

August 1, 2012

Dr. Jayant Bondre, PhD  
Vice-President – Engineering  
Transnuclear, Inc.  
7135 Minstrel Way, Suite 300  
Columbia, MD 21045

SUBJECT: APPLICATION FOR CERTIFICATE OF COMPLIANCE NO. 9358 FOR THE  
MODEL NO. TN-LC PACKAGE – SECOND REQUEST FOR ADDITIONAL  
INFORMATION

Dear Dr. Bondre:

By letter dated May 4, 2012, you submitted your responses to the Request for Additional Information letter dated November 22, 2011, in connection with staff's review of your June 7, 2011, application for the Model No. TN-LC as a Type B(U)F-96 package. You also provided Revision No. 2 of the application.

In connection with our detailed technical review, we need the information identified in the enclosure to this letter. We request that you provide this information by August 30, 2012. If you are unable to meet this deadline, you must notify us in writing no later than August 20, 2012, of your 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. 71-9358 and TAC No. L24543 in future correspondence related to this request. The staff is available to meet with you to discuss your proposed responses. If you have any questions regarding this matter, I may be contacted at (301) 492-3408.

Sincerely,

**/RA/**

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

Docket No. 71-9358  
TAC No. L24543

Enclosure: Second Request for Additional Information

Dr. Jayant Bondre, PhD  
Vice-President – Engineering  
Transnuclear, Inc.  
7135 Minstrel Way, Suite 300  
Columbia, MD 21045

SUBJECT: APPLICATION FOR CERTIFICATE OF COMPLIANCE NO. 9358 FOR THE MODEL NO.  
TN-LC PACKAGE – SECOND REQUEST FOR ADDITIONAL INFORMATION

Dear Dr. Bondre:

By letter dated May 4, 2012, you submitted your responses to the Request for Additional Information letter dated November 22, 2011, in connection with staff's review of your June 7, 2011, application for the Model No. TN-LC as a Type B(U)F-96 package. You also provided Revision No. 2 of the application.

In connection with our detailed technical review, we need the information identified in the enclosure to this letter. We request that you provide this information by August 30, 2012. If you are unable to meet this deadline, you must notify us in writing no later than August 20, 2012, of your 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. 71-9358 and TAC No. L24543 in future correspondence related to this request. The staff is available to meet with you to discuss your proposed responses. If you have any questions regarding this matter, I may be contacted at (301) 492-3408.

Sincerely,

**/RA/**

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

Docket No. 71-9358  
TAC No. L24543

Enclosure: Second Request for Additional Information

**DISTRIBUTION:**

G:\SFST\Saverot\71-9358 TN-LC\ 2<sup>nd</sup> round of RAI Letter

**ADAMS Accession No.: ML12219A280**

OFC	SFST	E	SFST	C	SFST	C	SFST	C	SFST	SFST
NAME	PSaverot		MGordon		ASotomayor		CBajwa		DPstrak	VCusamano
DATE	07/12/2012		7/17/12		7/25/12		7/23/12		7/18/12	7/24/12
OFC	SFST		SFST		SFST		SFST		SFST	SFST
NAME	MRahimi		MDeBose		MWaters					
DATE	7/25/12		7/31/12		8/1/12					

**C = COVER E = COVER & ENCLOSURE N = NO COPY OFFICIAL RECORD COPY**

SECOND REQUEST FOR ADDITIONAL INFORMATION  
FOR THE  
MODEL NO. TN-LC PACKAGE

DOCKET NO. 71-9358

By application dated June 7, 2011, Transnuclear, Inc. (TN) submitted an application for approval of the Model No. TN-LC package. The NRC staff completed an acceptance review of this application on July 26, 2011. On August 17, 2011, TN submitted responses to staff's request for Supplemental Information. By letter dated May 4, 2012, TN submitted responses to the first Request for Additional Information letter dated November 22, 2011, and also provided Revision No. 2 of the application.

This second Request for Additional Information (RAI) identifies information needed by the staff in connection with its review of the Model No. TN-LC package application. The requested information is listed by chapter number and title in the applicant's Safety Analysis Report. The staff reviewed the application using the guidance in NUREG 1617, "Standard Review Plan for Transportation Packages for Spent Nuclear Fuel."

Each individual RAI section describes information needed by the staff to complete its review of the application and to determine whether the applicant has demonstrated compliance with the regulatory requirements.

**Chapter 1      General Information**

**Licensing Drawings**

- 1.1      Remove the potential use of castings for the inner shell, cited on Engineering note 24 on sheet 2 of licensing drawing No. 65200-71-01. Alternatively, demonstrate that castings have the potential for maintaining a leak-tight containment barrier as described in American National Standards Institute (ANSI) 14.5.

Unlike rolled steel or large forgings, there is little ambiguity that castings will contain significant microstructural defects that will permit the leakage of helium at rates above  $1 \times 10^{-7}$  ref cm<sup>3</sup>/s.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(5)(iii) and 10 CFR 71.43(f).

- 1.2      Remove "or Equivalent" from Engineering note 17 on sheet 2 of Licensing Drawing No. 65300-71-01. Alternatively, list the critical characteristics of the polymer seal or a recognized standard, e.g., ASTM D2000, with appropriate acceptance criteria for the tests in ASTM D2000.

Equivalency should be evaluated by the staff to determine regulatory compliance.

"Equivalent Materials" are typically an acceptable method for designating not important to safety items (NITS) such as the Outer Bottom Plug O-Ring on sheet 1 of licensing drawing No. 65200-71-01.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(5)(iii).

- 1.3 Ensure that references to the ASME Code on the licensing drawings are internally consistent with other notes on the drawings and with the contents of the application.

Engineering note 6 on sheet 2 of 11 licensing drawing No. 65200-71-01 states that buyer specifications can be exempt from the ASME Code requirements, while Section 4.1.1.1 of the application clarifies that the containment-related components can be purchased through commercial grade dedication under the Certificate Holder's quality control program. The former statement permits unacceptably broad conditions for procuring components that the latter does not.

The staff notes that numerous references to the Code of Construction were added to the licensing drawings, potentially in response to RAI 1.17 dated November 22, 2011, regarding welding citations. The staff strongly cautions that references to the ASME Code can create significant fabrication difficulties if the language in the licensing drawings is not clear.

As an example, applicants have cited Subsections of the ASME Code for welding which may require volumetric examination using ultrasound or radiograph. In some instances, the welding geometries on packagings have precluded the use of volumetric examinations, which may result in an amendment to the application.

This information is required by staff to determine compliance with 10 CFR 71.31(c) and 71.33(a)(5)(iii).

- 1.4 Correct the typographical errors on sheet 1 of licensing drawing No. 65200-71-70.

Sheet 1 of licensing drawing No. 65200-71-70 repeats a statement "Dimensions are Nominal..." at the exclusion of engineering information found on other licensing drawings.

This information is required by staff to determine compliance with 10 CFR 71.31(c) and 71.33(a)(5)(iii).

- 1.5 Add dimensional tolerances or minimum dimensions to the impact limiting wood, gamma shielding material, neutron poisons, and containment components.

The statement "All dimensions are nominal unless a specific tolerance is indicated with the drawing dimension" cannot apply to items directly related to shielding, criticality and the containment. This includes the thickness of the lead shielding on the TN-LC cask lid.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(5)(iii), 71.47(a), 71.51(a)(2), 71.55(d)(1), and 71.55(d)(2).

## **Chapter 2     Structural and Materials Evaluation**

- 2.1     Clearly show the source(s) for the wood property data in the application and explain why the properties listed in the application are conservative. Provide example calculations showing how the listed wood properties were derived.

Wood is a highly variable material. The staff has reviewed the Wood Handbook (FPL-GTR-113), NASA Technical Report 32-944, "Environmental and Physical Effects on the Response of Balsa Wood as an Energy Dissipator [sic], "NUREG/CR-0322, "Effects of Temperature on the Energy-Absorbing Characteristics of Redwood," and the compression testing data presented in the application from Technical Report No. 35.01.424, "Compression Tests of Redwood Samples." It is not clear how all of the properties of the wood tabulated in the SAR were derived from these sources or how these values are necessarily conservative when compared to the values in the aforementioned documents. The moisture contents and testing temperature of the wood samples used to generate the data in Figure 2.13.12-16 is not stated. Provide example calculations referencing specific documents (and Figures or Tables from those documents) demonstrating how the wood properties presented in the SAR are derived.

Section 2.12.13.4 of "Balsa" states, "Similar testing [compared to the testing used to establish the properties of balsa wood parallel to the grain] were [sic] performed to determine the average crush stress perpendicular to the grain." There is no description of this testing in the application and the response to RAI 2.38 is not sufficient.

This information is required by staff to determine compliance with 10 CFR 71.73(c)(2).

## **Chapter 3     Thermal Evaluation**

- 3.1     Provide specific evidence that the time/temperature exposures of the seal in the TN-LC package are bounded by available performance data, either from the manufacturer or other testing of seals that can be shown to be equivalent to those used in the package. Provide copies of any references cited to respond to this RAI.

The O-rings specified for the TN-LC package lid are Parker 2-467 (inner) and 2-470 (outer) Fluorocarbon seals. The inner seals comprise the containment boundary for the package. This seal is shown to reach a temperature of about 450°F for the fire excursion. The seal is at this temperature for a relatively short period of time, and the Parker O-ring catalogue indicates that the fluorocarbon seals will perform up to excursion temperatures of 482°F for short periods of time; however, no time/temperature curves are provided.

The applicant references the paper WSRC-TR-98-00439 titled: "Performance Evaluation of O-Ring Seals in Model 9975 Packaging Assemblies" (E. Skidmore) as further evidence that "the fluorocarbon [sic] seals are leak tight (no leakage above  $1.0 \times 10^{-7}$  ref. cc/sec) at 470°F (243°C) for 10 hours, and at 500°F (260°C) for 3 hours." The seals tested (as described in the paper) are "Parker Seals compound V835-75, based on Viton® GLT fluoroelastomer, or equivalent." However, no demonstration of equivalency between the seals tested and the seals used for the TN-LC package is provided.

Therefore, no definitive conclusion can be drawn as to the applicability of the paper cited to the seals used in the TN-LC package.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(5)(v).

- 3.2 Restrict the use of impact limiting material to redwood, or alter the thermal analysis in the application or provide further justification for a linear charring rate of 55 mm/hr for balsawood in Section 3.4.2, "Fire Test Conditions."

The application should address the possibility of exposed balsa wood, which is a hardwood with a very low density. Linear extrapolations of hardwoods char rates as a function of density (Table 18-3) from hardwoods listed in the USDA Wood Handbook, FPL-GTR-190, project that balsa wood will have a char rate between 80 – 90 mm/hr, which significantly exceeds 55 mm/hr.

Ensure that the minimum and maximum thermal conductivity of any proposed wood(s) are used to conservatively bound normal conditions of transport and hypothetical accident conditions.

The response to RAI 3.4 dated November 22, 2011, is not sufficient. The applicant was cautioned about the fact that the char rate for low-density hardwoods may not be conservative.

This information is required by staff to determine compliance with 10 CFR 71.73(c)(4).

- 3.3 Provide a revision to the package thermal analysis coupled model, described in Section 3.4.2 of the application, that incorporates a realistic representation of the interaction between the package surface and the interior surface of the ISO container, including radiative and convective heat exchange, for the HAC condition, as previously discussed with the staff.

The coupled model provided as part of the thermal analysis of the TN-LC package within the ISO container used an average temperature for the interior environment of the ISO container to determine the temperatures of the package during the HAC fire exposure. While this approach may provide conservative results, it is not an accurate representation of the actual conditions of the HAC fire exposure, and therefore, a more accurate representation of the interaction between the package surface and the interior of the ISO container is requested.

This information is needed to determine compliance with 10 CFR 71.33(5)(v).

## **Chapter 5     Shielding Evaluation**

- 5.1 Provide the basis for assuming a 25% volume reduction of the active fuel region. If the basis cannot be justified and a change in volume reduction is required, please revise the appropriate sections of the application pertaining to criticality and shielding for reconfigured fuel analyses.

In Section 5.6.4.4.4 of the application, Revision 2, the applicant assumed a 25%

volume reduction of the active fuel region based on a number that was provided for illustration only in NUREG/CR-6835. The applicant should not use this number directly unless its applicability is demonstrated and justified for the package design.

This information is required by staff to determine compliance with 10 CFR 71.47.

## **Chapter 8      Acceptance Tests and Maintenance Program**

- 8.1      Remove the statement, "Resin-F composition or density test results which fall outside of this range will be evaluated to ensure that the shielding regulatory dose limits are not exceeded" from Section 8.1.6.2.

The staff has no way to evaluate neutron shielding materials that do not meet the acceptance criteria for specific tests of the TN-LC packaging and therefore cannot make a regulatory finding if such language is included in the application.

This information is required by staff to determine compliance with 10 CFR 71.47(a).

- 8.2      Specify that accessible welds and fasteners will be checked for cracking prior to package loading. Package shall be checked for signs of degradation and brought into compliance with the Licensing Drawings before shipment.

The requirements of 10 CFR 71.87, "Routine Determinations," must be met before all shipments. 10 CFR 71.87, a general requirement, does specifically address fatigue cracking of welds and fasteners, the most vulnerable part of the transportation packaging.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(5)(iii).

- 8.3      Clarify if leak testing will be performed on damaged impact limiters using the same acceptance criteria as the original leak tests. Remove the statement that damaged wood will be analyzed to determine its suitability to function as intended from Section 8.1.9.

The impact limiter and wood inside must conform to the licensing drawings prior to the shipment of the package. An analysis of the damaged wood must show compliance with the licensing drawings.

This information is required by staff to determine compliance with 10 CFR 71.73(c)(2).

- 8.4      Clarify the sampling methodology for the impact limiting wood undergoing acceptance tests in Section 8.1.9. Include mechanical testing to verify that the mechanical properties of the wood are within specification limits.

The sampling methodology for the wood used in the impact limiter is not included in the application. The staff recognizes that wood moisture content, density and species are critical characteristics of wood and significantly influence wood properties but wood quality, age, etc. also influence wood properties. Mechanical testing of the wood under

appropriate conditions and strain rates is the only way to verify the mechanical properties of the wood, which correspond to the measured density and moisture content.

The response to the RAI 8.4 dated November 22, 2011, did not provide a sampling plan for mechanical testing of the wood.

This information is required by staff to determine compliance with 10 CFR 71.73(c)(2).