

March 22, 2011

Mr. Mirza I. Baig
Chief Engineer – Engineering & Licensing
EnergySolutions
140 Stoneridge Drive
Columbia, SC 29210

SUBJECT: AMENDMENT REQUEST FOR CERTIFICATE OF COMPLIANCE NO. 9168
FOR THE MODEL NO. 8-120B PACKAGE – REQUEST FOR SUPPLEMENTAL
INFORMATION

Dear Mr. Baig:

By letter dated January 28, 2011, you submitted an amendment request of Certificate of Compliance No. 9168 for the Model No. 8-120B package. You requested an upgrade to “-96” status to allow fabrication of new packages. Your amendment request was supplemented on March 2, 2011, to provide both proprietary and non-proprietary calculations as well as an evaluation of the package per the current regulations. Staff performed an acceptance review of your application to determine if the application contains sufficient technical information in scope and depth to allow the staff to complete the detailed technical review.

This letter is to advise you that, based on our acceptance review, the application does not contain sufficient technical information. The information needed to continue our review is described in the enclosure to this letter. In order to schedule our technical review, this information should be provided by April 7, 2011. If the information described is not received by this date, the application may not be accepted for review. This letter confirms our e-mail on March 22, 2011, with respect to the supplemental information needed and the date of your submittal.

If you have any questions regarding this matter, please contact me 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. 71-9168
TAC No. L24514

Enclosure: Request for Supplemental Information

Mr. Mirza I Baig
 Chief Engineer – Engineering & Licensing
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DOCKET NO. 71-9168

REQUEST FOR SUPPLEMENTAL INFORMATION (RSI) RELATED TO THE
MODEL NO. 8-120B PACKAGE

RSI-1 Justify that the package complies with the “-96” requirements in 10 CFR Part 71.

Attachment 1 provided with the application is unclear and fails to positively show that the package is in compliance with 10 CFR Part 71, particularly 10 CFR 71.61 that requires all Type B packages to be subjected to (deep sea immersion) 2MPa (290psi) for a period of not less than 1 hour.

This information is required by the staff to determine compliance with 10 CFR 71.71 and 10 CFR 71.31.

RSI-2 Categorize all components listed in the Bill of Materials on the licensing drawings following the guidance of NUREG/CR-6407. Clarify their safety classification and acceptance criteria (if applicable) used to characterize the components.

All components should have their safety category indicated on the Bill of Materials, according to NUREG/CR-6407 (i.e. Category A, B, or C for components important to safety; or not important to safety). The term "Critical Components" listed on Note 14 of Sheet 1 of Licensing Drawing C-110-E-007, Rev. 14 is ambiguous and has no regulatory meaning.

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

RSI-3 Provide, in Section No. 1.2.2 of the application, a detailed description of the characteristics of each type and form of permitted contents of the package, including the identification of the main isotopes and radioactive constituents.

For example, Section No. 1.2.2, “Contents of Packaging,” gives only a general description of the contents of the package, i.e., solid or powdered materials, and does not include any technical or numerical data.

Section No. 1.2.2.3, "Loading Restrictions," provides limitations on the contents of the package, but the package’s contents themselves are not clearly defined. Furthermore, Section No. 1.2.2.3 implies that water can be present in the package contents. This inconsistency needs to be addressed.

In addition, the application, as submitted, does not address important aspects such as the type of radionuclides in the contents. The shielding evaluation only addresses a small Cobalt-60 source and states that the contents do not contain significant sources of neutron radiation. However, it is not clear that the currently proposed contents

descriptions in the CoC preclude materials containing significant sources of neutron radiation. Thus, the application should (i) describe the radionuclides proposed to be shipped in the package and provide evaluations for these radionuclides, and (ii) justify why powdered solids and irradiated hardware are the most limiting chemical and physical forms of the contents.

The staff also notes that no credit can be given to the secondary containers used to hold the radioisotopes for containment, as these containers are not described in the application. Contents that have the capacity to induce stress corrosion cracking of the containment boundary or degrade the elastomer seals must be prohibited.

This information is required by the staff to determine compliance with 10 CFR 71.31(a), 71.33(b), 71.35(a), 71.47, and 71.51.

- RSI-4 Provide a demonstration of the determination of flammable gas concentrations for various waste types and contents. Provide this analysis for each package configuration including specific procedures used to determine combustible gas contents. Alternatively, provide an example of a bounding hydrogen analysis, as referenced in Section No. 1.2.2.3, to restrict the maximum shipment time of the package. Also provide a justification, in Section No. 3.3.2 of the application, for the value presented in Section No. 1.2.2.3, i.e., "no more than 0.063 g-moles/ft³ at 14.7 psia and 70°F."

The staff cannot evaluate the restrictions of gas generation, as defined in 10 CFR 71.4(3)(iii), since the contents of the package are not listed.

Section No. 1.2.2.3 of the application provides only general statements on the need for a determination of gas generation by tests or measurements. The application should demonstrate that hydrogen and other flammable gases comprise less than 5% of the free gas volume in any confined region of the package.

This information is required by the staff to determine compliance with 10 CFR 71.33(b)(5) and 71.43(d).

- RSI-5 Provide a justification for the following statements in Section Nos. 1.2.2.3 and 3.3.2 of the application, respectively.

"For any package containing materials with radioactivity concentration not exceeding that for LSA and shipped within 10 days of preparation, or within 10 days of venting the secondary container, the gas generation determination above need not be made and the shipping time restriction does not apply." "Per the limitation on the contents specified in 1.2.3.3, the maximum amount (in volume percent) of gases produced by radiolysis will be 5% hydrogen and, correspondingly, 2.5% for oxygen.

The application should demonstrate that hydrogen and other flammable gases comprise less than 5% by volume of the total gas inventory within any confined region of the package.

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

- RSI-6 Provide a justification for the applicability and the use of the Finite Element Analysis (FEA) model using computer codes ANSYS/LSDYNA. Also provide discussions of deviations from the guidelines delineated in ISG-21, "Use of Computational Modeling Software."

The applicant has used computer codes ANSYS/LSDYNA to demonstrate the adequacy of the impact limiters of the package during the regulatory drop evaluations under NCT and HAC. The applicant has not identified deviations from staff's guidance provided in ISG-21. Explain in detail the FEA model and justify the use of that model. Include in the explanations why more accurate and current versions of the computer codes were not used to demonstrate the adequacy of the impact limiters of the package during the regulatory drop evaluations under NCT and HAC.

This information is required by the staff to verify the compliance with 10 CFR 71.71 and 10 CFR 71.73.

- RSI-7 Clarify and specify the mandatory stress-strain properties of the polyurethane foam under impact loading rates at temperatures bounded by HAC conditions. The critical characteristics of the foam and all of the acceptance tests of the foam must be specified in such a way that they are incorporated into the CoC by reference. The stress-strain characteristics of the foam used in the structural analysis should be unambiguous.

Neither the stress-strain plot of Figure No. 2-3 nor Figure No. 2-4 matches the stress strain plot listed in Appendix A of the application. It is unclear what loading rates were used to determine any of the stress strain curves. The test temperature used to generate the stress-strain plot in Appendix A is not specified.

This information is required by the staff to demonstrate compliance with 10 CFR 71.33(a)(5), and 10 CFR 71.73(c)(1).

- RSI-8 Describe how the 200 W decay heat given in Section No. 3.1.2 of the application has been determined and is bounding, based on the type and form of material and the maximum quantity of material per package.

The staff also notes the 200 W decay heat is not in agreement with the previously approved SER.

This information is required by the staff to determine compliance with 10 CFR 71.33(b)(7).

- RSI-9 Provide the impact limiter foam temperature limits during NCT and HAC in Table Nos. 3-1 and 3-2 of the application. Also, describe how the foam will be affected by the HAC fire temperatures in Section No. 3-4 of the application, and explain if the foam in the thermal model is replaced with air during the HAC post-fire.

This information is required by the staff to determine compliance with 10 CFR 71.73.

RSI-10 Revise Table No. 3-1 of the application to include the following components: primary lid, secondary lid, baseplate, primary lid seal, secondary lid seal, primary lid vent seal, and impact limiter foam.

Also include any additional components that are part of the containment boundary. Note that the containment boundary is not clearly defined in Chapter No. 4 of the application.

This information is required by staff to determine compliance with 10 CFR 71.71.

RSI-11 Revise Table No. 3-2 of the application to include the following components: primary lid, secondary lid, baseplate, primary lid vent seal, and impact limiter foam. Also include any additional components that are part of the containment boundary.

Table No. 3-2 also needs to include the maximum component temperatures during the fire and during the post-fire.

This information is required by staff to determine compliance with 10 CFR 71.73.

RSI-12 Provide outer surface material absorptivity values during NCT and HAC conditions in Section No. 3-2 of the application. Also, demonstrate how the values used for HAC conditions meet 10 CFR Part 71.73(c)(4).

This information is required by staff to determine compliance with 10 CFR 71.35(a).

RSI-13 Provide appropriate justification that all components meet the minimum allowable service temperature which is less than or equal to -40°C (-40°F) in Section No. 3.2.2 of the application.

This information is required by staff to determine compliance with 10 CFR 71.71(a)(2).

RSI-14 Provide the methods and calculations used in the package thermal evaluation, describe and justify assumptions used in the analysis. Also, describe models and modeling details in Section No. 3.3. of the application.

Regulatory Guide 7.9 provides examples of information that should be included in an application, e.g., modeling software, type of package symmetry modeled, number of nodes, types of elements for various components, discussion of any gaps between components, heat transfer methods, models and equations used.

This information is required by staff to determine compliance with 10 CFR 71.35(a).

RSI-15 Describe how solar insolation is applied to the thermal models during NCT and how the application meets the regulations of 10 CFR 71.71(c)(1) in Section No. 3.3 of the application.

Also, describe how solar insolation is applied to the thermal models during the HAC post-fire and how the application meets the regulations of 10 CFR 71.73(c)(4) in Section No. 3.4 of the application.

The application of solar insolation should be in agreement with the transport configuration of the package that should be described in the application.

This information is required by staff to determine compliance with 10 CFR 71.35(a), 71.71(c)(1), and 71.739c(4).

RSI-16 Demonstrate compliance with 10 CFR 71.43(g) requirements.

Section No. 3.3.1 of the application should explicitly show that the package meets the maximum surface temperature requirements specified in 10 CFR 71.43(g).

This information is required by staff to determine compliance with 10 CFR 71.43(g).

RSI-17 Discuss the rationale for using a maximum decay heat instead of a zero decay heat for the cold environment and normal cold conditions in Section No. 3.3.1 of the application.

This information is required by staff to determine compliance with 10 CFR 71.71(c)(2).

RSI-18 Describe the effects of the HAC drop and puncture tests in Section No. 3.4.1 of the application and any dimensional modifications made to the thermal model as a result of these tests.

The staff needs to have a clear understanding of the potential modifications of the thermal model after the HAC drop and puncture tests.

This information is required by staff to determine compliance with 10 CFR 71.73.

RSI-19 Provide all ANSYS NCT and HAC thermal analysis input and output files.

This information is needed to verify the results shown in the application.

This information is required by staff to determine compliance with 10 CFR 71.71 and 71.73.

RSI-20 Provide a clear and detailed figure showing the entire cross section of the containment boundary in Chapter No. 4 of the application.

Figure No. 2-2 of the application does not provide an adequate or immediately clear depiction of the entire containment boundary. This figure should have a dotted line depicting the entire containment boundary with additional figures, if necessary, showing how the containment boundary crosses the containment boundary inner seals and the vent/drain ports. The containment boundary and its components should be shown in a figure in Chapter No. 4. This figure should be consistent with the containment boundary description and named components leak tested as described in Chapter Nos. 1, 7 and 8 of the application, Section No. 4.1 of the application, and the named components on the licensing drawings.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(4).

RSI-21 Provide specific information missing from Chapter Nos. 1, 7, and 8, Section No. 4.1, and licensing drawings. Any use of lid, seals, or vent/drain port should be specifically designated as to be associated with the primary or secondary lid to provide a clear understanding and avoid potential confusion.

Also clarify if there is a vent/drain port, vent port and drain port, only an optional drain port, or only a vent port and modify the application accordingly. Chapter No. 4 of the application mentions a vent port and occasionally a drain port.

This information is required by staff to determine compliance with 10 CFR 71.33(a)(4).

RSI-22 Address the following assumption from Section No. 4.2.2, "Assume the mass (M) of the powdered solids is 60 grams and the activity (A) is 3000 A₂," by showing how the assumed values are (i) bounding based on the description of the contents and (ii) conservative for the calculations subsequently presented in that section of the application.

Remove all references to an A₂ limit to define authorized contents. An A₂ limit is directly linked to the structural robustness of the package, classified as a Category II package in accordance with NUREG/CR-3019, "Recommended Welding Criteria for use in the Fabrication of Shipping Containers for Radioactive Materials."

This information is required by staff to determine compliance with 10 CFR 71.51(a)(1).

RSI-23 Perform a structural evaluation or provide reference to the structural section of the application that shows that the containment boundary, seal region, and closure bolts do not undergo any inelastic deformation.

This information is required by staff to determine compliance with 10 CFR 71.51.

RSI-24 Justify the differences in L_R between Section No. 4.4 and Section Nos. 4.5 and 4.6 of the application. Update subsequent calculations. This value should be consistent throughout the application.

In Section No. 4.4 of the application, $L_R = 2.2 \times 10^{-6} \text{ ref} \cdot \text{cm}^3/\text{sec}$, while Section Nos. 4.5 and 4.6 base calculations on a less conservative value $L_R = 2.3 \times 10^{-6} \text{ ref} \cdot \text{cm}^3/\text{sec}$.

This information is required by staff to determine compliance with 10 CFR 71.51.

RSI-25 Address the fabrication leakage rate test and maintenance leakage rate test acceptance criterion and respective sensitivities in Section No. 4.8 of the application.

The application should include both fabrication and maintenance leakage rate test acceptance criteria in addition to the periodic leakage rate test acceptance criterion and sensitivity.

This information is required by staff to determine compliance with 10 CFR 71.51 and 71.93(b).

RSI-26 Provide a shielding evaluation for both NCT and HAC conditions that adequately supports the contents proposed to be shipped in the package, as described in the CoC, including the items described in this question. The CoC description of the contents should be modified as necessary.

The CoC indicates that the contents are to be 2000 times a Type A quantity. There is no limit as to the radionuclides to be shipped. The current evaluation provides dose rates for a 47 Curie Cobalt-60 source, that is modeled as a small steel cylinder. This source represents only about 4 times a Type A quantity for Cobalt-60. Thus, neither the NCT nor the HAC evaluations support the contents proposed in the CoC for this package.

Such evaluations must account for all radionuclides proposed to be shipped in the package and address different source configurations (i.e., point sources and distributed sources, including sources that are not uniformly distributed within the package). The evaluations should account for tolerances on all features important for shielding. Any assumptions regarding the contents properties should be adequately justified. This extends to any credit for shoring. Some assumptions may necessitate the inclusion of additional conditions in the CoC and/or additional descriptions in Chapter No. 7 "Package Operations" of the application that ensure the validity of those assumptions for actual packages.

Staff noticed a statement in Section No. 1.2.1.11 of the application that indicates the contents will be such as to ensure the presence of radiation shielding equivalent to 4.5" of lead. This statement should be clarified as to its meaning and how this is done. Also, the applicant should clarify if and how this shielding is credited in the shielding evaluation, justifying the appropriateness of the assumed configuration of the contents with respect to this shielding. As already noted, assumptions regarding this shielding may necessitate additional descriptions in Chapter No. 7 of the application (or a CoC condition) regarding contents loading to include this shielding and verify its presence and configuration in the package.

Staff also recognizes there is guidance that indicates a representative loading may be used for the NCT evaluations. The current evaluation, however, does not constitute a representative loading for the contents as proposed in the current CoC.

These evaluations are needed to confirm compliance with 10 CFR 71.31(a)(2), 71.35(a), 71.47 and 71.51.

RSI-27 Provide an evaluation for the effects of lead slump.

The current evaluation states that lead slump does not affect the shielding capabilities of the package. The application refers to the evaluations for the NuPac 125 package. However, nothing is provided to justify the applicability of that evaluation to the Model No. 8-120B.

This evaluation is needed to confirm compliance with 10 CFR 71.31(a)(2), 71.35(a) and 71.51.

RSI-28 Modify the licensing drawings to show the tolerances for the features important to the shielding performance of the package.

The tolerances in the shielding evaluation should be consistent with the tolerances provided in the drawings. NUREG/CR-5502 states (see Section 3.3.1) that appropriate tolerances should be included on the package dimensions. Tolerances are important on those features affecting the package's shielding performance.

This information is needed to confirm compliance with 10 CFR 71.31(a)(1) and 71.33(a).

RSI-29 Provide surface dose rates in the NCT shielding evaluation for the surface of the secondary top lid.

The surface of the secondary top lid is not covered by the impact limiter. Thus, this lid's surface constitutes part of the package's external surface that must meet the dose rate limits in 10 CFR 71.47(b)(1). The shielding evaluation should therefore, for NCT, demonstrate that the surface dose rates at this location will meet the limits in 10 CFR 71.47.

This information is needed to confirm compliance with 10 CFR 71.31(a)(2), 71.35(a), and 71.47(b)(1).

RSI-30 The package operations for cask loading and preparation for shipment should be modified to clearly indicate that dose rates will be measured to ensure compliance with the limits of 10 CFR 71.47 and contamination levels meet limits stated in 10 CFR 71.87(i).

Paragraph 7.1.19.3 is unnecessarily ambiguous as to the operations being performed and the limits/acceptance criteria being used to ensure that the package as configured for shipment can be transported. Some of those criteria are the dose rate limits in 10 CFR 71.47, for which compliance is verified by dose rate measurements.

This information is needed to confirm compliance with 10 CFR 71.87(i) and (j).

RSI-31 Clarify the following regarding the proposed contents in the CoC and provide appropriate evaluations for the contents.

- a. The proposed contents described Condition No. 5.(b)(1)(i) are intended to include powdered and dispersible solids
- b. The proposed contents described in Condition No. 5.(b)(1)(ii) are placed in a secondary container as described in Section 1.2.2.1 of the application.

This information is needed to confirm compliance with 10 CFR 71.31(a), 71.33, 71.35(a), and 71.87.

RSI-32 Provide an evaluation for the effects of the HAC puncture test.

The shielding evaluation for HAC only neglects the impact limiters. It does not account for other damage to the package such as from puncture testing. In a puncture test, similar packages have experienced deformation at and around the impact area that affects the shielding. Evaluations for these packages have included analyses with the shielding thickness reduced by the amount of deformation in the area at and around the puncture test's impact area and placing the contents as a point source next to the impact area.

This information is needed to confirm compliance with 10 CFR 71.35(a) and 71.51.

RSI-33 Show on Drawing No. C-110-E-0007 the changes made to the drawing since the currently approved CoC drawing revision number (revision 13).

The currently approved revision of the drawing has only 3 sheets whereas the revision with the new submittal has 5 sheets. It is not clear from the drawings where changes have been made to the drawings from the previous revision, including the reason for the revised drawing to include 5 sheets now versus 3 sheets in the currently approved revision. Staff notes that guidance related to engineering drawings for 10 CFR Part 71 packages (see NUREG/CR-5502, Section 2.2) also indicates that revised drawings should include descriptions of the changes made in the revision.

This information is needed to confirm compliance with 10 CFR 71.31(a)(1), 71.31(b) and 71.33(a).

RSI-34 Address in detail the issues related to inerting or remove the inerting process from the application.

Staff does not agree with the nitrogen inerting operations, as shown and planned in Section No. 7.4 of the application, because:

- a. The applicant did not clearly show that the inerting process will prevent the development of flammable gas mixtures in any confined area of the package throughout the entire transport period.
- b. The applicant did not provide a detailed evaluation or analysis to demonstrate that there are no flammable gas mixtures (considering the worst case concentrations of hydrogen or any other flammable gases, and oxygen) during shipment.
- c. The applicant did not provide a detailed configuration of the secondary container to ensure that the nitrogen could be introduced effectively, e.g., injection path, port orientation, to the innermost packaging or other confined areas within the containment system of the Model No. 8-120B package.
- d. The applicant did not demonstrate that the inert gas either effectively occupies the containment cavity or is in uniform concentration through the cavity. Likewise, the applicant did not discuss how the concentrations of combustible gases would be quantitatively analyzed nor did the applicant provide detailed information on the different steps of the inerting process in Section No. 7.4.

The applicant also states in Section No. 7.4.1.2 of the application that "If a leak path can develop between the secondary container and the cask, the cask will also be inerted." It is not clear how the leak path between the secondary container and the package is defined in the operating procedure and the applicant did not show that both the secondary container and the package cavity can be properly inerted prior to shipment.

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

RSI-35 Describe the surface temperature survey in Section No. 7.1 of the application.

The application should show and staff needs to be able to verify that limits specified in 10 CFR 71.43(g) are not exceeded.

This information is necessary to determine compliance with 10 CFR 71.87(k).

RSI-36 In reference to Section No. 7.2 of the application, describe how "packages containing quantities of radioactive material in excess of Type A quantities specified in 10 CFR 20.1906(a)" are determined.

The current description of contents, even though inaccurate and incomplete, does not refer to "material in excess of Type A quantities specified in 10 CFR 20.1906(a)."

This information is required by staff to determine compliance with 10 CFR 71.33.

RSI-37 Provide additional information regarding the preparation of an empty package in Section No. 7.3 of the application.

According to NUREG-1609, such preparation procedures should, at a minimum, verify that the package is empty, ensure that external and internal contamination levels meet the requirements of 49 CFR 173.443 and 49 CFR 173.428, and describe the package closure requirements. Such information has not been described in Section No. 7.3.

Also, revise Section No. 7.3 of the application to include an operation to verify that the package meets DOT regulations limits for transportation of empty packages. The current description indicates that no special preparation is necessary for an empty package. This statement is not quite accurate. The requirements and limits described in 49 CFR 173.428 for dose rates and contamination must be met in order to be able to ship the package as an empty package. Optionally, empty packages may be transportable under 49 CFR 173.415(b), provided the applicable limits/criteria are met.

Thus, the package operations described in Section No. 7.3 should be revised to include descriptions of operations for demonstrating compliance with the appropriate regulation, citing the regulation, prior to shipment.

This information is required by the staff to determine compliance with 10 CFR 71.31(a) and 71.87.

RSI-38 Remove option b. from Section No. 7.4 and the entire Section No. 7.4.2 from the application.

Section No. 4.5.2.3 of NUREG-1609 states that, "No credit should be taken for getters, catalysts, or any other recombination devices."

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

RSI-39 Justify and explain the reason for the lack of thermal acceptance tests to demonstrate the heat transfer capability of the Model No. 8-120B packaging after fabrication and during the service life of the package as described in Chapter No. 8. Also explain the reason for the lack of thermal tests to be performed as part of the maintenance program.

Thermal tests may be needed to confirm that heat transfer performance is consistent with the thermal analyses given uncertainties in calculations, fabrication, or aging of the package during its service life. The staff needs to verify that the maintenance program remains adequate to assure packaging effectiveness for the Model No. 8-120B package. If thermal tests are performed, the application should indicate the frequency, method of testing, and the equipments used in the tests.

This information is required by the staff to determine compliance with the requirements of 10 CFR 71.33(b)(7), 71.71(c), 71.73(c), and 71.85.

RSI-40 Describe in detail the maintenance leak testing procedures of the package.

Maintenance leak testing should be described, according to ANSI N14.5, in Section No. 8.2.2 of the application.

This information is required by staff to determine compliance with 10 CFR 71.51 and 71.93(b).

RSI-41 Provide the allowable test leakage and allowable test leakage sensitivity equations as a function of temperature, in Section No. 4.5 of the application, to allow the staff to verify the results presented in Figure Nos. 4.1 through 4.5 of the application.

The staff notes that the equations as a function of temperature have been provided for Figure Nos. 4.6 and 4.7 of the application.

This information is required by staff to determine compliance with 10 CFR 71.51(a)(1).

Observations

1. Modify Chapter No. 7 of the application (which is incorporated in the CoC by reference) to explicitly indicate the transport configuration of the package.

This information is required by the staff to determine compliance with 71.31(a) and 71.87(f).

2. Justify the use of surface detectors, and not point detectors, and their use as described in the shielding evaluation and sample inputs, especially given that contents may not be uniformly distributed within the package.

Analyses used to demonstrate compliance should use appropriate methods for calculating dose rates and include justification for the selected methods. Staff notes that the evaluation indicates that some point detectors were used in some cases; however, the sample inputs in Section No. 5.6 of the application all show 'nod = 0'. This input means that point detectors are not used. Staff also noted that the section heading indicates the inputs are for the 10-160B package. Thus, the applicant should ensure the application includes sample input files that are for the 8-120B package and modify the section heading.

This information is required by the staff to determine compliance with 10 CFR 71.35(a), 71.47 and 71.51.

3. Clarify if there are steel ribs that extend between the package inner and outer shells, and evaluate them as necessary.

It is not clear from the licensing drawings if there are no steel ribs in this area. The existence of such ribs would constitute streaming paths through the lead shielding that would need to be addressed by the shielding evaluation.

This information is required by the staff to determine compliance with 10 CFR 71.31(a), 71.33(a), 71.35(a), 71.47, and 71.51.

4. Drawing number referenced in Section No. 7.1.3.1.1 of the application should be corrected to give the correct licensing drawing.

The current reference is to Drawing No. C-110-E-007. The correct drawing number is C-110-E-0007.

This information is required by the staff to determine compliance with 10 CFR 71.87.

5. Describe how shoring is placed in the package to keep the radioactive contents in place (prevent movement) during NCT if the package is only opened via the secondary lid. Also, clarify the meaning of the description provided in paragraph 7.1.9A in the application.

Shoring is important to keep the contents from shifting during NCT. It appears the shielding evaluation relies upon this shoring; thus, the package operations in the application should clearly describe how the shoring is to be placed in the package for the different contents when different lids are used to access the package cavity.

This information is required by the staff to determine compliance with 10 CFR 71.31(a), 71.35(a) and 71.87.

6. Justify the need for inclusion of the phrase "fabricated after January 1, 2011" in Chapter No. 8 of the application, removing it in instances where it is not needed.

It is not clear why this phrase was added in different places, e.g., Section Nos 8.1 and 8.1.4 of this chapter of the application. The applicant should justify the need to include

this phrase, indicating the differences in packages already in use versus those that would be fabricated under the currently proposed revision of the CoC.

The applicant should note that Chapter No. 8 should be written to address all packages fabricated and/or used under this CoC, not just new packages.

This information is required by the staff to determine compliance with 10 CFR 71.85.

7. References to the licensing drawings in Chapter Nos. 7 and 8 of the application should be clarified to point to the licensing drawing (including revision number) in the CoC.

There are references, such as the one in the first paragraph of Section No. 8.1.1, that refer to the "current revision" of the licensing drawing. References to the drawings should be clear and direct the reader to the revision of the drawings in the (current) CoC.

This information is required by the staff to determine compliance with 10 CFR 71.85 and 71.87.

8. Clarify how the acceptance criteria for the shielding test in Section No. 8.1.6 are consistent with ensuring the minimum thickness of lead specified in the licensing drawing, and modify the acceptance test for shielding as necessary. Also clarify the test as requested below.

It is not clear that the acceptance criteria for the shielding acceptance test ensure the minimum lead thickness specified in the drawing. It seems that the criteria would allow for less lead to be acceptable. However, a package that does not meet the specifications in the drawings cannot be used for shipments.

The test criteria should be consistent with the drawing specifications; the application should show the criteria are consistent with the drawings. The applicant should also explain the differences between the test methods (gamma scan and gamma probe) and add that all statements regarding tests using the scan method apply to the tests using the probe method.

This information is required by the staff to determine compliance with 10 CFR 71.31(a) and 71.85.

9. Provide the version of SCALE (SAS4) used in the shielding evaluation and justify the appropriateness of using that version of the code.

It is not clear from the application what version of the SCALE SAS4 code is used. The cover letter for the application indicates that the shielding evaluation has been updated for new methods and codes; however, SAS4 is a fairly old code. Thus, the applicant should also justify the appropriateness of using SAS4 and the selected version of this code considering the potential changes to the code and the cross-sections with newer versions as well as the availability of other shielding codes that enable more accurate shielding and dose rate analyses.

This information is required by the staff to determine compliance with 10 CFR 71.35(a), 71.47, and 71.51.

10. Provide a detailed description of the steps performed when leak testing the package for the contents.

The application provides only an overview of the testing that is planned to be done, but a more detailed discussion is needed to ensure that the package can be effectively tested by the package user for the authorized contents.

This information is required by the staff to determine compliance with 10 CFR 71.93(b).

11. Decrease the maximum ductility transition temperature of the ASTM E208 tests mentioned on Sheet 1 of Licensing Drawing C-110-E-0007, Rev. 14, to -20°F, or lower.

The current nil-ductility transition temperatures for the ASTM E208 tests do not sufficiently guarantee adequate ductility of the material under HAC conditions.

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

12. Specify the acceptance criteria for safety-related base material, welds, and fasteners which demonstrates adequate ductility of the material under HAC.

All safety-related structural components susceptibility to brittle fracture at -20°F should have adequate ductility such that the package will meet the requirements of 10 CFR 71 following drop testing.

This information is required by the staff to determine compliance with 10 CFR 71.73(c)(1).

13. Remove Note 20 on Sheet 1 of Licensing Drawing C-110-E-0007, Rev. 14.

Specific equivalent materials must be reviewed by the NRC staff to make a safety determination.

This information is required by the staff to determine compliance with 10 CFR 71.73(c)(1).

14. Clarify Note 5 on Sheet 1 of Licensing Drawing C-110-E-0007, Rev. 14.

It is not clear where non-penetration welds are located on the package and if any of these welds are important to safety.

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

15. Explicitly describe and dimension the sealing surface and O-ring groove.

Note 9 on Sheet 1 of Licensing Drawing C-110-E-0007, Rev. 14 mentions the sealing surface on the package, but the O-ring groove is not described in necessary detail on the licensing drawings.

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

16. Provide an updated thermal analysis demonstrating that the maximum temperature of the package contents (assuming that the contents are in a secondary container with bounding insulating properties) surrounded by the "metal cavity filler" mentioned in Section No. 8.1.4.2 or the "shoring" mentioned in Section No. 1.2.3.3. Specify an approximate description and bounding dimensions of the "metal cavity filler" and "shoring" mentioned on the licensing drawings.

Temperature limits on the phase changes of the contents (which are prohibited in Section No. 1.2.2.3, "Loading Restrictions" of the application) should be dictated by a thermal analysis of the contents assuming the most conservative scenario.

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

17. Justify the statement in Section No. 2.2.3 of the application that the elastomeric O-ring and foam, along with the contents, "exhibit no measurable degradation of their mechanical properties under a radiation field produced by the contained radioactivity."

The shielding analysis provided by the applicant gives no indication of the maximum radiation dose received by the polymeric materials.

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

18. Clarify the exact elastomers used in the package for maintaining containment, e.g., manufacturer, compound number, etc. Alternatively, provide an industrial standard, e.g., ASTM D2000 that describes the elastomer material and include specific acceptance criteria for high-temperature testing, e.g., maximum permissible compression sets that are applicable to the NCT and HAC conditions.

The generic references to butyl rubber or silicone rubber on the licensing drawings are not sufficient to make a safety evaluation.

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

19. Remove or justify the reference to the AA-59588A specification from Section No. 8.1.5 of the application.

The thermal tests described in AA-59588A are limited to 70 hours, which are not reflective of potential transportation times.

This information is required by the staff to determine compliance with 10 CFR 71.71(b).

20. Remove silicone rubber from the use of potential seal materials (including the use of AA-59588A from Section No. 8.1.5) if helium leak-testing is to verify the leakage rate of the package.

Silicone rubber is highly permeable to helium and is not acceptable for the leak-testing of transportation casks in conjunction with helium.

This information is required by the staff to determine compliance with 10 CFR 71.51(a)(1).

21. Specify an appropriate Code of Construction on Note 4 on Sheet 1 of Licensing Drawing C-110-E-007, Rev. 14, e.g., Section III, Division I Subsection ND of the ASME Code.

Section IX of the ASME Code is used to qualify welders and welding procedures, it does not specify essential welding variables, heat-treatments or acceptance criteria for welds.

This information is required by the staff to determine compliance with 10 CFR 71.31(3)(c).

22. Clarify the material of construction listed on Bolt Ring Plate on Sheet 1 of Licensing Drawing C-110-E-0007, Rev. 14. There are two materials of construction specified for this material, ASME A516 Gr 70 and ASTM A514.

It is unclear if both materials are intended for use as the Bolt Ring Plate.

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

23. Specify the maximum permissible moisture content of the "dry air" in Section No. 8.2.2.2, "Pre-Shipment Leak Test" used to fill the containment boundary after loading.

The term "dry air" is not quantitative and the staff cannot make a safety evaluation regarding the corrosiveness of the air in containment.

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

24. Specify a visual inspection of accessible welds in Section No. 7 of the application as part of the pre-loading procedure.

Fatigue cracking of the package welds can occur over time, affecting the package's safety function.

This information is required by the staff to determine compliance to demonstrate compliance with 10 CFR 71. 71 and 71.33(a)(5).