Non-proprietary Request for Additional Information
NAC International
Docket No. 71-9225
Certificate of Compliance No. 9225
Model No. NAC-LWT Package

By application dated December 28, 2012, as supplemented on March 14, 2013, and March 5, 2014, NAC International (NAC) requested an amendment to Certificate of Compliance No. 9225 for the Model No. NAC-LWT package. The applicant requested that the certificate be revised to add high enriched uranyl nitrate liquid (HEUNL) as authorized contents. This request for additional information identifies information needed by the U.S. Nuclear Regulatory Commission 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 (SAR). NUREG-1609, "Standard Review Plan for Transportation Packages for Radioactive Materials," was used by the staff in its review of the application.

Each question 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 regulatory requirements.

Chapter 1 – General Information Evaluation

1. Revise the maximum HEUNL payload per container in Table 1.2.3-14 of the application to ensure it correctly identifies the maximum quantity of HEUNL based on the minimum as build container interior volume. In addition, ensure that the quantity of HEUNL and volume of the HEUNL container in the application are consistent throughout the application and calculation packages.

   a. See Enclosure 1.

   b. See Enclosure 1.

   This information is needed to determine compliance with Title 10, *Code of Federal Regulations* (10 CFR) 71.33(b)(2), and 71.87(d).

2. Revise the maximum heat load in a package and per container in Section 1.2.3 and Table 1.2.3-14 of the application to be consistent with the hydrogen gas generation evaluation. Also revise Sections 3.1 and 3.4.1.18 of the application accordingly.

   The maximum HEUNL heat load has been revised to be 0.02 W/L in the application to ensure that the concentration of hydrogen gas remains below 5% by volume, as described in Section 4.5.6.2. Table 1.2.3-14 of the application states that the maximum HEUNL payload per container is 64.3 liters. Therefore based on this volume, the maximum per container heat load is 1.286 watts and the maximum cask heat load is 5.144 watts. These heat load values should be further reduced based on the HEUNL container volume calculations in Item 1, above. Section 1.2.3 of the application which states that the maximum heat load shall not exceed 12.88 watts should be revised. In Section 3.1 of the application, the sentence, "The maximum heat load for four (4) HEUNL containers filled to capacity is 12.88 watts per cask.", should be revised to be in agreement with the application, and also address that the higher value used in the hypothetical accident conditions (HAC) analysis (3.22 watts per HEUNL container) is for

a bounding calculation only. Section 3.4.1.18 of the application should also be revised to note the 12.88 watts per cask and 0.05 watts/liter values applied to the model are for a bounding calculation only.

This information is needed to determine compliance with 10 CFR 71.33(b)(7).

3. Revise the following portions of the SAR to be consistent with the approach of the HEUNL container not being full, filled to capacity, or diluted.

   a. Pages 1-4, 1.1-2, 1.2-6, 3.1-1, and 5.1.1-1 refer to containers that shall be either full (or at fill capacity) or partially filled or empty.

   b. See Enclosure 1.

   This information is needed to determine compliance with 10 CFR 71.33(b)(3) and 71.87(d).

4. See Enclosure 1.

   a. See Enclosure 1.

   b. See Enclosure 1.

   c. See Enclosure 1.

   d. See Enclosure 1.

   e. Clarify whether there will be only vertical filling of the HEUNL container. If so, the first sentence in Section 7.1.14.1 should replace “can be loaded” with “must be loaded.”

   This information is needed to determine compliance with 10 CFR 71.33 and 71.87(d).

5. Address the following relative to the minimum length of the vent / siphon tube and the void volume present after HEUNL container filling operations.

   The void volume present after HEUNL container filling operations is a function of the length of the vent / siphon tube. The void volume present after HEUNL container filling operations is a critical parameter that is the basis of the pressure and hydrogen gas generation calculations in the application.

   a. Provide on Drawing No. 315-40-181 the numerical value of the minimum length of the vent and siphon tubes referred to in note 11 and provide in Chapter 8, “Acceptance Tests,” a description of the verification test that will be used to ensure a 1-gallon minimum void volume.

   b. Include a note in Section 7.1.14.2, step 4, of the application to indicate the possibility that for the last shipment the contents may not reach the bottom of the vent / siphon tube to allow for HEUNL material discharge from the vent line described.

This information is needed to determine compliance with 10 CFR 71.33 and 71.87(d).

Chapter 3 – Thermal Evaluation

1. Clarify the HEUNL container pressure during HAC is 150 psia as stated in Section 4.5.6.1 of the application. Also clarify whether the following regarding the HEUNL liquid temperature and HAC pressure is based on previous analysis and is bounding for the analysis presented in Sections 3.5.3.16 and 4.5.6.1 of the application.

   See Enclosure 1.

   This information is needed to determine compliance with 10 CFR 71.43(c), (f), and 71.73.

2. See Enclosure 1.

3. Provide justification for the size of the air gap between the lead shielding and the outer shell in the ANSYS HAC model.

   It is not clear whether the size of the air gap (0.065 inches) between the lead shielding and the outer shell in the ANSYS HAC model is appropriate based on the licensing drawings and if a gap will always be present in the fabricated packages. The 0.065-inch modeled air gap may not provide accurate or bounding temperatures. [Proprietary Information removed, see Enclosure 1.]

   This information is needed to determine compliance with 10 CFR 71.51(a)(2) and 71.73(c)(4).

4 Clarify the pressure in the NAC-LWT during the normal conditions of transport (NCT) heat test.

   See Enclosure 1.

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

Chapter 4 – Containment Evaluation

1. Clarify the calculation results that show the maximum hydrogen concentration within the HEUNL container.

   The title of Table 6-8 (Calculation package 65008500-3010) is “Canister Hydrogen Volume % as a Function of G Value and Time.” Provide a column showing the time periods associated with the different G values and hydrogen concentrations.

   This information is needed to determine compliance with 10 CFR 71.43(d).

2. Describe the plug and seal used in the HEUNL vessel lid so that a review of the HEUNL container can be performed.

a. Provide details of the plug/seal (e.g., National Pipe Thread, Unified Fine, Unified Coarse threads, O-ring/groove, etc.) in the SAR, including seal material, its material compatibility with HEUNL, allowable hot and cold temperatures, and principle of the sealing mechanism.

b. Confirm that the plug/seal can withstand the pressures/stresses during NCT and HAC.

c. Is the plug/seal a commercial engineered product that is used for sealing purposes (STAT-O-SEAL, etc.)? Justify the plug/O-ring's effectiveness in repeatedly sealing to the leaktight criterion.

This information is needed to determine compliance with 10 CFR 71.33.

3. Provide details of the port plug and HEUNL lid O-ring and O-ring groove, including dimensions in the drawings and manufacturer data sheets that confirm the dimensions of the grooves are proper for the O-rings.

a. See Enclosure 1.

b. Clarify within the application that the HEUNL lid O-ring and port plug/seal are important to safety components.

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

Chapter 7 – Operating Procedures Evaluation

1. Revise Section 7.1.14.2 of the application to ensure that the HEUNL content temperature will exceed 20°C during HEUNL container filling operations.

Analyses in Chapters 2, 3, and 4 were revised to credit a minimum liquid temperature of 20°C during HEUNL container filling operations. This minimum HEUNL liquid temperature was not addressed in the operating procedures. The bounding pressure analysis was based on a minimum liquid temperature of 20°C during filling operations; liquid temperatures lower than that during filling operations will result in an unanalyzed condition. The minimum loading temperature is also necessary to ensure a void space is present during NCT and HAC conditions.

This information is needed to determine compliance with 10 CFR 71.35(c), and 71.87.

2. Clarify whether the following should be revised in Section 7.2.7.2 of the application, to capture the following steps that appear in Section 7.2.7.1 for vertical unloading, but do not appear in Section 7.2.7.2 for horizontal unloading:

a. Step 16 to, "Install the seal surface protector in the lid cavity, if required" to be added in Section 7.2.7.2 between steps 11 and 12;

b. Step 23 to, "Remove the cask seal surface protector, if used" to be added in Section 7.2.7.2 between steps 17 and 18; and

c. Step 30 to, “Complete a health physics survey…” after the ISO container is in place to be added to Section 7.2.7.2 between steps 23 and 24

This information is needed to determine compliance with 10 CFR 71.47 and 71.51(a).

3. Revise Section 7.2.8 of the application to specify flushing of the HEUNL containers with demineralized water.

NAC’s response to NRC’s question No. 8.1 in letter dated July 2, 2013 (see ADAMS Accession No. ML13183A453) specifies that the HEUNL containers are flushed with demineralized water to minimize corrosion of empty containers. The use of demineralized water was not specified in Section 7.2.8 of the application.

This information is needed to determine compliance with 10 CFR 71.43(d).

4. Revise the leak tests in the operating procedures or maintenance program, as appropriate to address the following:

a. Section 7.1.14.1, step 4, states that a helium pressure boundary verification leakage test is performed but provides no procedure to follow or acceptance criteria. In addition, the last sentence in step 4 is unfinished.

b. Section 7.1.14.2, step 5, states that a leak test of the fill/drain and vent quick disconnect valved nipples is performed but provides no procedure to follow or acceptance criteria.

c. Confirm that the Section 7.1.14.2, step 5, functional leak test would indicate a leak at the valved nipple(s) and container interface. A leak in that area could negate the principle of using the vent/siphon line that guarantees a 1 gallon void.

This information is needed to determine compliance with 10 CFR 71.87.

Chapter 8 – Acceptance and Maintenance Tests Evaluation

1. Clarify in Section 8.1.4.4 of the application which HEUNL container pressure boundary components were tested after each of the first and the second hydrostatic tests.

From Section 8.1.4.4 of the application it is not clear what pressure boundary components have been tested after each of the first and the second hydrostatic tests. The pressure boundary of the HEUNL container is defined as the container shell, top end cap, bottom end cap, container lid, lid plug and O-ring seal, and container lid inner O-ring seal. Section 8.1.4.4 of the application states, “The secondary test is conducted with the fill/drain and vent valves installed and the test lid removed. Two tests shall be conducted such that each valve is tested “closed” while the test fixture is connected to the other for access to the cavity.” It is not clear if each of the valves is being hydrostatically tested in addition to some other portion of the pressure boundary that was not tested during the first hydrostatic test (i.e., container lid, lid plug, etc.).

This information is needed to determine compliance with 10 CFR 71.33, 10 CFR 71.43(f), and 10 CFR 71.51.

2. Clarify how one would replace a drain pipe, especially if damaged due to frozen content.

   a. See Enclosure 1.

   b. NAC's response to NRC's question No. 7.10 in letter dated July 2, 2013 (see ADAMS Accession No. ML13183A453) states, "The design of the HEUNL container allows the installation of a drain tube through the vent port (i.e., removal of the vent tube/siphon and installation of a new drain tube welded to a spare Snap-tite nipple) in order to properly empty the container in the event that a drain tube is damaged or disconnected during transport." It is not clear to the staff how a rigid, long drain, tube with one or more bends necessary for complete draining of the HEUNL contents can be installed as described.

   This information is needed to determine compliance with 10 CFR 71.43(f).

3. Revise the maintenance procedures and helium leakage tests of the HEUNL container in Sections 8.1.4.4 and 8.2 to address the following. Note that a helium leak test of the HEUNL container is performed in order to ensure the HEUNL content remains within the container, which is the basis of the analyses in the SAR.

   a. Page 8.1-10 indicates that the "HEUNL container will be assembled with the container lid and inner O-ring seal … removed. A test envelope will be installed around the assembled HEUNL container enclosing all of the pressure boundary welds, base metal plates, and the container lid." There is a discrepancy with the test procedure. One sentence states that the container lid is removed and another sentence states the lid is tested.

   b. It is not understood how the pressure boundary, which includes the lid and inner O-ring, can be tested to the leaktight criterion if they are not included in the test.

   c. Page 8.1-10 and 8.1-11 state that leakage testing of the HEUNL container pressure boundary shall be performed "in accordance with written and approved procedures." Clarify that those procedures are written and approved by personnel certified by the American Society for Nondestructive Testing Level III Nondestructive Testing for leakage testing.

   d. Page 8.1-10 states that a 12 month periodic leakage test of the HEUNL container is not performed, presumably because the container is limited to a 15 month cumulative exposure service life. However, a 15 month cumulative exposure could potentially extend to a calendar time period that is well beyond 15 months. This calendar time period may be sufficient to affect pressure boundary components such that they may not meet the 1×10^{-7} ref cm^3/sec "leaktight" criteria per American National Standards Institute (ANSI) in ANSI N14.5-1997, "Radioactive Materials - Leakage Tests on Packages for Shipment." Justify not performing a 12-month periodic leak test as specified in ANSI N14.5.

   e. Page 8.2.2 states that vent and drain/fill valves are replaced prior to refilling. Specify the replacement periods of the HEUNL closure lid O-rings and the port

plug/O-ring. Note that NUREG-1609 indicates that O-ring seals should be replaced every 12 months.

f. Clarify whether the procedures mentioned in the NAC response to NRC's question No. 1 in letter dated July 2, 2013 (see ADAMS Accession No. ML13183A453), have been incorporated into Chapter 7 and Chapter 8 of the SAR. Some of the terminology and methods in the RAI response do not appear to be included in the SAR.

This information is needed to determine compliance with 10 CFR 71.87.

Editorial

1. Revise the "note" in Section 7.1.13.1, step 32 b., by changing "dely" to "delay."