NRC FORM 699
(11-2017)

U.S. NUCLEAR REGULATORY COMMISSION

CONVERSATION RECORD

NAME OF PERSON(S)/TITLE CONTACTED OR IN CONTACT WITH YOU	DATE OF CONTACT	TYPE OF CONVERSATION
Royston Ngwayah	04/08/2020	☐ E-MAIL ☑ TELEPHONE ☐ INCOMING ☑ OUTGOING
E-MAIL ADDRESS R.Ngwayah@holtec.com	**TELEPHONE NUMBER**	
ORGANIZATION HOLTEC	**DOCKET NUMBER(S)** 71-9375	
LICENSE NAME AND NUMBER(S) HOLTEC INTERNATIONAL	**MAIL CONTROL NUMBER(S)**	

SUBJECT
Discussion on staff's structural and containment RAIs for the Model No. ATB 1T package.

SUMMARY AND ACTION REQUIRED (IF ANY)
Date: April 8, 2020

Subject: HI-STAR ATB 1T Structural RAIs

Participants: Royston Ngwayah, Kishore Gangadharan, Venkat Prabhala, Chuck Bullard, Robert Mahorter
NRC : Pierre Saverot, Joe Borowski, Antonio Rigato

Holtec requested this conference call to discuss the progress made in responding to the staff's RAIs dated November 8, 2019. The NRC staff and Holtec had previously exchanged their views on November 19, 2019. Holtec's design and licensing efforts have been largely focused on two crucial topics raised by the staff as RAIs 2-1 and 4-1: analysis of the secondary impacts due to the internal gaps inside the HI-STAR ATB 1T cask, and performance of the containment boundary in the seal region by eliminating the inelastic strain in the vicinity of the containment boundary seal. These efforts have led Holtec to incorporate new design enhancements to the HI-STAR ATB 1T package: addition of hollow aluminum inserts in the bottom surface of the cask lid to minimize the gap between the BFA-Tank and the cask and mitigate the secondary impact effects. Likewise, stainless adjustable inserts are now recessed into the side walls of the HI-STAR ATB 1T cask for the same reason. These changes have also benefited the containment boundary seal by essentially eliminating inelastic strains in the seal region.

NAME OF PERSON DOCUMENTING CONVERSATION
PIERRE SAVEROT

SIGNATURE	DATE OF SIGNATURE
P.S.	04/13/2020

Add 1 Continuation Page Delete 1 Continuation Page

CONVERSATION RECORD (continued)

LICENSE NAME AND NUMBER(S)	MAIL CONTROL NUMBER(S)
HOLTEC INTERNATIONAL	

SUMMARY AND ACTION REQUIRED (IF ANY) (Continued)

Regarding the aluminum inserts and the steel tubing, staff asked Holtec to specify the temper of the Aluminum that will be used since Aluminum has about 3 times the expansion rate of the steel. Staff said that the dimensions of the tubes shall be put on the drawings and that the tubes have to crush and not be restricted by the recess holes in the lid. Staff also reminded Holtec that this new design shall not be detrimental to the shielding of the package in regards to the "weaker" parts of the package (Aluminum is not steel for shielding purposes). Staff also noted that there are other considerations to keep in mind in this design, such as the detrimental effect of vibration on the screws.

Holtec explained that the internal gap between the BFA-Tank Cassette (BTC) and the surrounding BFA-Tank, as well as the internal gap(s) between the BTC and the stored contents, are not modeled explicitly in LS-DYNA. Instead, the contents' mass is lumped together with the BTC as a single rigid body, and the BTC is assumed to be in contact with the BFA-Tank at the time of impact. Holtec justified this modeling approach as being conservative, based on the following:

a) the rigid modeling of BTC plus the contents does not allow for any energy dissipation due to straining/ deformation of these components, and it guarantees that all of the mass moves perfectly in phase (maximizing the impact momentum transfer);

b) the zero gap assumption between the BTC and the BFA-Tank at the start of the simulation is expected to maximize the secondary impact between the BFA-Tank and the HI-STAR ATB 1T cask and increases the structural demand on the cask containment boundary;

c) there are no structural acceptance criteria for the BTC under hypothetical accident conditions (HAC), so the response of the BTC is not important to consider.

The NRC staff said that it was a reasonable assumption to model the BTC and contents as a rigid body with no energy/ momentum loss due to the deformation of contents or non-coherent impacts.

Holtec indicated that its intent was to implement the above modeling approach, together with explicit modeling of the BFA-Tank to the cask gap, for the 9-meter HAC drops, but to forego this approach for the 1-foot normal condition drops due to a lower impact energy and the shorter time duration during free fall (limiting the potential for secondary impact effects due to internal gaps). While the NRC staff agreed that the secondary impact would be less significant for the 1-foot drop, the staff disagreed with Holtec's approach and believes that the effect still needs to be quantified to support this application. The NRC also pointed to the different acceptance limits for HAC versus normal conditions of transport (NCT) as an additional reason for using the same approach for the 1-foot drop.

Add 2nd Continuation Page | Delete 2nd Continuation Page

CONVERSATION RECORD (continued)

LICENSE NAME AND NUMBER(S)	MAIL CONTROL NUMBER(S)
HOLTEC INTERNATIONAL	

SUMMARY AND ACTION REQUIRED (IF ANY) (Continued)

In response, Holtec proposed re-running the most limiting 1-foot drop case (based on previous results) using the same modeling approach than the one described for the 9-meter drops (with an adjusted initial gap condition commensurate with 1-foot drop) to quantify the effect of secondary impacts and demonstrate compliance with NCT limits. The staff was generally supportive of this decision, and said that the threshold is always reasonable assurance with safety margins that can be defended.

Holtec summarized some of the preliminary results for the 9-meter drop cases based on the new ATB 1T cask design, while also including secondary impact effects. Based on the critical drops performed so far, Holtec reported no inelastic strains in the primary sealing region (viz. on the seal seating surfaces). For the side drop, there were still some amounts of inelastic strain (less than 0.5%) along the outer periphery of the cladded seal region. However, the strain was adjacent to the test seal and opposite from the containment boundary seal. The NRC staff asked if this inelastic strain could be totally alleviated by revisiting the conservative modeling assumptions applied to the BTC and its contents for the 9-meter drop cases (possibly as a sensitivity case). Holtec agreed to give this further consideration.

Finally, with respect to RAI 4-2, Holtec confirmed that the seal grooves are modeled accurately in the LS-DYNA model and the critical dimensions will also be reflected on the updated licensing drawing. The surface finish for the cladded seal region will be determined based on the seal manufacturer's recommendations, and be also captured on the updated licensing drawing (RAI 4-3). Staff said there shall be no approximation in the behavior of the cladding region. Uncertainties shall be reflected in the LSDYNA model and there shall be no radioactive release post drop events.

Holtec concluded the call by estimating a mid-May submittal for the RAI responses.