

SUMMARY OF PROPOSED CHANGES (SOPC)

HI-STAR 100 MB TRANSPORT LAR 9378-1

Introduction

This document is intended to communicate a summary of proposed changes to Holtec Report HI-2188080, "Safety Analysis Report on the HI-STAR 100MB Package" Rev. 3 (generally referred to herein as the HI-STAR 100MB Transport SAR or simply SAR), that are considered significant. All proposed changes are reflected in Revision 3 of the SAR, the HI-STAR 100MB licensing drawing package and SAR supporting documents submitted to the USNRC via license amendment request (LAR-9378-1). SAR supporting documents consist of Holtec technical reports and Holtec calculation packages.

This SOPC is presented in three parts and includes reason and justification for proposed changes.

- A. Proposed Changes to Certificate of Compliance
- B. Proposed Changes to the Safety Analysis Report
- C. Proposed Changes to the Licensing Drawing Package

In general, editorial changes and certain minor changes are not summarized in the SOPC. The SAR's revision summary log contains additional change description information on a section by section basis for all SAR chapters. SAR supporting documents supplied with this LAR are listed in the LAR submittal letter Holtec Document ID 5026004-NRC.

A. PROPOSED CHANGES TO COC

1. Updated Condition 5.(a)(2) to include description of the HI-STAR 100MB Version LW impact limiters.
2. Updated Condition 5.(a)(2) to reflect the maximum packaging weights.
3. Updated HI-STAR 100MB cask licensing drawing revision from Rev. 2 to Rev. 3.
4. Add HI-STAR 100MB Version LW Impact Limiter licensing drawing.

B. PROPOSED CHANGES TO SAR

Proposed Change Identifier	Topic Description	SOPC
PC-1	Inclusion of Impact Limiter Version LW Design	<p>Discipline(s) Impacted: Structural, Thermal, and Shielding</p> <p>Proposed Change and Justification: An additional AL-STAR impact limiter design, HI-STAR 100MB Impact Limiter Version LW is added as an optional impact limiter for the HI-STAR 100MB Version SL Cask with fuel basket F-24M. The new impact limiter design follows the same requirements of the AL-STAR Impact Limiters using two types of crush material: unidirectional honeycomb and perforated aluminum rings. The Version LW impact limiters are further detailed in the new Licensing Drawing 11758 added to SAR Section 1.3. The additional impact limiters attach to the HI-STAR 100MB Cask in the same method and design of the standard impact limiters previously approved for the HI-STAR 100MB.</p> <p>Chapter 2, Structural, has been updated to provide discussion and analysis results of the HI-STAR 100MB package with Impact Limiter LW under normal conditions of transportation and hypothetical accident conditions of transportation. All the obtained peak deceleration, deformation and stress results are below the allowable limits previously established in the SAR.</p> <p>Chapter 3, Thermal, has been updated to provide discussion of the HI-STAR 100MB package with Impact Limiter LW. Thermal analysis of normal conditions of transport are added to report HI-2188066. As the impact limiters are located at cask ends and peak temperatures are seen near fuel mid-height, variance in impact limiter and its properties have negligible impact and cask component temperatures meet the regulatory limits presented in SAR Section 3.2.</p> <p>The shielding analysis credits only portion of the impact limiter, and these Version LW components are listed in SAR Subsection 5.3.1. Shielding analysis of the HI-STAR 100MB Version SL cask with fuel basket F-24M is added to report HI-2188049, and the dose rate results meet the regulatory limits for this configuration which is recorded in SAR Section 5.4.</p> <p>Reason for Proposed Change: The Impact Limiter Version LW allows a reduced package weight for transportation of the HI-STAR 100MB Version SL with the F-24M fuel basket. This reduced HI-STAR 100MB package weight is an option that may be used when transportation routes have more restrictive weight limits.</p> <p>Licensing Drawings: New Licensing Drawing 11758 for the HI-STAR 100MB Impact Limiter Version LW is added to the Licensing Drawing Package.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-2	Cask Trunnions Qualified as Tie-Downs	<p>Discipline(s) Impacted: Structural and Operations</p> <p>Proposed Change and Justification: Top and Bottom Trunnion designs have been analyzed as tie down supports for normal conditions of transport and hypothetical accident conditions. Structural evaluations have been performed and incorporated in the Structural Calculation Package, HI-2188083, to demonstrate the trunnion design is qualified as a tie-down device structure. The transportation frame is modified to secure the HI-STORM 100MB Cask by the top and bottom trunnions. SAR Section 2.5 is revised to reflect the qualification and use of the trunnions as tie-down devices.</p> <p>Chapter 7 is revised to reflect securing of the trunnions to the transport frame prior to shipment.</p> <p>Reason for Proposed Change: To simplify the transport frame design by using the robust trunnions as a means to secure the cask.</p> <p>Licensing Drawings: No Impact</p>

Proposed Change Identifier	Topic Description	SOPC
PC-3	Inclusion of New Fuel Assembly Class 17x17F	<p>Discipline(s) Impacted: Shielding and Criticality</p> <p>Proposed Change and Justification: Add new 17x17F fuel assembly class to the allowable contents specified in SAR Table 7.7.2. The 17x17F fuel assembly classification is based on the required fuel parameter needs to be shipped in the HI-STAR 100MB Package, which includes an increase to the initial enrichment up to 5% and an increase in the cobalt-59 content of fuel assembly hardware to 1.2 g/kg. The 17x17F fuel assembly class continues compliance with SAR Table 7.7.1 fuel assembly limits which govern the structural and thermal cask models.</p> <p>Shielding evaluations in HI-2188049 are performed for the new 17x17F fuel parameters, including numerical analysis for source terms and dose rates, and SAR Chapter 5 Tables have been revised accordingly. The updated shielding evaluations take into account the revised solid shim dimensions per proposed change PC-11.</p> <p>Criticality evaluations in HI-2188084 are performed for the 17x17F fuel assembly parameters, and SAR Chapter 6 tables have been revised to reflect the inclusion of 17x17F fuel assemblies. The HI-STAR 100MB remains in compliance with the subcritical regulatory requirements.</p> <p>Reason for Proposed Change: The new fuel assembly characteristics reflect the latest needs of fuel assemblies to be transported in the HI-STAR 100MB Package.</p> <p>Licensing Drawings: No Impact</p>

Proposed Change Identifier	Topic Description	SOPC
PC-4	Helium Leakage Rate Criteria Modified to 1×10^{-5} ref-cm ³ /s	<p>Discipline(s) Impacted: Containment, and Design</p> <p>Proposed Change and Justification: The proposed change revises the helium leakage rate criteria in SAR Table 8.1.1 to 1×10^{-5} ref-cm³/s for the HI-STAR 100MB system containment enclosures leakage rate test. The leakage rate criteria are based on containment analysis performed and further referenced in SAR Chapter 4. The analysis demonstrates compliance with the criterion radionuclide release rates specified in 10CFR71.51(a)(1) and 10CFR71.51(a)(2).</p> <p>Reason for Proposed Change: To update the Helium Leakage Rate Criteria with the acceptable limits from the containment analysis.</p> <p>Licensing Drawings: No Impact</p>
PC-5	Revise Minimum Cooling Times in Table 7.7.6(a)	<p>Discipline(s) Impacted: Shielding</p> <p>Proposed Change and Justification: The initial enrichment and burnup of Table 7.7.6(a) is expanded to specify additional allowable cooling times to be shipped with the F-24M basket configuration in a HI-STAR 100MB Version SL. The minimum cooling times continue to meet the criticality and shielding evaluations performed for the cask configuration. Additionally, Table 7.7.6(a) is revised to include modifications for proposed changes PC-1, PC-3 and PC-11.</p> <p>Reason for Proposed Change: The allowable fuel burnup, initial enrichment, and cooling time combinations are revised considering proposed changes PC-1, PC-3 and PC-11.</p> <p>Licensing Drawings: No Impact</p>

Proposed Change Identifier	Topic Description	SOPC
PC-6	Update Metamic-HT welding qualifications	<p>Discipline(s) Impacted: Materials and Structural</p> <p>Proposed Change and Justification: The proposed activity revises SAR Paragraph 8.1.5.5 Metamic-HT weld soundness criteria require only visual examination and bend testing. Radiography testing of the weld is not mandatory to determine weld soundness, as ASME Section IX specifies bend testing is used to determine the degree of soundness and ductility of weld joints.</p> <p>Reason for Proposed Change: To bring the Metamic-HT weld qualification verification in alignment with ASME code compliance.</p> <p>Licensing Drawings: No Impact</p>
PC-7	Addition of Optional Port Cover Design for HI-STAR 100MB Cask Lids	<p>Discipline(s) Impacted: Design, Structural, and Operations</p> <p>Proposed Change and Justification: The optional port cover design for the HI-STAR 100MB cask lid is reflected in Licensing Drawing 11070 Rev.3 and introduces a design similar to the MPC port cover plate design. This new design includes two additional threaded containment connections in the center of the port cover plate. The central threaded connections are used to purge the port cover space with helium during installation of the port cover plate.</p> <p>Structural analysis is performed in HI-2188063 for the optional port cover design which derives the required torque values for bounding seal parameters listed in Table 2.2.11.a and 2.2.11.b. SAR Section 2.2, Table 2.2.10, Chapter 7, and Table 7.1.1 are updated to reflect the torque values needed to maintain containment with this design.</p> <p>Reason for Proposed Change: To provide flexibility to field operations for purging the port cover space with helium.</p> <p>Licensing Drawings: The optional Port Cover Design is added to Cask Licensing Drawing 11070 Rev. 3.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-8	Add Metallic Seal Option for Port Covers of the HI-STAR 100MB Cask Lids	<p data-bbox="489 277 1314 310">Discipline(s) Impacted: Structural, Containment, and Operations</p> <p data-bbox="489 350 1934 565">Proposed Change and Justification: Additional metallic material is added to the port cover seals for maintaining containment when the port cover is sealed. The metallic seal alloy is added to the Cask Licensing Drawing 11070, along with the critical requirements specified in SAR Table 2.2.11. Calculation 10 of the structural calculation package HI-2188083R3 contains the supporting calculation for this design change. As provided by the structural analysis, the optional seal for the port covers maintains containment of the HI-STAR 100MB Cask system.</p> <p data-bbox="489 605 1917 638">Reason for Proposed Change: The proposed change adds fabrication flexibility due to seal design availability.</p> <p data-bbox="489 678 1665 711">Licensing Drawings: Seal material is added to SAR Cask Licensing Drawing 11070 Rev.3.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-9	Reduce Intermediate Shell Thickness for HI-STAR 100MB Cask	<p>Discipline(s) Impacted: Structural, Thermal, Shielding, and Design</p> <p>Proposed Change and Justification: The intermediate shell thickness is reduced from 3” to a minimum of 2.49” in Cask Licensing Drawing 11070. To ensure the package effective shielding requirements are maintained, Flag Note 7 is added to the cask drawing that specifies the total thickness of the containment shell, intermediate shell, and outer shell must be at least 5” thick.</p> <p>Structurally, reduction in the intermediate shell thickness does not prevent the cask’s ability to withstand the normal conditions of transport or any of the hypothetical accident conditions analyzed in the SAR. Due to the reduction in the intermediate shell thickness, the puncture evaluation for the 1-M Horizontal Drop Event in Appendix F of Structural Calculation Package HI-2188068 is reperformed. The analysis demonstrates the proposed change meets regulatory requirements and is further reflected in Chapter 2 of the SAR.</p> <p>Thermal analysis has previously used an intermediate shell of 2.5” in their model, along with other effective properties assumed in analysis in the Thermal Calculation Package HI-2188066. No changes to the thermal model are required.</p> <p>Current shielding evaluations remain relevant to the proposed design as the total radial thickness of the cask’s steel containment, intermediate, and outer shells remain equivalent to the total thickness analyzed. A sensitivity evaluation is performed and further discussed in the Shielding Calculation Package HI-2188049.</p> <p>Reason for Proposed Change: Allows for fabrication flexibility during manufacturing while meeting the safety requirements of the HI-STAR 100MB Cask Package.</p> <p>Licensing Drawings: The SAR Cask Licensing Drawing 11070 Rev. 3 includes the updated intermediate shell and an additional Flag Note 7.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-10	Add Thermal Insulation Layer Between Intermediate Shell and Holtite-B	<p>Discipline(s) Impacted: Thermal and Design</p> <p>Proposed Change and Justification: Note 8 is added to the Cask Licensing Drawing 11070 and includes thermal insulation as an optional material between the intermediate shell and neutron shield. The insulating material would provide additional margin to the thermal temperature limit of the neutron shield material. The insulation does not provide any other structural functions to the cask system. The use of insulation has no impact on the peak cladding temperature or previously established safety conclusions, while also increasing the thermal resistance during a postulated fire accident.</p> <p>Reason for Proposed Change: The proposed change improves the safety margins of the neutron shield material's temperature limits.</p> <p>Licensing Drawings: The insulation material is specified in Flag Note 8 of the SAR Cask Licensing Drawing 11070 Rev. 3.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-11	Reduce Solid Shim Thickness of Version SL Cask	<p>Discipline(s) Impacted: Shielding and Design</p> <p>Proposed Change and Justification: The solid shim design for the F-24M Version SL (Item 40 of drawing 11070) is reduced in size to properly conform to the geometry of the F-24M basket due to tolerances of components. This proposed design change does not alter the solid shim's function to fill the annular space between the fuel basket and containment shell, and the solid shim dimensions are not credited in any structural design functions. Additionally, the thermal model does not explicitly include gaps between the shim and its neighboring components. Any increased helium flow area, as a result of smaller shims, provides additional cooling to the fuel.</p> <p>The allowable fuel burnup, initial enrichment, and cooling time combinations are revised to meet the regulatory limits. These changes are reflected in the shielding analysis and in Chapter 5 of the SAR. The updated burnup, enrichment, and cooling time values for this change are reflected in the allowable fuel assembly limits in Table 7.7.6(a).</p> <p>Reason for Proposed Change: Reduction of the solid shim's dimensions ensure installation of components within the cavity does not lead to any damage, while ensuring the space between the fuel basket and containment shell is filled.</p> <p>Licensing Drawings: The solid shim dimensions are specified in SAR Cask Licensing Drawing 11070 Rev. 3.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-12	Hollow Shim Dimensions of Version SL Cask	<p>Discipline(s) Impacted: Shielding and Design</p> <p>Proposed Change and Justification: The hollow shim dimensions for the F-24M Version SL (Item 39 of drawing 11070) are modified to improve the hollow shims extrusion during fabrication. The shim liners dimensions within the extruded hollow shims are modified accordingly to maintain the shim liner overall length along the fuel basket face. This proposed change does not alter the extruded shim's function to fill the annular space between the fuel basket and containment shell. Additionally, this proposed change does not allow the flow holes of the fuel basket to be blocked, so the flow of helium is maintained to cool to the fuel.</p> <p>Since no material is removed the dose rate effect is insignificant. Nevertheless, a sensitivity evaluation is performed and further discussed in the Shielding Calculation Package HI-2188049.</p> <p>Reason for Proposed Change: Modification in the hollow shim's dimensions improve the fabricability of the component, while ensuring the space between the fuel basket and containment shell is filled.</p> <p>Licensing Drawings: The hollow shim and shim liner dimensions are specified in SAR Cask Licensing Drawing 11070 Rev. 3.</p>
PC-13	Increase Short-Term Containment Seal Temperature Limits	<p>Discipline(s) Impacted: Containment and Thermal</p> <p>Proposed Change and Justification: Short-term containment seal temperature limits in Table 2.2.11 is increased. The containment boundary seal performance is ensured to meet increased temperature limits which may be seen in any hypothetical accident condition, and this increase limit provides additional margins to the containment of the HI-STAR 100MB Package.</p> <p>Reason for Proposed Change: Increase the containment seal temperature margins during hypothetical accident conditions.</p> <p>Licensing Drawings: No Impact.</p>

Proposed Change Identifier	Topic Description	SOPC
PC-14	Update Leaktight Glossary Definition	<p>Discipline(s) Impacted: Containment</p> <p>Proposed Change and Justification: ANSI N14.5, 2014 Edition, is adopted in the SAR for leak testing. Leaktight definition is revised to remain consistent with the ANSI N14.5 requirements. The change to the definition does not change the cask design, but provides clarity for leak testing requirements during development and performance of leak test procedures.</p> <p>Reason for Proposed Change: SAR update to reflect the latest expert guidance.</p> <p>Licensing Drawings: No Impact.</p>

C. PROPOSED CHANGES TO LICENSING DRAWING PACKAGE

Cask Licensing Drawing 11070 Rev. 3

- Radial thickness of Item 30 is reduced to 2.49" MIN per PC-9 in Section B above.
- Flag Note 7 is added to specify the combined as-built radial thickness of Items 1, 30, and 37, shall be 5", and the flag note is referenced on the dimensional call out of Items 1, 30, and 37. Tolerances on item 37 are revised accordingly. See PC-9 in Section B above.
- Flag Note 8 is added to include an optional insulating material between the neutron shield and intermediate shell per PC-10 in Section B. The flag note is referenced for Items 30 and 36.
- Optional Port Cover Plate design is added, including additional Items 48 and 49 for the port cover plate purge plug and its respective seal. See PC-7 in Section B.
- Solid Shim dimensions are revised per PC-11.
- Metallic material added to Port Cover Seals Items 12 and 13 as an option and Note 17 is revised accordingly per PC-8 in Section B.
- Cask Bottom Cover Plates, Items 22 and 47, dimensions are revised to include upper and lower bound dimension tolerances to allow for stock plate procurement. The combined thickness of Items 3, 47, and 22 in accordance with SAR Table 5.3.4 account for the tolerances in the steel used at the bottom of the cask. All other analyses referencing the bottom plates use a nominal thickness.
- Neutron shield radial pocket dimension is revised to reduce the excess gap securing the neutron shield between the intermediate shell and enclosure shell. There is no change to the thickness of the neutron shield.
- Dimensions of the F-24M hollow basket shims are readjusted to support the fabrication process of the shims per PC-12.
- Closure Lids seal gland depth tolerances are modified to support manufacturing the seals while maintaining compliance with requirements for the elastomeric seals.
- Weldment of the Enclosure Shell to the Neutron Shield Rib is revised to support fabrication process.
- Editorial changes to Flag Note 1 to include all shims, and Flag Note 5 is deleted. Reference to Flag Note 5 on Item 40 is revised to Flag Note 1.

Impact Limiter Version LW, Licensing Drawing 11758 Rev. 0 is added to the Licensing Drawing Package per PC-1 in Section B.