytical approaches and methodologies not available elsewhere. This information would provide other parties, including competitors, with information from Holtec International's technical database and the results of evaluations performed by Holtec International. A substantial effort has been expended by Holtec International to develop this information. Release of this information would improve a competitor's position because it would enable Holtec's competitor to copy our technology and offer it for sale in competition with our company, causing us financial injury.

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(9) Public disclosure of the information sought to be withheld is likely to cause substantial harm to Holtec International's competitive position and foreclose or reduce the availability of profit-making opportunities. The information is part of Holtec International's comprehensive spent fuel storage technology base, and its commercial value extends beyond the original development cost. The value of the technology base goes beyond the extensive physical database and analytical methodology, and includes development of the expertise to determine and apply the appropriate evaluation process.

The research, development, engineering, and analytical costs comprise a substantial investment of time and money by Holtec International.

The precise value of the expertise to devise an evaluation process and apply the correct analytical methodology is difficult to quantify, but it clearly is substantial.

Holtec International's competitive advantage will be lost if its competitors are able to use the results of the Holtec International experience to normalize or verify their own process or if they are able to claim an equivalent understanding by demonstrating that they can arrive at the same or similar conclusions.

The value of this information to Holtec International would be lost if the information were disclosed to the public. Making such information available to competitors without their having been required to undertake a similar expenditure of resources would unfairly provide competitors with a windfall, and deprive Holtec International of the opportunity to exercise its competitive advantage to seek an adequate return on its large investment in developing these very valuable analytical tools.

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STATE OF NEW JERSEY)
) ss:
COUNTY OF BURLINGTON)

Ms. Tammy S. Morin, being duly sworn, deposes and says:

That she has read the foregoing affidavit and the matters stated therein are true and correct to the best of her knowledge, information, and belief.

Executed at Marlton, New Jersey, this 10th day of August, 2010.

Tammy S. Morin
Holtec International

Subscribed and sworn before me this 10th day of August, 2010.

Maria C. Massi

MARIA C. MASSI
NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 25, 2015