UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

November 8, 2019

Mr. Mr. Royston Ngwayah
Holtec International
1 Holtec Blvd.
Camden, NJ 08104

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE MODEL NO. HI-STAR ATB 1T PACKAGE

Dear Mr. Ngwayah:

By letter dated June 7, 2019, Holtec International submitted an application for Certificate of Compliance No. 9375, Revision No. 0, for the Model No. HI-STAR ATB 1T package. The U.S. Nuclear Regulatory Commission staff (the staff) performed an acceptance review of your application and accepted your application for a detailed technical review upon receiving your response (Agencywide Documents Access and Management Accession No. ML19221B423), on August 9, 2019, to our request for supplemental information dated July 15, 2019.

In connection with our technical review, we need the information identified in the enclosure to this letter. We request that you provide this information by January 6, 2020. If you are unable to meet this deadline, you must notify us in writing no later than December 15, 2019, of your new submittal date and the reasons for the delay. The staff will then assess the impact of the new submittal date and notify you of a revised schedule.

Please reference Docket No. 71-9375 and EPID L-2019-LRM-0006 in future correspondence related to this request. If you have any questions regarding this matter, I may be contacted at (301) 415-7505.

Sincerely,

/RA/

Pierre Saverot, Project Manager
Storage and Transportation Licensing Branch
Division of Fuel Management
Office of Nuclear Material Safety
and Safeguards

Docket No. 71-9375
EPID L-2019-LRM-0006

Enclosure: Request for Additional Information

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE MODEL NO. HI-STAR ATB 1T PACKAGE, DOCUMENT DATED:

DISTRIBUTION:
SFST r/f
AKock, NMSS
ADimitriadis, RI
BBonser, RII
MKunowski, RIII
GWarnick, RIV

G :\SFST\Saverot\HI-STAR ATB 1T\RAIFALL2019.doc

ADAMS Accession No. : ML19316A159

OFC:	DFM	E	DFM	E	DFM	DFM	C	DFM	C
NAME:	PSaverot		DTarantino		ARigato	JBorowsky		VWilson	
DATE:	10/06/19		10/22/19		10/11/19	10/10/19		10/07/19	
OFC:	DFM	E	DFM	E	DFM	DFM	C	DFM	C
NAME:	DTang		TTate		JIreland	SFigueroa		DDoyle	
DATE:	11/05/19		10/07/19		11/08/19	11/06/19		11/08/19	

C=Without attachment/enclosure E=With attachment/enclosure N=No copy

OFFICIAL RECORD COPY

Request for Additional Information
Holtec International
Docket No. 71-9375
Model No. HI-STAR ATB 1T Package

By letter dated June 7, 2019, Holtec International submitted an application for Certificate of Compliance No. 9375, Revision No. 0, for the Model No. HI-STAR ATB 1T package. The U.S. Nuclear Regulatory Commission staff (the staff) performed an acceptance review of your application and accepted your application for a detailed technical review upon receiving your response, on August 9, 2019, to our request for supplemental information dated July 15, 2019.

This request for additional information (RAI) identifies information needed by the the staff in connection with its review of the Model No. HI-STAR ATB 1T 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-1609, "Standard Review Plan for Transportation Packages for Radioactive Material," was used for this review.

1- GENERAL INFORMATION

1-1 Provide tolerances on the licensing drawings.

General note E on sheet 1 of 7 of licensing Drawing No. 9786 describes how tolerances in the drawings are to be used but the title block, in the lower portion of the drawing, does not provide any tolerances. Tolerances are used to determine compliance with package weight limits, and the thermal stresses due to material expansion, as well as component interaction during drop simulations.

This information is required to determine compliance with the requirement of Title 10 of the *Code of Federal Regulations* (10 CFR) 71.33(a)(5).

1-2 Provide a drawing of the closure lid insulation board to ensure proper fit and function within the package.

Page 3-29 of the application states that an insulation board is needed to protect the seal from reaching high temperatures. Although part number 26 (sheet 2 of 7 of drawing 9786, Rev. 5) notes that the insulation board is Important-to-Safety (ITS), both a drawing and specifications were not included in the application.

This information is required to determine compliance with 10 CFR 71.33(a).

2- STRUCTURAL AND MATERIALS EVALUATION

2-1 Incorporate the spaces, in accordance with the licensing drawings, between the BFA-Tank, the containment boundary, and the BTC, in the drop simulations and describe the condition of the ATB 1T package for all drop simulations which incorporate them.

The applicant assumes in Section 3.7 (page 14) of document HI-STORM 2177539 that, during the 30 ft top end drop simulation, no space exists between the BFA-Tank and the closure lid prior to impact. However, drop testing of the ¼ scale model of the ATB 1T at Sandia National Laboratories, in September 2016, showed that a gap naturally forms between the internals and the containment boundary as witnessed for the 30 ft CGOC drop and as mentioned in the ¼ scale drop report (HI-2167515R2). This gap forms due to the relaxation of stressed components upon package release.

The licensing drawings indicate that the BFA-Tank has at least a 3/8" of clearance between it and the containment boundary for this gap to form. Likewise, the same models, used in drop simulations, assume no gap exists between the BTC and the BFA-Tank. When calculated from the licensing drawings, a clearance between 26 mm and 64 mm exists between these two parts, allowing a gap to form between them upon package release in all drop simulations.

Higher stresses are expected in the containment boundary as a result of internals striking each other and the containment boundary, due to these gaps forming during real drop tests. Update all corresponding calculations and drop simulations and the application, as necessary.

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-2 Verify that a space does not exists between the directly loaded contents and the lid of the ATB 1T.

The licensing drawings indicate that a 3/8" space exists between the BFA-Tank and the closure lid of the ATB 1T (Note 4 on Licensing Drawing 9786). However, it is unclear what space exists for directly loaded material, since no BFA-Tank is being used for this loading case.

Update the licensing drawings with this description as necessary.

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

2-3 Justify how the mass of the BTC contents is modeled in drop simulations.

Calculation 5 of document HI-2177540R2 states, in part, that the BFA-Tank and BTC must meet the following requirements:

> *1. The BFA-Tank walls including the top and bottom plates must not be subject to gross failure under the postulated normal and hypothetical accidental drop conditions. It implies that the walls including the top and bottom plates must not be subjected to buckling (gross yielding) under the inertial loads resulting from drop accidents.*
>
> *2. The connections between the BFA-Tank walls and the top and base plates must not be subject to gross failure under the normal drop conditions (NCT).*
>
> *3. The BTC corner reinforcing must not buckle or suffer gross yielding under the postulated normal drop events.*

4. The BTC the top and bottom plates must not separate from the corner structural bars under the postulated normal drop events.

The applicant has lumped all of the mass that represents the contents of the BTC (BFA-Tank cassette) to its lid (model part 29) for all drop simulations. While this approach may be appropriate, and/or conservative, for some drop simulations, it does not appear to be so for others.

For instance, the contents of the BTC during the side drop or CGOC drop simulation would be distributed close to the target upon package impact, but the lid of the BTC does not necessarily have to be. The greatest challenge to the containment boundary, BFA-Tank, and BTC, is expected when the contents are distributed as per actually loaded conditions, which tend to be close to the impact location.

In addition, the decelerations observed for the BTC do not match the calculations. The applicant's calculations assume that the BTF-Tank observes decelerations of 400 g while the BTC observes decelerations of 300 g. However, these values are exceeded by the top and bottom plate of the BTC (357 g) during the 30 ft top end drop. The bottom plate (Model part 29) of the BTC also experiences decelerations exceeding 800 g during the 9 m side drop simulation. In addition, the corner columns of the BTC (model part 25) are assumed to observe decelerations of up to 100 g, but do not appear to be stressed nor are other model parts (27 and 28) of the BTC for any drop simulation that was submitted.

Describe the performance of the package when the contents of the BTC are free to occupy the cavity of the BTC in a more realistic way for all postulated drop simulations and update calculations and the entire application, as necessary.

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-4 Justify the material flow curves used to perform sensitivity studies of the impact limiter components.

The applicant uses material flow curves for aluminum and stainless steel that are amplified by 10%, to demonstrate that materials with higher than minimum tabulated ASME values will not negatively impact the performance of the package. However, the value of 10% appears to be unsubstantiated.

Tabulated ASME material properties are expected to be exceeded 95% of the time based on a minimum of 5 samples. With this consideration in mind, the applicant shall (1) compare the 10% amplification to the one expected that insures that minimum flow curve properties are exceeded only 5% of the time, (2) update the sensitivity analysis, and the application, and (3) update drop simulations as necessary.

Additionally, the applicant shall confirm that the amplified simulations (Simulation C1), tabulated in Tables C.1 and C.2 of document HI-2177539R3, do result in *reduced* component stresses values rather than *increased* stress values, when compared to base simulations (Simulation 1).

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-5 Provide design calculations for the BFA-Tank lid bolts and additional dimensions of the BFA-Tank lid.

The applicant states that the BFA-Tank lid is recessed (Detail 2C, Sheet 2 of licensing drawing 9876) so that, in the event of a side drop, the recess in the lid protects the lid bolts from shearing (Section 6.2 of document HI-2177540R2). However, the recess dimensions have not been provided.

Without such dimensions, it is unclear how the BFA-Tank bolts would not be subject to shear, especially during an end drop where the BFA-Tank walls/lid bolts would experience shear, regardless of the lid recess specified.

In addition, the BFA-Tank lid bolts themselves observe direct loading during free drops, particularly during a top end drop of any kind, as the BTC would impact the BFA-Tank lid during a free fall, because of the gap forming between the two during an actual free fall, as a result of the relaxation of stressed components upon package release. It is noted that the BFA-Tank lid bolts prevent gross failure/separation of the BFA-Tank lid to the BFA-Tank side walls, a criteria that is specified in calculation 5 of document HI-2177540R2.

This information is required to determine compliance with 10 CFR 71.71(c)(7).

2-6 Justify the ratio of hourglass energy to internal energy observed for certain parts of the ATB-1T package during drop simulations in LS-DYNA.

As stated by the applicant, the ratio of hourglass energy to internal energy should be kept to a ratio of 10% or less, as hourglass energy indicates that a nonphysical part of internal energy is present in the model, which, in turn, implies that deformations and the overall physical behavior of the part may not be realistic simulated.

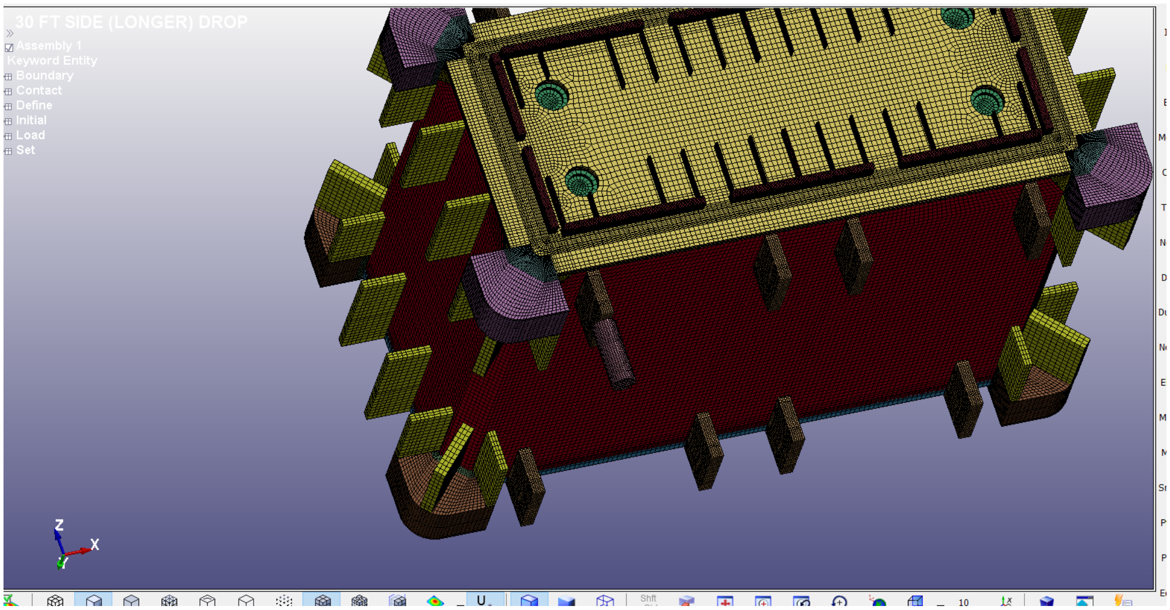
Several drop simulations, such as the 30 ft top end drop, exhibit ratios for certain parts which grossly exceed 10%; as an example, the top lid of the BTC (model part 29) observes a ratio of 130%, part 23 (intermediate dose blocker plate) in the model observes ratios of greater than 30%, and several others parts, not mentioned here, exceed 10% by smaller amounts.

According to calculation 5 of document HI-2177540R2, the BTC side walls and the top/bottom plates of the BTC have to avoid gross yielding and rupture, which is difficult to ascertain given the large amount of hourglass energy observed. The applicant shall verify and/or justify these large values or update the application and simulated drop sequences, as necessary.

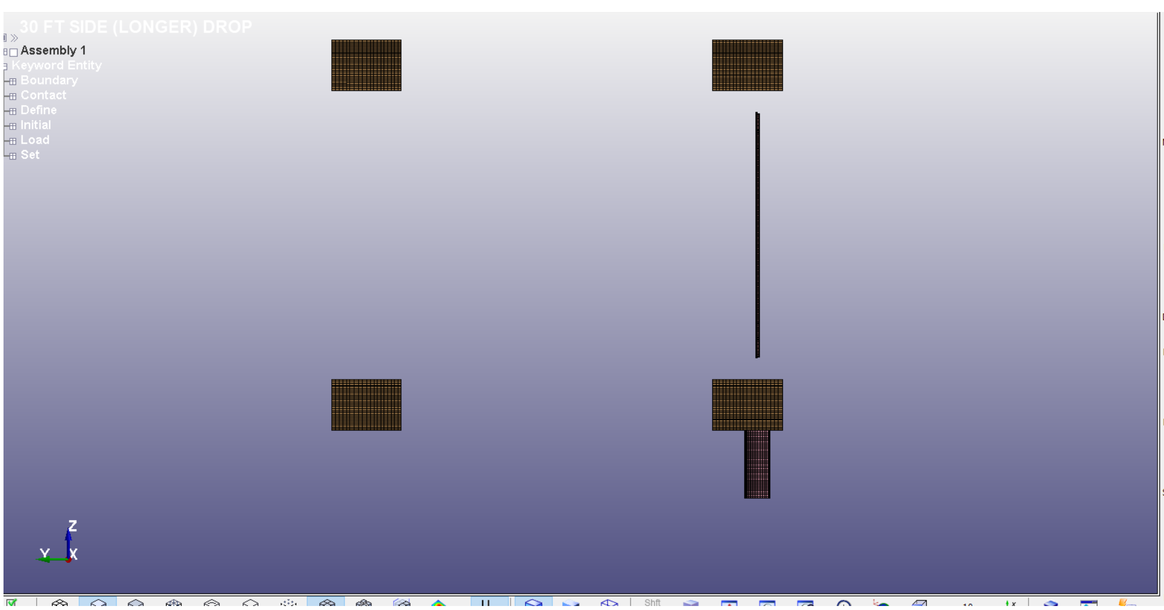
This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-7 Describe the condition of the sealing surface of the package when subject to the 9 m side drop, followed by a 1 m puncture drop at the side impact absorber near the sealing surface. Clarify and justify how containment requirements will be met given inelastic deformations are observed for the 9 m side drop.

The package's sealing surface (cladding) experiences inelastic deformations after the 9 m side drop next to the side aluminum impact absorbers (BOM 42 of the licensing drawings). It appears that additional damage could be experienced in this region as a result of the 1 m puncture drop (cumulative damage) in the area as shown:



Puncture Bar Centered over Sealing Surface at Side Impact Absorber (Side Drop Orientation Shown)



Puncture Bar Centered over Sealing Surface (Side Drop Orientation Shown)
Note: Only Side Impact Absorbers and Sealing surface Shown for Clarity

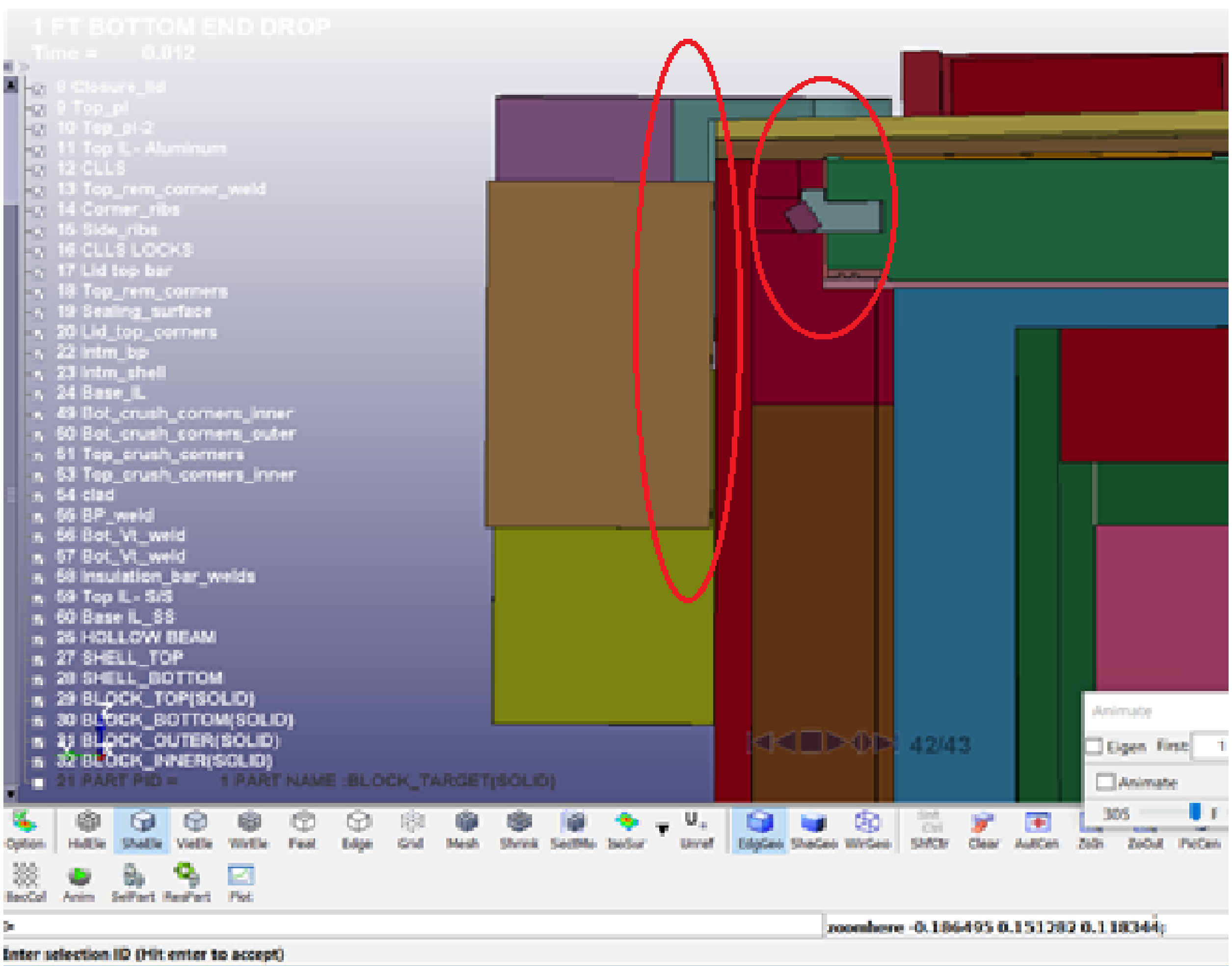
Additional damage in this region could further hinder and jeopardize the package's ability to maintain containment regulatory requirements.

A justification that containment requirements, such as leak rates, will be met given inelastic deformations at the closure region after the 9 m side drop has not been provided (see also containment RAI 4-1). The applicant shall update the application and all associated calculations, as necessary.

This information is required to determine compliance with 10 CFR 71.73(c)(1), and 71.73(c)(3).

2-8 Clarify the location of the aluminum impact absorber plates on the licensing drawings and their attachment in drop simulations.

Licensing drawing 9786 (Sheet 7 of 7) depicts the relative arrangement between aluminum impact absorbers (BOM part 42). However, their location relative to the cask itself has not been provided. These plates are partially missing from the 1 ft bottom end drop, 1 ft top end drop, and 30 ft BOT CGOC + 1 m puncture drop simulations. In the case of the 1m drops, they also do not appear to be connected, as shown below. In addition, it appears that part 16 of the model, CLLS locks, rotates unnaturally through its neighboring parts.



Impact absorbers are intended to reduce the demands on the containment boundary. It is unclear how "loose" or "missing" impact absorbers will affect the package's performance. The applicant shall update existing drop simulations and the application as necessary, including the licensing drawings.

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-9 Clarify the thickness of the closure lid and dose blocker plates.

Section 4A-4A on sheet 4 of 7 on licensing drawing 9786 depicts that the combined minimum thickness of BOM items 19 and 20 is 8.125 inches. However, the models, used to perform drop simulations in LS-DYNA, indicate that the combined thickness of these parts is only 7.75 inches.

It is unclear how the package will behave, with effectively less mass and stiffness, during drop simulations. Such changes could also increase the stresses on the package as a whole, as well as on the containment boundary.

The applicant shall clarify the thickness of the closure lid and dose blocker plates and justify the impact this thickness has on the stress margins, the licensing drawings, and update the application as necessary.

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-10 Clarify the dimensions describing the lifting lugs.

Calculation 4 of document HI-2177540 depicts lifting lug dimensions t_1 and t_2 (BOM Part 30 on the licensing drawings) as being 0.63 inches. However, Section 4A-4A on Sheet 4 of licensing drawing 9786 depicts these dimensions as being 0.5 inches.

Describe what impact this has on the lifting calculations and update the licensing drawings and the application, as necessary.

This information is required to determine compliance with 10 CFR Part 71.45(a).

2-11 Verify the model used to represent the BTC, the loads observed in the BTC, and the BTC's relative position within the BFA-Tank during drop simulations.

Calculation 5 of document HI-2177540R2 states (in part) the criteria used to examine the BTC:

> *3. The BTC corner reinforcing must not buckle or suffer gross yielding under the postulated normal drop events.*
>
> *4. The BTC top and bottom plates must not separate from the corner structural bars under the postulated normal drop events.*

However, drop simulations for NCT and HAC, such as the bottom end 1 m drop and bottom end 9 m drop, show that the BTC side walls (model part 32) appear to be not connected to the BTC top (model part 30) nor the BTC bottom plate (model part 29). This implies that the applicant's specified criteria of plate separation have been violated.

Specifically, the side walls of the BTC move independently from the top and bottom plate which seem to move in unison. This may be the reason why the corner reinforcing (model part 25) and remaining portion of the BTC model parts 27 and 28 do not observe any loading for any drop simulation submitted.

The applicant shall update all drop simulations, calculations, and the application results as necessary.

This information is required to determine compliance with 10 CFR 71.71(c)(7), 71.73(c)(1), and 71.73(c)(3).

2-12 Justify or quantify that a sufficient amount of water will not be available to produce flammable hydrogen by radiolysis following the vacuum drying process.

To prevent flammable conditions, hydrogen concentrations are limited to less than 5% by volume. Section 1.2.2 of the application states, in part, that the package contents include secondary waste (i.e. debris/chips) generated by the mechanical cutting process, chip drums with surface contamination or induced activity and metallic waste filters (stainless steel or ceramic mesh screens) in the chip drums. Because the chips and mesh screens may hold residual water, the staff requires additional information that demonstrates that the potential amount of residual water after drying is not capable of generating flammable levels of hydrogen due to radiolysis.

This information is required to determine compliance with 10 CFR 71.43(d).

2-13 Further justify why the carbon steel used to fabricate the BFA-Tank and BTC does not require fracture toughness testing by providing additional information demonstrating that the BFA-Tank and BTC will not undergo gross failure or will fail only in the intended manner (e.g., cracks of a limited width).

The BFA-Tank and BTC are designated as ITS components on the licensing drawings. Licensing drawing 9876, flag note 1, specifies that they are made of a steel that has minimum mechanical properties of ASTM A36 steel. Section 2.2.5 of the application provides reasons why this structural steel material does not require fracture toughness testing. However, based on the applicant's acceptance criteria, the BFA-Tank and BTC cannot fracture under certain postulated NCT and HAC drops scenarios. Fracture is a failure mechanism which is random in nature and difficult to predict a priori.

Specifically, Calculation 5 of HI-2177540R2 (proprietary) evaluates the BFA-Tank/BTC under NCT and HAC drops and states in part:

1. The BFA-Tank walls including the top and bottom plates must not be subject to gross failure under the postulated *normal and hypothetical accidental drop conditions*. It implies that the walls including the top and bottom plates must not be subjected to buckling (gross yielding) under the inertial loads resulting from drop accidents.

2. The connections between the BFA-Tank walls and the top and base plates must not be subject to gross failure under the normal drop conditions *(NCT)*.

3. The BTC corner reinforcing must not buckle or suffer gross yielding under the postulated *normal drop events*.

4. The BTC the top and bottom plates must not separate from the corner structural bars under the postulated *normal drop events*.

Elsewhere in the application, the applicant states that during HAC conditions, crack formation in the top or bottom plate of the BFA-Tank/BTC is acceptable; however, gross failure is not.

It is unclear for the staff how the material of the BTC and BFA-Tank will perform in the intended manner when brittle fracture requirements for the material have not been established.

This information is required to determine compliance with 10 CFR 71.47, 10 CFR 71.51 (a)(2), 71.71(c)(2), 71.71(c)(7), and 71.73(c)(1)

3- THERMAL EVALUATION

3-1 Clarify the results and methods used for the hypothetical accident condition thermal calculations pertaining to the exterior surface temperature, seal temperature, and cask cavity temperature.

(1) Statements on page 3-30 of the application indicate that a) the decay heat of the waste has negligible impact on the temperature increase of the cask under the fire accident and b) that “the increase in the average temperature of the cask cavity is expected to be smaller than the increase in the average temperature of the cask containment boundary components since the heat from the fire is transferred from outside to inside.”

Considering the above statements, there was no explanation for the temperatures provided in Figure 3.4.1(a) and Table 3.1.2 of the application. For example, Table 3.1.2 indicated that the cask closure lid inner seal, at the end of the fire and at the post-fire period (433°F and 532°F, respectively), is at a higher temperature than the closure lid (252°F and 358°F, respectively), even though the closure lid is near to the fire boundary condition.

In addition, it is noted that these results appear to be different from those of the previous submittal.

(2) the applicant shall provide a description and definition and the locations (relative to the fire boundary condition) of the cask lid, closure lid, containment wall, and base plates, and of the volume average of containment boundary components, in order to help to explain the temperature trends of Figure 3.4.1(a).

(3) It is noted that Section 3.4.3.2 (and page 3-5 of the application stated that “the maximum cask cavity average temperature under the fire condition is conservatively overestimated by adding 160°C (320°F) to that under the normal conditions”.

> The applicant shall provide a calculation and justify that adding 160°C to the cask cavity normal conditions of transport temperature provides a bounding cask cavity temperature during the hypothetical accident thermal conditions.

In addition, recognizing that (i) the decay heat and content were modeled during the fire thermal condition (and, therefore, should have temperatures associated with it, per Section 3.4.1), and (ii) the thermal hypothetical accident condition model accounts for damage that is not included in the normal conditions of transport model, the staff notes there was no discussion for needing to use normal condition temperatures (i.e., adding 160°C).

It is also noted that internal temperatures have an impact on the seal temperature at the hypothetical accident condition, and therefore, accurate and/or bounding temperatures are needed.

This information is required to determine compliance with 10 CFR 71.51(a).

3-2 Clarify the surface temperature of the package after the 30-minute fire to ensure the boundary conditions for subsequent analyses are appropriate.

A review of the T200-half-uniform-1d75kw-fire-initial.cas file appeared to show an approximately 388°C external surface temperature 30 minutes after the start of the fire. This is different from expected temperatures, considering that the surface had been exposed to an 800°C fire for 30 minutes and previous submittals have shown temperatures approaching 800°C.

It is also noted that final boundary conditions after the 30-minute fire are applied as input for the subsequent cooldown transient analysis, and therefore, appropriate inputs are necessary. The thermal analyses are used in determining the effectiveness of the containment boundary seals.

Recognizing the uncertainty in the temperature above and the presence of oscillatory-like swings at the end of the energy balance residual plot (T200-half-uniform-1d75kw-fire-initial.cas), the applicant shall demonstrate and clarify that the hypothetical accident condition thermal results have reached convergence (e.g., monitoring seal temperature throughout the timesteps) to ensure that reported values are representative. As mentioned above, the thermal analyses are used in determining the effectiveness of the containment boundary seals.

This information is required to determine compliance with 10 CFR 71.51(a).

3-3 Justify the appropriateness of a 0.11 emissivity value in the thermal analyses and that the value can be maintained during both normal conditions of transport and hypothetical accident conditions.

Table 3.2.5 of the application includes a new “polished stainless steel” material with an emissivity of 0.11. However, a description and use of this material is not clearly discussed in the thermal analysis.

In addition, the appropriateness of the 0.11 value was not justified, recognizing the difficulty in maintaining a polished surface.

This information is required to determine compliance with 10 CFR 71.33(a).

4- CONTAINMENT EVALUATION

4-1 Justify that the release calculations presented in Chapter 4, and corresponding allowable leakage rate, are appropriate considering the condition of the seal and closure region of the containment boundary during hypothetical accident conditions.

According to Figure 8.5 and Figure 8.5.7 (Document HI-2177539), there is separation of the lid from the flange beyond the gasket's springback for an unspecified perimeter length.

In addition, plastic deformation in the closure region is observed in the LS-DYNA results for many of the analyzed drops. The closure's performance would affect the potential release beyond that analyzed in Chapter 4.

This information is required to determine compliance with 10 CFR 71.51(a).

4-2 Specify the inner and outer seal locations in drawing 9786 Rev. 5 (sheet 4 of 7) and clarify that the inner and outer seals are correctly positioned in the LS-DYNA models/results provided in the application.

The performance of the containment boundary seals is dependent on its position within the closure lid. However, the seal's relative position within the lid is not defined in the drawings.

In addition, there is an uncertainty in the strains and loads on the seals within the reported LS-DYNA model results during hypothetical accident condition modeling scenarios because of the uncertainty in the seal's position.

This information is required to determine compliance with 10 CFR 71.33(a).

4-3 Provide the closure's surface condition (e.g., RA, RMS and units) for the contact surface between the flange and closure lid, including the weld overlay and the O-ring grooves.

The sealing performance of an O-ring is dependent on surface condition (per page 7-4 of the application), but surface condition specifications were not found in the drawings (e.g., 9786 Sheet 4 of 7, Rev. 5).

This information is required to determine compliance with 10 CFR 71.33(a).

5- SHIELDING EVALUATION

5-1 Provide justification for the mesh size of the tallies for the trunnions, the closure lid lift lug holes and the chamfered cask edges.

The applicant provides the sizes of the tallies in Table 3 of Enclosure 10: Shielding Analysis for the HI-STAR ATB 1T, HI-2156583 Rev. 4 to the application (ADAMS Accession No. ML19158A519). Section 5.1.3 of the application states: *"In normal conditions models, tallies are present adjacent to the chamfered edges of the cask and adjacent to lift lug holes to ensure any local dose rate maximums are considered in these areas with localized steel through-thickness reductions."*

Since the purpose of these tallies is to account for localized reductions in shielding, the tally sizes should be sufficiently small to detect these local effects. However, from Table

3 of Enclosure 10, it appears that the tally sizes may be too large to capture the details of the potential hot spot(s) in the weak shielding area.

The staff requests that the applicant justify that the mesh sizes of the tallies, designed to account for local effects, are appropriate for capturing the maximum dose rate.

This information is required to determine compliance with 10 CFR 71.47(b).

5-2 Update the Drawings and Chapter 7 of the application to clearly state the BFA Tank Configurations, when not using the BTC, for the various waste container types.

Section 1.1 of the application states that the BFA Tank Cassette (BFC) is an optional component. This section states, *"If the optional BTC is not used, equivalent material shielding thickness is provided by commensurately increasing the BFA-Tank top cover and bottom plate thickness."*

The staff requests that the applicant updates the drawings of the BFA-Tank to show the alternate BFA-Tank configuration. The staff also requests that the applicant updates Chapter 7 of the application to clearly show that the BFA Tank and BTC are required or show that the alternate BTC configuration, with the increased thickness, is required for the various Waste Package Types. The loading procedures, for loading without the BTC, shall also be updated.

This information is required to determine compliance with 10 CFR 71.47 and 71.51(a)(2).

5-3 Provide an analysis demonstrating that the package meets the NCT dose rates in 10 CFR 71.47 when the side trunnions have failed and are removed from the package.

The trunnions on the side of the package are currently credited as part of the shielding of the package when evaluating the package's ability to meet NCT dose rate limits as shown in Figure 5.3.2 of the application.

As discussed in Section 5.4.4 of the application, the applicant has evaluated whether the shielding of the package is adequate to meet HAC dose rate limits in 10 CFR 71.51(a)(2) assuming the trunnions have failed and are removed from the package; however, the requirements in 10 CFR 71.45(a) are not specific to HAC and state that *"failure of any lifting device under excessive load would not impair the ability of the package to meet other requirements of this subpart"* which includes NCT dose rate limits in 10 CFR 71.47.

This information is required, in accordance with 10 CFR 71.45(a), to determine compliance with 10 CFR 71.47.

7- OPERATING PROCEDURES

7-1 Clarify how the lift points of the package will remain inoperable during transport.

Chapter 7 does not mention when lifting points will be rendered inoperable during transport as per the regulations. Clarify and/or update the application, as necessary.

This information is required to determine compliance with 10 CFR Part 71.45(a).

7-2 Clarify either in the application or in the licensing drawings when the security seal is inspected for tampering and removed during unloading operations.

Section 1.2.1.8 of the application discusses the security seal that is used to indicate when the package has been opened by non-authorized persons. However, in the package operating procedures section, it is not mentioned when the seal is examined and removed from the package.

This information is required to determine compliance with 10 CFR 71.43(b).

7-3 Clarify the torque of the bolts used to secure the BFA-Tank lid and designate them as ITS on the drawings.

Section 7.1.2.1 of the application on page 7-5 indicates that the BFA-Tank has bolts which secure the lid to the rest of the BFA-Tank. The torque values don’t appear to have been specified in the licensing drawings or in any submitted calculations.

The bolts prevent the lid from separating from the BFA-Tank during free drop and puncture accident scenarios and therefore are ITS rather than denoted as NITS. The applicant states that lid and sidewall separation is not permitted according to Calculation 5 of document HI-2177540R2. Update the licensing drawings and calculations as necessary.

This information is required to determine compliance with 10 CFR 71.43(c).