

November 18, 2005

Dr. James M. Shuler  
Office of Licensing  
U.S. Department of Energy  
EM-24/CLV-1081  
1000 Independence Avenue, S.W.  
Washington, DC 20585-2040

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR MODEL NO. ES-3100  
PACKAGE

Dear Dr. Shuler:

By letter dated February 28, 2005, as supplemented on April 27, May 26, and August 15, 2005, the Department of Energy submitted an application to the U.S. Nuclear Regulatory Commission for approval of a new transport package for high enriched uranium, Model No. ES-3100.

In connection with the staff's review, we need the information identified in the enclosure to this letter. We request that you provide this information by February 6, 2006. Inform us at your earliest convenience, but no later than January 23, 2006, if you are not able to provide the information by that date. To assist us in re-scheduling your review, you should include a new proposed submittal date and the reasons for the delay.

Please reference Docket No. 71-9315 and TAC No. L23818 in future correspondence related to this request. The staff is available to meet to discuss your proposed responses. If you have any questions regarding this matter, I may be contacted at (301) 415-8500.

Sincerely,

**/RA/**

Shawn Williams, Project Engineer  
Licensing Section  
Spent Fuel Project Office  
Office of Nuclear Material Safety  
and Safeguards

Docket No. 71-9315  
TAC No. L23818

Enclosure: Request for Additional Information

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Enclosure: Request for Additional Information **ML053220374**

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Request for Additional Information  
Department of Energy  
Docket No. 71-9315  
Model No. ES-3100

By letter dated February 28, 2005, as supplemented on April 27, May 26, and August 15, 2005, the Department of Energy submitted a Safety Analysis Report to the U.S. Nuclear Regulatory Commission (NRC) for approval of a new transport package, Model No. ES-3100. This request for additional information (RAI) identifies information needed by the NRC staff in connection with its review of the application. The requested information is listed by chapter number and title in the applicant's Safety Analysis Report. NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Material," was used by the staff in its review of the application.

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

**Editorial Comments**

- 0-1 Submit a statement retracting the disclaimer in the August 15, 2005, response to a Request for Additional Information. In the future, remove all disclaimers on applications submitted to the NRC.

This information is needed to determine compliance with 10 CFR 71.7(a).

- 0-2 Revise the Safety Analysis Report by removing:

- a) all disclaimers to the accuracy and completeness of the report. Staff notes disclaimers on page ii, Volume 1 and 2, and all drawings.
- b) all additional information on page ii, Volume 1 and 2.
- c) the Acknowledgments page xvii, Volume 1 and 2.
- d) the Executive Summary page xix, Volume 1 and 2.

This information is needed to determine compliance with 10 CFR 71.7(a). The additional information provided does not follow the format in Regulatory Guide 7.9, "Standard Format and Content of Part 71 Applications for Approval of Packages for Radioactive Material."

- 0-3 Delete references to ORNL reports that are not part of the application. If the ORNL report is necessary to make a regulatory determination and submitted as part of the application, cite the specific appendix page number and include the applicable pages in the application as Appendices.

This was particularly noted by staff in review of Chapter 2, 4, 7, and 8.

As specified in Reg. Guide 7.9, include the applicable pages of referenced documents in the Appendix.

## 1.0 General Description

- 1-1 Revise all drawings following the guidelines in NUREG/CR-5502 and Interim Staff Guidance (ISG)-20.
- a) In general, the drawings submitted appear to be detailed fabrication drawings that are not appropriate as a condition of approval per NUREG/CR-5502, Section 3.1.
  - b) There are general legibility problems in all drawings. For example, it is difficult to read the statement in the box located at the bottom left hand corner of every drawing. It appears to be a disclaimer to the accuracy or completeness to each drawing. It is also difficult to read the entries in the block titled "Tolerances Unless Otherwise Specified."
  - c) There seems to be an excessive number of drawings, duplication of identical drawings, and excessive detail for features that may not be of high safety significance. For example, an identical isometric view of the drum assembly is located on 3 drawings, details of the drum lid are located on 5 drawings, and the dimensions of the containment vessel are located on 3 drawings. Staff also noted a discrepancy when comparing the dimensions on identical features that were located on multiple drawings.
  - d) Some dimensions on drawings have no tolerances and have no nominal tolerances specified on the drawing. The drawings that do have dimensions with tolerances and nominal tolerances appear to be fabrication tolerances (+/- 0.03 in. and +/- 0.003 in.). Fabrication tolerances are not appropriate as a condition of approval per NUREG/CR-5502, Section 3, and ISG-20.
  - e) The maximum allowable weight of the package and maximum allowable weight of the contents should be provided on the General Arrangement drawing. It should not be approximate or for "for ref. only" as described in Section 3.2, NUREG/CR-5502.

This information is needed to determine compliance with 10 CFR 71.7(a). The information provided by the applicant does not follow the guidance in NUREG/CR-5502, ISG-20, and Regulatory Guide 7.9.

- 1-2 Clarify the content description for the six HEU oxide categories that are presented in Section 1.2.3. Identify the filler material(s) that may be present other than the uranium oxide. Identify and/or quantify the unspecified beta emitters that may be part of Group 5 oxides.

The application states that oxide material from Group 2 contains at least 20% uranium by weight. No information is provided about the remaining 80% filler material(s). The same comment applies to all other oxide groups.

This information is needed to determine compliance with 10 CFR 71.7(a) and 10 CFR 71.33.

## 2.0 Materials

### General

The applicant should use ISG-15, "Materials Evaluation," as a framework for the revised submittal when formulating RAI responses.

- 2-1 Revise the Tables that provide material properties so that they are consistent in the use of either English or SI (metric) units, or both.

Throughout the application, some tabulated data are expressed in SI units, while other sections of the application use English units. Those inconsistencies demanded extra staff efforts to review. For example, Table 1 on page 3-45 was expressed in SI units, whereas other tables (e.g., Table 1 on page 3-87 and 3-127) use English units.

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

- 2-2 Justify the time interval for the inspection of each safety related component.

For example, Chapter 8, specifies an annual inspection for all of the safety related components. However, in Section 8.2.3, there is no interval for O-ring inspection. Note that elastomeric O-rings should be replaced annually.

This information is needed to determine compliance with 10 CFR 71.7(a).

- 2-3 Revise the application to change name of Chapter 1, page xxi from ACRONYMS to ABBREVIATIONS AND ACRONYMS. Add the abbreviation LOD, loss on drying.

This information is needed to determine compliance with 10 CFR 71.7(a) and ISG-15.

### Applicable Codes and Standards

- 2-4 State whether any portion of ASME SA 182 for "Grade F304L for a forged component" applicable to austenitic stainless steel will be disregarded and provide justification. If portions of the standard are proposed to be disregarded, provide a discussion of compensatory actions that will be included to ensure an equivalent level of quality.

Equipment Specification JS-YMN34-801580-A001 states, "The formed, heat-treated, and finished containment vessel body part number M2E801580A012-1, shall meet the applicable requirements of ASME SA 182 for Grade F304L for a forged component."

This information is needed to determine compliance with 10 CFR 71.7(a).

- 2-5 Clarify whether or not the drum lid closure nuts are ASME Code material. Incorporate the drum lid closure nut material in the drawings.

Page 1-5 indicates that the specification for the drum lid closure nuts are ASTM, which is not necessarily ASME Code material.

This information is needed to determine compliance with 10 CFR 71.7(a) and in accordance with NUREG/CR-5502, Section 3.3.1, General Specifications.

- 2-6 Revise Section 8.1.2, "Weld Examinations," to read: "...Section IX is to be employed as the applicable requirement for welds ..." Also, modify this Section to clarify that Sections III and VIII of the ASME Code are invoked for acceptance criteria for Code specified examinations which are to be performed in accordance with the provisions of ASME Code Section V. Table 8.1, paragraph 2.3.1.1, and the appropriate equipment specifications should also be suitable revised.

This information is needed to determine compliance with 10 CFR 71.7(a).

### Structural Materials

- 2-7 Revise the application to correct a statement on page 2-4 in Section 2.1.2.1.

"10 CFR 71.41..." The correct Code of Federal Regulation should read 10 CFR 71.43 (a) through (e) .

This information is needed to satisfy the requirements of 10 CFR 71.31(a)(1) and 10 CFR 71.33(a).

- 2-8 Provide the missing unit of stress for the allowable stress intensity on page 2-102.

This information is needed to satisfy the requirements of 10 CFR 71.31(a)(1) and 10 CFR 71.33(a).

- 2-9 Verify data tabulated in Table 5.8; in particular, the column of atomic density.

In Table 5.8, the hydrogen composition in Cat 277.4 was quoted as  $4.642 \times 10^{-2}$ . This value appears to be one order of magnitude too high. That data may have an impact on the criticality analysis.

This information is needed to satisfy the safety requirements of 10 CFR 71.43(f) and 10 CFR 71.51 (a)(1).

### Containment Materials

- 2-10 Provide in a footnote to page 2-120, the exact citation in the Parker Catalogue where Attachment A, "O-ring spring constant," can be found and verified.

Staff is unable to verify the data for the O-ring.

This information is needed to satisfy the safety requirements of 10 CFR 71.71, 10 CFR 71.43(f), and 71.51(a)(1).

## Thermal Materials

2-11 With respect to the thermal evaluation, address the following issues:

- a) Evaluate the effect of fluorine in the water on the setting of the mixture and subsequent performance of the mixture. Section 3.1.2 and 3.1.3 in the Equipment Specification No. JS-YMN3-801580-A003 of the application indicate the use of potable water for cleaning and mixing. It should be noted that many municipal potable water supplies are fluorinated.
- b) Provide documentation that the Kaolite made by the process on page 1-91 to 1-100 has the same properties as the test samples.
- c) Evaluate if the different heating cycles used for tensile specimens will affect the resultant properties.

The heating cycle described on page 2-475 used to bake the tensile specimens is different then the heating cycle described on page 1-96 used for the actual pours.

- d) State how the uniformity of the actual pours are controlled and measured. It is stated on page 2-488 that there can be large variations in local density and density variation.
- e) Discuss how the quality of the sample pour is related to the quality of the pour in the package. The acceptance criteria in Table 8.1, page 8-3 for the Kaolite 1600 are a "visual inspection," a material certification, and sample pour.

Note that the Kaolite has both a thermal and containment function. It is an insulator and also provides impact protection. In order for the Kaolite to perform these functions, it must be within specifications. This information is needed in order to ensure that the Kaolite stays within specification, when constructed and while in use.

This information is needed to satisfy the safety requirements of 10 CFR Part 71.31(a)(1), 71.31(a)(2), 71.33(a), and 71.35(a).

2-12 Revise the application to provide the "THERM 1-2 thermal properties data base" or pertinent pages by RA Bailey.

The information is needed to verify the thermal properties of silicon rubber on page 3-17.

This information is needed to determine compliance with 10 CFR 71.7(a).

## Weld Design and Specification

- 2-13 Discuss the rationale for not specifying a volumetric examination of the butt welds that are part of the drum fabrication. Any deviation from the ASME Code must be identified and discussed by the applicant in the SAR and identified in the drawings. Where appropriate, paragraph 8.1.2 and Table 8.1 should also be modified for consistency with any changes to paragraph 2.3.1.1.

Paragraph 2.3.1.1, of the application, states that the drum will be fabricated in accordance with the provisions of ASME Section VIII, Division 1. The Code specifies the types of welds that must be volumetrically examined, and also provides a list of exemptions to this requirement. However, neither the application nor the Equipment Specification JS-YMN34-801580-A002, Rev. B, describes the rationale for whether or not a volumetric examination of the drum welds is required. Since the drum is designed for conditions different from those expected for a pressure vessel, the normal reasons for exemptions from Section VIII inspection requirements do not necessarily apply.

It is evident that the drum structural integrity must be preserved to some extent (with respect to gross weld failure) under hypothetical accident conditions. Consequently, the applicant should consider whether postulated buried weld flaws of such a size could exist that would not be enveloped by the presently specified surface examinations and that would pose a challenge to the drum integrity under design accident conditions.

This information is needed to determine compliance with 10 CFR 71.7 (a) and in accordance with NUREG/CR-5502, Section 3.3.1, "General Specifications."

## Neutron Absorbers

- 2-14 Revise Chapter 8 of the application to provide acceptance-testing for the neutron absorber for review. It should address the following issues in a clear and concise manner:

- a) Specify an absorber material (e.g., content or percentage of B<sub>4</sub>C) and the areal or volume density (e.g., the <sup>10</sup>B content or density) to be used in the mix. Typically, applicants specify a minimum areal density requirement and an actual areal density that will be used for their application.
- b) Specify how the absorber density required for the application will be verified in acceptance tests, giving details on any measurement methods used in the acceptance tests. If test methods other than neutron attenuation are used, give benchmark data used to ensure the acceptability of the alternative method(s).
- c) Provide the statistical sampling plans used for qualification and acceptance testing, so as to justify that the product meets the performance criteria. Provide discussion that (1) defines a lot and the actions taken when a lot does not meet the required performance criteria, (2) describes how the acceptability of the lot is determined, (3) gives sample locations, (4) determines the values of variances and the measured values of the lower tolerance limit, and (5) how an estimation of the variances, if any, is done for credit that will be taken in the criticality analysis.



- d) Specify all feed materials in the mix including the absorber (e.g., B<sub>4</sub>C) in sufficient detail to ensure consistency from any lot to be used for the service. Alternatively, specify industry codes that will be used (e.g., ASTM, ACI, or ASME) in preparation of the mix, so as to assure consistency from lot to lot.
- e) Specify the steps taken to qualify the material for this application. Clearly show how the uniformity of the mix is (1) guaranteed during blending and (2) verified by performance tests.
- f) If the material will take structural credit, specify in tabular form, the mechanical properties required by the structural analysis. Staff has noted that the application contains data to assure material durability under the service conditions for which it is designed.

The information in Chapter 8 is incomplete and scattered throughout the application. Chapter 8, Section 8.1.6, refers to a testing procedure for acceptance testing of the Cat 277-4 liner. See ISG-15, Materials Evaluation, Section X.5.2.7, "Neutron Absorbing/Poison Materials for Control of Criticality," for additional technical guidance in addressing the issues above.

The neutron absorber material that is proposed for use in this application has not been standardized by a consensus body nor has it been previously qualified and approved by the NRC for use in transportation packages as a neutron absorber material. From the information provided, the staff cannot conclude, with reasonable assurance that the manufacturing process yields a uniform and effective absorber and the amount of B-10 present in the absorber. The information should be adequate to provide reasonable assurance that absorber material(s) will be adequate and effective throughout the service life of the system(s) in which it is proposed for use as a neutron absorber. The absorber material should be shown to be durable and uniformly distributed throughout the pertinent parts of the component that contains the absorber. The process used to fabricate absorber materials must be adequately governed to ensure quality and reproducibility as well as efficacy throughout the expected service life. The amount of <sup>10</sup>B, or other high-cross-section isotope, must be shown to be present, at or above the minimum level (in all pertinent parts of the component) used in calculations that establish the safe operating limits of the system.

This information is needed to determine compliance with 10 CFR 71.55(b) and 10 CFR 71.59(a).

- 2-15 In Appendix 1.4.5, state the key process controls in the fabrication of Catalog No. 277-4. Describe the method to ensure the materials durability and efficacy under normal and accident conditions if any key process control changes are made that can affect the material's performance. Specify what tests, if any, are performed to verify the continued absorption characteristics of the absorber materials.

This information is needed to determine compliance with 10 CFR 71.43(f), 10 CFR 71.51(a)(1), 10 CFR 71.55, and 10 CFR 71.59.

## Polymer Performance

2-16 With respect to the polymer performance, address the following issues:

- a) Explain why there is a large difference in the specific volume outgassing characteristics between the two silicon rubber samples on page 2-588 to the two polyethylene samples on page 2-586. Also, indicate what are the gaseous products that are released during the outgassing.
- b) Explain why the figures on pages 2-586 and 2-588 show outgassing of the silicon rubber and polyethylene samples but Table 3 on page 3-150 and Table 4 on page 3-151 shows none. Make any changes in the outgassing conclusions based on the resolution.
- c) Clarify the inconsistency in the outgassing temperatures.

The 2<sup>nd</sup> paragraph on page 3-157 states that outgassing testing was performed at temperatures up to 500 F. However, the figures on pages 2-586 to 2-588 show that testing was only performed to 338 EF.

- d) On page 2-588, specify the type (formula) of silicon rubber being used.

This information is needed to show compliance with 10 CFR 71.51(a)(1) and 10 CFR 71.71(c)(1) to determine that the seals will not deteriorate to a point where containment is no longer maintained.

2-17 Delete the statement on page 1-68, Section 3.0, paragraph 3, that suggests that a material substitution may be authorized after the Company's written approval.

The staffs review is being conducted using the material properties of the materials stated in this SAR. Any substitution in material that are referenced in the drawings, including the Equipment Specifications that are referenced in the drawings, are not authorized without NRC approval.

The choice of materials must allow the package to meet the requirements of 10 CFR Part 71, Subpart E.

## Chemical and Galvanic reaction

2-18 Evaluate the hygroscopic nature of the uranyl nitrate. In particular, address and provide the technical basis for the following:

- a) Will all the water stay bound during transport or will the material dissociate?
- b) If dissociation occurs, what is the potential interaction of the resultant water with the can? (Does it contain nitric acid?)
- c) What, if any, is the explosive reactivity of the remaining solid?

The SAR does not adequately address the interaction of the waste form with the packaging materials.

This information is needed to determine compliance with 10 CFR 71.43(d), which requires that the package be made of materials that assure that there will be no significant chemical, galvanic, or other reaction among the packaging contents or components.

- 2-19 Provide analysis (and/or) references for the loading restriction in Section 1.2.3.8 (5), page 1-16, that indicate pyrophoric reactions will not occur.

The SAR does not adequately address the interaction of the waste form with the packaging materials. Any pyrophoric behavior will raise the temperature of the package beyond the limits stated in this SAR and may reduce the effectiveness of the seals, neutron absorber and thermal shield.

This information is needed to determine compliance with 10 CFR 71.43(d), which requires that the package be made of materials that assure that there will be no significant chemical, galvanic, or other reaction among the packaging contents or components.

### Contents

- 2-20 Provide consistency for the uranyl nitrate formula throughout the SAR.

The applicant may use the UNH abbreviation as long as it is made clear that this is  $\text{UO}_2(\text{NO}_3)_2 \cdot 6 \text{H}_2\text{O}$ . In some places the chemical formula is given as  $\text{UO}_2(\text{NO}_3)$ .

This information is needed to determine compliance with 10 CFR 71.7(a).

- 2-21 Correct the theoretical density value for  $\text{UO}_2$  on page 6-39 to  $10.98 \text{ g/cm}^3$ . State if the correct value affects other areas of the application. Revise if necessary.

The theoretical density of  $\text{UO}_2$  is incorrectly given as  $6.9425 \text{ g/cm}^3$ .

This information is needed to determine compliance with 10 CFR 71.7(a).

- 2-22 Clarify the table on page 6-39, in particular:

- a) Are the values given really theoretical densities or are they smear densities for the various cases?
- b) Why do the H/O and N/O ratios vary from case to case; and why are they so different from the theoretical values of 0.0536 for H/O and 0.125 for N/O?
- c) Are the samples being diluted to get these values, if so, what are they being diluted with?

The table on page 6-39 gives a variety of theoretical densities for  $\text{UO}_2(\text{NO}_3)_2$ , that are significantly different from the theoretical density of  $2.79 \text{ g/cm}^3$ .

This information is needed to determine compliance with 10 CFR 71.7(a).

- 2-23 Concerning the draft Certificate of Compliance (CoC) submitted on June 1, 2005, Section 5(b)(2), specify the contents that require the use of spacers between convenience cans for criticality safety.

The contents must be clearly stated in order to determine what parts of the 10 CFR 71 are applicable.

This information is needed to determine compliance with 10 CFR 71.7(a).

#### **4.0 Containment**

The following containment RAs are needed to determine compliance with 10 CFR 71.7(a), 10 CFR 71.31, 10 CFR 71.33, 10 CFR 71.51, and additional references to ANSI N14.5-1997.

- 4-1 Clarify the second paragraph on page 4-2, where  $UF_4$  is indicated as one of the possible materials that can be transported in the ES-3100.

Chapter 1 of the application states that the ES-3100 package will be used to ship bulk HEU in the form of oxide, uranium metal or alloy, and uranyl nitrate hexahydrate crystals.

- 4-2 Revise Chapter 4 so that any leakage rate testing after O-ring replacement due to maintenance be consistent with ANSI N14.5-1997, Section 7.4, which specifies a leakage rate no greater than  $L_R$ , which in this case is leaktight ( $1 \times 10^{-7}$  ref-cm<sup>3</sup>/s air) or provide justification for a less sensitive leakage rate test.

The fourth paragraph on page 4-6 indicates the use of pre-shipment pass criteria for O-ring maintenance. Section 7.6.4 of the ANSI N14.5-1997 clearly states that "pre-shipment leakage rate tests for packages that have reusable seals that have been replaced shall demonstrate a leakage rate according to the guidance of Section 7.4."

- 4-3 Clarify how the proposed pre-shipment leakage rate test of  $1 \times 10^{-4}$  ref-cm<sup>3</sup>/s will be equivalent to the ANSI N14.5-1997, Section 7.6.4, criterion of "no-detected leakage when tested to a sensitivity of at least  $10^{-3}$  ref-cm<sup>3</sup>/s." Revise Chapter 4 appropriately.

- 4-4 Clarify the 2.4773 ref-cm<sup>3</sup>/s leak rate reported in the second paragraph of page 4-7, when testing Test Unit-4 for leak in the cavity between the O-rings. Remove the reference to a CALT5 leak tester.

- 4-5 Revise the second paragraph on page 4-8 so that the containment vessel hydrostatic test is performed after the leakage rate test ( $\#1 \times 10^{-7}$  ref-cm<sup>3</sup>/s air, or  $\#2 \times 10^{-7}$  cm<sup>3</sup>/s helium).

Section A.3.5 of the ANSI N14.5-1997 states that "for leaks smaller than  $10^{-6}$  ref-cm<sup>3</sup>/s, wetting of the test item before leakage rate test should be avoided." Some of the leak paths may become clogged by liquid if the hydrostatic test is conducted prior to the leakage rate test.

- 4-6 Explain the need for the two leakage rate tests (O-ring cavity leak check and full-body helium leak test) performed as part of the design acceptance as shown in Table 2.23. Clarify the discrepancy for the O-ring leakage rate test criteria between Table 2.23 ( $1 \times 10^{-3}$  ref-cm<sup>3</sup>/s ) and Table 4.8 ( $1 \times 10^{-4}$  ref-cm<sup>3</sup>/s ). Clarify that, during these physical tests, the complete containment system, including welds and O-ring seals, meet the leaktight criterion as defined in ANSI N14.5-1997. Note that Column 11 in Table 2.23 may imply that the containment system was not tested to a sensitivity that would show it remained leak tight.

Section 7.2 of the ANSI N14.5-1997 indicates that the entire containment boundary must be tested as part of the design verification. For the proposed package, the acceptance criteria is leaktight.

- 4-7 Clarify the zero mass values shown for both transuranic and Np-237 isotopes in Table 2 of Appendix 4.6.1, after 60 and 70 years have passed since the making of the oxide. Revise the calculation, in case these zero values are indeed a mistake.

The text, on page 4-16, supporting the Table 2 values, states that “contributions from the transuranics and Np-237 are held constant at each time interval during the 70-year evaluation.”

- 4-8 Justify the specific activity ( $1.5 \times 10^{-2}$  TBq/g) and  $A_2$  ( $9.0 \times 10^{-2}$  TBq) values attributed to the transuranic isotope in Tables 3, 4, and 5 of Appendix 4.6.1. Address the conservatism of these assumptions.
- 4-9 Provide a reference for the temperature-dependent viscosities ( $\mu$ ) for both air and helium used in Appendix 4.6.2 .

## **6.0 Criticality**

- 6-1 Remove the statement, “However, billets, buttons, or large irregular pieces of solid HEU metal may be approved under limits for specified geometric shapes evaluated in this SAR, provided that a facility criticality safety evaluation/approval demonstrates these content loadings are bounded by the results of this SAR evaluation for specified geometric shapes” from Section 6.3.4(7); Section 6.4.1, page 6-51, paragraph 3; Section 6.5.1, page 6-56, paragraph 2; and Section 6.6.1, page 6-59, paragraph 2.

This provision would allow for contents not authorized in the CoC to be loaded into the ES-3100 package. This type of change authority is not permitted under 10 CFR Part 71 regulations. Any additional HEU metal shapes not specified in the CoC would need to be added by submitting an amendment to the application.

This correction is necessary to comply with the requirements of 10 CFR 71.33(b).

## 7.0 Package Operations

The following containment RAls are needed to determine compliance with 10 CFR 71.7(a), 10 CFR 71.31, 10 CFR 71.33, in addition to any specific reference provided in each question.

- 7-1 Remove statements in Chapter 7 that require Package Operations to be conducted in accordance with Department of Energy (DOE) orders, Y-12's quality assurance plan, and the Safe-Secure Trailer/Safeguards Transporter (SST/SGT). Also remove statements that require communications with Y-12 such as on page 7-2, "Contact Y-12 Packaging Engineering to report containment vessel body thread damage," and on page 7-3, "forward a copy of the document to Y-12."

These statements are not necessarily applicable to shipments made by NRC licensees, are not typically included in package operations described in an application for package approval, and are not consistent with guidance in NUREG-1609.

- 7-2 Remove the example of Y-12's leak test procedure reference on page 7-5 and the actual procedure in Appendix 7.5.

The NRC does not approve an applicant's specific leak test procedure. However, in reviewing the leak test procedure, it doesn't appear that it meets ANSI 14.5, in that it measures the performance of the secondary O-ring and not the primary O-ring.

The information provided by the applicant does not follow the guidance in Regulatory Guide 7.9.

- 7-3 Remove all statements that the user of the package must have compliance with all actions and restrictions specified in the Safety Analysis Report. Staff noted the comment on page 7-1, Section 7.1, Step 4.

The regulation 10 CFR 71.17(c)(2) requires compliance with the CoC. The CoC will require compliance with the drawings, Chapter 7, and Chapter 8 of the SAR.

- 7-4 Revise Section 7.1.2.1 so that any leakage rate testing after O-ring replacement due to maintenance be consistent with ANSI N14.5-1997, Section 7.4, which specifies a leakage rate no greater than  $L_R$ , which in this case is leaktight ( $1 \times 10^{-7}$  ref-cm<sup>3</sup>/s air). See RAl question 4-2.

Section 7.6.4 of the ANSI N14.5-1997 clearly states that "preshipment leakage rate tests for packages that have reusable seals that have been replaced shall demonstrate a leakage rate according to the guidance of Section 7.4."

- 7-5 Revise Section 7.1.2.1 to describe the leakage rate testing to be performed prior to each shipment. This information should show that the package meets the containment leaktight criterion in Chapter 4 of the application, and should be consistent with ANSI N14.5-1997 (as stated on page 7-4 of the application). The information should include the proposed test method(s) and corresponding test sensitivity, test configuration or setup, test duration, acceptance criteria, etc.

## 8.0 Acceptance Tests and Maintenance Program

The following containment RAIs are needed to determine compliance with 10 CFR 71.7(a), 10 CFR 71.31, 10 CFR 71.33, in addition to any specific reference provided in each question.

- 8-1 Remove all statements in Chapter 8 that the Acceptance Tests and Maintenance Program must be conducted in accordance with Department of Energy (DOE) orders, Y-12's quality assurance plan, and the Safe-Secure Trailer/Safeguards Transporter (SST/SGT). Remove Figure 8.1. (See explanation in RAI 7-1.) Also, remove the following statements:
- a) "QCPIs are used by the BWXT Y-12 and are available upon request" (page 8-1 and 8-2);
  - b) "Y-12 personnel will witness final testing at the vendor" (page 8-6);
  - c) "and DOE must take custody of the package" (page 8-8); and
  - d) the reference that "Y-12 Procurement Organization verifies ..." (Section 8.2.5.4).

- 8-2 Remove the references to (page 8-6 and 8-8) and the sample leak test procedure in Appendix 8.3.1, "Y-12 Plant Product Specification Procedure."

The NRC does not approve an applicant's specific leak test procedure. However, in reviewing the leak test procedure, the proposed procedure seems to indicate that the external O-ring, which is not even part of the containment boundary, is the one tested for leaktightness.

The information provided by the applicant does not follow the guidance in Regulatory Guide 7.9.

- 8-3 Revise Section 8.1 so that the containment vessel hydrostatic test is performed after the leakage rate test ( $\#1 \times 10^{-7}$  ref-cm<sup>3</sup>/s air, or  $\#2 \times 10^{-7}$  cm<sup>3</sup>/s helium).

Section A.3.5 of the ANSI N14.5-1997 states that "for leaks smaller than  $10^{-6}$  ref-cm<sup>3</sup>/s, wetting of the test item before leakage rate test should be avoided." Some of the leak paths may become clogged by liquid if the hydrostatic test is conducted prior to the leakage rate test.

- 8-4 Revise Section 8.2.2 so that any leakage rate testing after O-ring replacement due to maintenance be consistent with ANSI N14.5-1997, Section 7.4, which specifies a leakage rate no greater than  $L_R$ , which in this case is leaktight ( $1 \times 10^{-7}$  ref-cm<sup>3</sup>/s air). See RAI question 4-3.

Section 7.6.4 of the ANSI N14.5-1997 clearly states that "pre-shipment leakage rate tests for packages that have reusable seals that have been replaced shall demonstrate a leakage rate according to the guidance of 7.4."



- 8-5      Revise Section 8.2.2 to describe the leakage rate testing to be performed annually. This information should show that the package meets the containment leaktight criterion in Chapter 4 of the application, and should be consistent with ANSI N14.5-1997 (as stated on page 8-8 of the application). The information should include the proposed test method(s) and corresponding test sensitivity, test configuration or setup, test duration, acceptance criteria, etc. Clarify how helium, and at which concentration, will be used for the leakage rate test. Identify what parts of the containment vessel boundary are being tested with the proposed method(s).