April 9, 2007

MEMORANDUM TO: William H. Ruland, Deputy Director
Licensing and Inspection Directorate
Division of Spent Fuel Storage
and Transportation, NMSS

FROM: Robert A. Nelson, Chief
Licensing Branch **/RA/**
Licensing and Inspection Directorate
Division of Spent Fuel Storage
and Transportation, NMSS

SUBJECT: PATH TO RESOLUTION FOR THE LID SEPARATION ON DRUM TYPE TRANSPORTATION PACKAGES

This memorandum provides a proposed resolution for drum type transportation packages that may potentially have problems with lid separation during accident conditions. Several years ago, it was determined by testing that lids on drum type transportation packages could potentially be separated from the package during hypothetical accident conditions 30-ft drop test. The drum lid could become separated when dropped over the drum corner and with the drum's longer axis at a shallow angle to the horizontal. A brief history of this issue is attached (Attachment 1). Results of the testing and follow-up analysis of package inventory determined the likelihood of this situation being a safety issue was small and that immediate action was not required. A more detailed discussion of the analysis is included in Attachment 2.

In response to this issue, staff from the Licensing Branch (LB) investigated the inventory of drum type Certificates of Compliance (CoC) and determined that 18 of the current 130 active CoCs are drum type packages. A list of the drum type packages is attached (Attachment 3). Of the 18 drum type transportation packages, 11 of the CoCs did not require further investigation because the drum is: (1) enclosed by an overpack; (2) uses clamps for closure; or (3) assumed full containment loss in the criticality analysis. Additionally, the CoC for two packages will expire on October 1, 2008.

I propose to address the remaining seven CoCs by issuing a Request for Additional Information (RAI) during the next renewal or amendment. An example of a proposed RAI is attached (Attachment 4). The RAI will provide additional information to staff to determine if a revision to the drum design or mitigating measures should be taken. The LB staff will track the remaining seven packages and will periodically update SFST management regarding the status of this issue. If schedule permits, staff from the Technical Review Directorate (TRD) will be asked to assess the remaining seven packages in more detail to determine if the RAI is necessary

If you have any questions regarding this memorandum, please contact me or Ms. Jill Caverly of my staff.

I propose to address the remaining seven CoCs by issuing a Request for Additional Information (RAI) during the next renewal or amendment. An example of a proposed RAI is attached (Attachment 4). The RAI will provide additional information to staff to determine if a revision to the drum design or mitigating measures should be taken. The LB staff will track the remaining seven packages and will periodically update SFST management regarding the status of this issue. If schedule permits, staff from the Technical Review Directorate (TRD) will be asked to assess the remaining seven packages in more detail to determine if the RAI is necessary.

If you have any questions regarding this memorandum, please contact me or Ms. Jill Caverly of my staff.

Distribution: SFPO r/f EEaston BWhite JGlenny MRahimi JCuadrado
KHardin SBrown NOsgood

Filename: C:\FileNet\ML071020309.wpd

OFC	SFST	E	SFST	E	SFST			
NAME	JCaverly*		MDeBose*		RNelson			
DATE	02/20/07		02/21/07		04/09/07			

OFFICIAL RECORD COPY

BACKGROUND AND HISTORY OF THE DRUM TYPE TRANSPORTATION PACKAGES AND LID SEPARATION

Background

The U.S. Nuclear Regulatory Commission (NRC) became aware of a potential problem related to the performance of drum-type transportation packages when subjected to the Hypothetical Accident Conditions (HAC) 9-meter (30-foot) drop test described in 10 CFR 71.73. Previous physical tests for these packages had been performed with the center of gravity over the lid corner, an angle of approximately 45° from horizontal, which was considered to be the orientation expected to cause maximum damage. However, new tests showed that the drum lid may separate from the drum body when the package is drop tested at a shallower angle from horizontal. Based on this new information, NRC contracted with an outside organization to perform a 9-meter (30-foot) drop test at a shallow angle of an NRC-certified drum-type package used for fissile material shipments.

History

Prior to 1999, the NRC became aware of a potential problem related to the performance of drum-type transportation packages when subjected to the Hypothetical Accident Conditions (HAC) 9-meter (30-foot) drop test described in 10 CFR 71.73

March 7, 1999, Lawrence Livermore National Laboratory, researched and created for NRC a list of all Drum Type Packagings Certified by the NRC. At that time 27 Drum Type Packagings were Certified by the NRC.

On November 15, 2001, NRC's contractor performed a 9-meter (30-foot) drop test of the Model No. ABB-2901 (Certificate of Compliance (CoC) No. 9274) package, with the package oriented approximately 17.5° from horizontal and with the lid contacting the target opposite the ring-closure bolt. The test resulted in the complete separation of the lid and top insulation from the drum body. The results were published on October 2003, in NUREG/CR-6818, "Drop Test Results for the Combustion Engineering Model No. AB-2901 Fuel Pellet Shipping Package." Qs & As were prepared for this report.

Several options for resolution were considered. Both a bulletin and an information notice were prepared but management did not agree with either of these forms of generic communication. Management recommended a generic letter. A generic letter was prepared in 2003 but not issued.

In 2006, this issue was transferred to the Licensing Branch in the Division of Spent Fuel Storage and Transportation. Staff proposed an option of requesting additional Request for Additional Information (RAI) for drum type transportation packages that may experience lid separation. Many of the drum type packages were removed from question by determining that the package was reinforced or that the criticality analysis included a complete removal of the lid. Seven of the 18 drum type transportation packages will require a RAI.

RISK IMPLICATIONS FROM DRUM TYPE TRANSPORTATION PACKAGE STUDY

Risk Implications for the ABB-2901

The NRC staff performed a scoping study to determine the realistic risks to public health and safety based on the potential for lid separation of drum type transportation packages. The staff used the ABB-2901 package as the sample package for the scoping study (the package in which the lid separated from the drum during the shallow angle 30-foot drop test). This study was intended to guide the NRC on what is an acceptable level of compensatory measures for the Certificate of Compliance holders to take and what regulatory actions the NRC needs to take to deal with the implications of the test results on drum type transportation packages.

The risk scoping study incorporated the following assumptions based on the test results and engineering judgement: a) the lid of the ABB-2901 was separated and the inner box that holds the radioactive contents was separated from the drum; b) the radioactive material was not released from the inner boxes; c) moderation used in the criticality calculations assumed lake water; d) an array of inner boxes were analyzed in the criticality study; e) the radioactive contents used were derived from CoC 9274.

The following conclusions can be derived based on the results of the study: a) no number of packages could go critical without moderation in water; b) an array of about 18 inner boxes (from 18 packages) in water has a K-eff of about 0.95 which is the upper limit that NRC allows for determination of subcriticality; c) an array of about 45 inner boxes in water has about a K-eff of 1.00 (criticality event is possible).

The transport index (TI) for criticality control for the ABB-2901 is 0.5 as shown in the CoC. This TI translates into an allowable shipment of 100 packages in a non-exclusive use shipment and 200 packages in an exclusive use shipment as per 10 CFR 71.59. Therefore about 50% of the packages in a non-exclusive use shipment or about 25% for an exclusive use shipment have to be damaged (lid separated and in water) in order for a criticality event to potentially occur. Additionally, these types of packages are frequently transported internationally on cargo vessels in which the allowable TI is 200 for a vessel as defined in 49 CFR 176.704. Therefore the risk level is acceptably low enough for the NRC to allow for the continued use of the packages with a limited degree of compensatory measures until full regulatory compliance with 10 CFR Part 71 can be demonstrated by the CoC holder. It should be noted that the regulations in 10 CFR Part 71 are harmonized with the international regulations developed by the International Atomic Energy Agency (IAEA) to assure that international commerce is not adversely impacted.

DRUM TYPE PACKAGES WITH POSSIBLE LID SEPARATION ISSUES

#	CoC	Model No.	Type of Package	Expiration Date	Certificate Holder	Contents
1	9037	TRIGA-II	Fresh Fuel - Triga	31-Dec-10	General Atomics	Sealed Sources
2	9034	TRIGA-I	Fresh Fuel - Triga	31-Dec-10	General Atomics	Sealed Sources
3	9203	DHTF	Fresh Fuel	28-Feb-11	Framatome ANP	Normal Form
4	9250	5X22	Fresh Fuel	31-Mar-08	BWXT	Normal Form
5	9185	OP-100	Radiography Pckg. - Source Changer	31-Dec-08	Industrial Nuclear Company	Special Form
6	9217	ANF-250	Fresh Fuel	30-Jun-10	Framatome ANP	Normal Form
7	5086	UNC-2600	Fresh Fuel	28-Feb-09	BWXT	Normal Form

Proposed RAI for the 7 CoCs (Drum type packages) During Renewal or Amendment

Evaluate whether a 9-meter (30 foot) drop test at a shallow-angle orientation could result in lid separation. If the analysis results in lid separation, examine the effect of such lid separation on the ability of the package to meet the requirements of 10 CFR Part 71.

[Include only for fissile packages]
The licensing basis for the drum-type package that was tested assumed that the lid would remain attached to the drum. Separation of the lid from these drum-type packages could adversely affect the criticality evaluation required to meet 10 CFR 71.55 (e), and affect the assessment of an array of damaged packages, as required by 10 CFR 71.59 (a)(2). Thus, the results of the shallow angle drop testing could invalidate the basis for approval of the transportation package.

[Don't include if shielding is not a problem - fresh fuel]
For non-fissile-material drum type packages, the possibility of lid separation could adversely affect the package complying with the external dose limits stated in 10 CFR 71.47, and radioactive materials release requirements, as stated in 10 CFR 71.51.

This information is needed to determine compliance with 10 CFR 71.55(e), 10 CFR 71.59 (a)(2) {for fissile packages only} 10 CFR 71.47, and 10 CFR 71.51.