71-9204

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7 December 2005
E&L-112-05

Meraj Rahimi
Spent Fuel Project Office
Office of Nuclear Material Safety and Safeguards, NMSS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Rahimi:

Subject: Amendment Request for the CNS 10-160B Certificate No. 9204

As we discussed, Duratek has made additional changes on five pages of our amendment request for the CNS 10-160B cask SAR and C of C. The attached pages for Appendix 4.10.2 and 4.10.2.1 should be substituted for those attached to our submittal dated December 2, 2005. We request that you approve this proposed Revision 20 to the SAR, with these changes, and revise the Certificate.

The changes have been noted with margin bars identifying the location of changes and deleted language is shown with "strikeout".

There are five pages attached to this letter to be substituted for pages previously submitted. These pages are: 4.10.2-14, 4.10.2.1-7, 4.10.2.1-8, 4.10.2.1-11, and, 4.10.2.1-C-2.

Should you or members of your staff have questions about the responses, please contact me at (803) 758-1898.

Sincerely,

Mark Whittaker, CHP
Sr. Analyst

Attachments: As stated

NMSS01

Isotopic Composition - List of radionuclides present in the waste
Activity - Reported activities of the listed radionuclides in curies or Becquerel.

10.4.3 Procedure For Determining Maximum Allowable Decay Heat Limits

The necessary inputs are provided to the code prior to initiating a run. A time period ~~of 60 days~~ equivalent to the shipping period (Attachment C) is conservatively assumed between the date of beginning of decay and date of analysis. ~~to reflect the shipping period (Attachment C).~~ The model is run with the initial isotopic composition and activity and the corresponding hydrogen gas generation rate is obtained. It is compared with the maximum allowable hydrogen gas generation rate as obtained from Section 10.3, and the scaling factor is obtained by dividing the maximum allowable hydrogen gas generation rate by the RadCalc obtained rate. The isotopic composition is scaled by this differential factor. This is done on the basis of the assumption that the maximum decay heat occurs at the time of maximum activity that will result in the maximum hydrogen gas generation rate. The associated decay heat value will be the maximum decay heat limit as the decay heat limit shares a direct relationship with the hydrogen gas generation rate, independent of time.

10.5 Methodology for Compliance with Payload Assembly Requirements

Prior to shipping, the Transportation Certification Official at the shipping site (TCO) shall ensure that the CNS 10-160B Cask payload consists of payload containers belonging to the same or equivalent content code. In the event that payload containers of different content codes with different bounding G values and resistances are assembled together in the CNS 10-160B Cask, the TCO shall ensure that the decay heat and hydrogen gas generation rate for all payload containers within the payload are less than or equal to the limits associated with the payload container with the lowest decay heat limit and hydrogen gas generation rate limit.

## 11.0 WEIGHT

The weight limit for the contents of the loaded cask is 14,500 pounds.

## 12.0 REFERENCES

12.1 U.S. Department of Energy (DOE), 2002, "Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant," Rev. 0, *DOE/WIPP-02-3122*, U.S. Department of Energy, Carlsbad Field Office, Carlsbad, New Mexico.

12.2 Hatayama, H.K., J.J. Chen, E.R. de Vera, R.D. Stephens, and D.L. Storm, "A Method for Determining the Compatibility of Hazardous Wastes," *EPA-600/2-80-076*, U.S. Environmental Protection Agency, Cincinnati, Ohio, 1980.

12.3 U.S. Department of Energy, "Safety Analysis Report for the TRUPACT-II Shipping Package," Current Revision, U.S. Department of Energy Carlsbad Area Office, Carlsbad, New Mexico.

12.4 Duratek Federal Services, Richland, Washington, "RadCalc 3.0 Volume I: User's Manual," prepared for the National Transportation Program, U. S. Department of Energy, (November 2001).

12.5 FENDL/D Version 1, January 1992 is a decay data library for fusion and (other) applications. Summary documentation by A. B. Pashchenko. Index No. IAEA-NDS-167 in Index to the IAEA-NDS-Documentation Series.

**Table 7-1. Maximum Pressure Increase Over 365-Day Shipping Period**

| Content Code | $G_{eff}$ (RT)[a] | Void Volume (Liters) | Activation Energy (kcal/mole) | Decay Heat Limit per Cask (Watts) | $G_{eff}$[b] | $P_{max}$[c] (psig) |
|---|---|---|---|---|---|---|
| BC 121A | 8.1 | 1938 | 2.1 | 2.26 | 14.19 | 31.13 |
| BC 121B | 8.1 | 1938 | 2.1 | 2.26 | 14.19 | 31.13 |
| BC 312A[d] | -- | -- | -- | -- | -- | -- |
| BC 314A | 0.72 | 1938 | 0 | ~~7.23~~11.43[e] | 0.72 | ~~12.02~~14.17 |
| BC 321A | 8.1 | 1938 | 2.1 | ~~1.96~~2.26[e] | 14.19 | ~~28.10~~31.13 |
| BC 321B | 8.1/2.1[fe] | 1938 | 2.1 | ~~2.03~~4.17[e] | 4.65 | ~~15.03~~22.10 |
| BC 322A | 0.024 | 1938 | 0 | ~~217342.81~~ 00.0[e] | 0.024 | ~~12.02~~14.17 |

[a] G value for net gas (molecules per 100 eV) at room temperature (70°F).
[b] Effective G value (molecules per 100 eV) at maximum operating temperature of 168°F calculated using the Arrhenius equation for which activation energy is an input.
[c] Maximum pressure.
[d] This code consists of solidified organics; compliance with pressure limits will be shown by testing.
[e] Decay heat limit per cask from 10-day controlled shipment. This is the maximum decay heat for this content code.
[fe] BC 321B reports 12% cellulosics and 80% resins (remainder being inorganic material) and is reflected in the calculation of the temperature-corrected $G_{eff}$.

Compliance with the restrictions on flammable gas concentration is discussed in Section 10.0.

## 8.0 PAYLOAD CONTAINER AND CONTENTS CONFIGURATION

### 8.1 Requirements

Fifty-five-gallon drums are authorized payload containers in a CNS 10-160B cask. Up to ten 55-gallon drums of TRU waste may be packaged in the cask. Each 55-gallon drum to be packaged in the CNS cask must have a minimum of one filter vent. The minimum filter vent specifications for the 55-gallon drums and drum liners used to package waste inside the drums are provided in Table 8-1.

The test methods used to determine the compliance of filter vents with the performance-based requirements of flow rate, efficiency, and hydrogen diffusivity shall be directed by procedures under a quality assurance program.

Filter vents shall be legibly marked to ensure both (1) identification of the supplier and (2) date of manufacture, lot number, or unique serial number.

| Table 8-1. Minimum Filter Vent Specifications | | | | |
|---|---|---|---|---|
| | Filter Specification | | | |
| Container/Filter Type | Number of Vents Required per Container | Flow Rate (ml/min of air, STP, at 1 inch of water)[a] | Efficiency (percent) | Hydrogen Diffusivity (mol/s/mol fraction at 25°C) |
| Drum Filter | 1 | 35 | 99.5 | 3.70E-6 |
| Drum Liner Filter | 1 | 35 | NA[b] | 3.70E-6 |

[a] Filters tested at a different pressure gradient shall have a proportional flow rate (e.g., 35 ml/min at 1 inch of water = 1 L/min at 1 psi).
[b] Filters installed in containers that are overpacked are exempt from the efficiency requirement as the drum must exhibit a ≥99.5 percent efficiency.
NA = Not applicable.

The rigid polyethylene liner, if present, in a payload container shall be punctured with a 1-inch diameter hole before the container is transported in the CNS 10-160B.

### 8.2 Methods of Compliance and Verification

Procured filter vents at BCL shall be inspected as directed by QD-AP-04.1, Documentation and Control of Purchased Items and Services, to verify compliance with the applicable filter vent specifications specified in the purchase requisition (i.e., visual inspection of certificate of conformance serial numbers to actual filter vents and inspection of filters for physical damage). Under WA-OP-006, Procurement and Inspection of Packagings for Hazardous Materials Shipments, payload containers and liners, if present, shall be visually inspected to ensure that they have been fitted with the required number of filter vents or required hole diameter as specified above. Nonconforming filter vents shall be segregated in accordance with QD-AP-15.1, Nonconformance Reporting for Activities, Items and Materials. As described in TC-OP-01.4, Segregation and Packaging of TRU Waste, qualified BCLDP TRU WCP personnel also shall visually inspect payload containers during packaging to ensure that each has been fitted with the correct type and number of filter vents.

Prior to transport, payload container filter vents shall be visually inspected by the Transportation Certification Official (TCO) for damage or defect. If a defect is identified, a nonconformance report shall be issued in accordance with QD-AP-15.1, Nonconformance Reporting for Activities, Items and Materials, and the payload container shall be returned for repackaging or overpacking prior to certification.

## 9.0 ISOTOPIC CHARACTERIZATION AND FISSILE CONTENT

### 9.1 Requirements

The CNS 10-160B cask payload allows fissile materials, provided the mass limits of Title 10, Code of Federal Regulations, Section 71.~~53~~15 are not exceeded. Plutonium content cannot exceed 0.74 TBq (20 curies) per cask.

| Table 10-1A Maximum Allowable Hydrogen Generation Rates and Decay Heat Limits 60-Day Shipping Period | | | | | | |
|---|---|---|---|---|---|---|
| Content Code | Maximum Allowable Hydrogen Gas Generation Rate, mole/second/ drum | Maximum Allowable Hydrogen Gas Generation Rate, moles/second/ cask | Maximum Allowable Decay Heat Limit, Watts/Drum (Dose <= 0.012 watt*year) | Maximum Allowable Decay Heat Limit, Watts/Cask (Dose <= 0.012 watt*yr) | Maximum Allowable Decay Heat Limit, Watts/Drum (Dose > 0.012 watt*year) | Maximum Allowable Decay Heat Limit, Watts/Cask (Dose > 0.012 watt*year) |
| BC 121A | 3.944E-8 | 3.944E-7 | 0.081 | 0.81 | 0.238 | 2.26[a] |
| BC 121B | 4.745E-8 | 4.745E-7 | 0.101 | 1.01 | 0.298 | 2.26[a] |
| BC 312A | 3.429E-8 | 3.429E-7 | –[b] | –[b] | –[b] | –[b] |
| BC 314A | 3.429E-8 | 3.429E-7 | 0.723 | 7.23 | 0.723 | 7.23 |
| BC 321A | 3.429E-8 | 3.429E-7 | 0.096 | 0.96 | 0.196 | 1.96 |
| BC 321B | 3.429E-8 | 3.429E-7 | 0.181 | 1.81 | 0.203 | 2.03 |
| BC 322A | 3.429E-8 | 3.429E-~~8~~7 | 21.7 | ~~217~~100[c] | 21.7 | ~~217~~100[c] |

[a] Constrained by total decay heat that will comply with design pressure limit (see Table 7-1).
[b] No decay heat limit or activity limit due to unknown G value; compliance must be demonstrated by measurement of hydrogen generation rate per Section 4 of Attachment B.
[c] Constrained by package limit of 100 watts.

| Table 10-1B Maximum Allowable Hydrogen Generation Rates and Decay Heat Limits 10-Day Controlled Shipment Shipping Period | | | | | | |
|---|---|---|---|---|---|---|
| Content Code | Maximum Allowable Hydrogen Gas Generation Rate, mole/second/ drum | Maximum Allowable Hydrogen Gas Generation Rate, moles/second/ cask | Maximum Allowable Decay Heat Limit, Watts/Drum (Dose <= 0.012 watt*year) | Maximum Allowable Decay Heat Limit, Watts/Cask (Dose <= 0.012 watt*yr) | Maximum Allowable Decay Heat Limit, Watts/Drum (Dose > 0.012 watt*year) | Maximum Allowable Decay Heat Limit, Watts/Cask (Dose > 0.012 watt*year) |
| BC 121A | 6.848E-08 | 6.848E-07 | 0.164 | 1.64 | 0.482 | 2.26[a] |
| BC 121B | 9.691E-08 | 9.691E-07 | 0.277 | 2.26[a] | 0.814 | 2.26[a] |
| BC 312A | 5.431E-08 | 5.431E-07 | –[b] | –[b] | –[b] | –[b] |
| BC 314A | 5.431E-08 | 5.431E-07 | 1.142 | 11.42 | 1.142 | 11.42 |
| BC 321A | 5.431E-08 | 5.431E-07 | 0.197 | 1.97 | 0.402 | 2.26[a] |
| BC 321B | 5.431E-08 | 5.431E-07 | 0.371 | 3.71 | 0.417 | 4.17 |
| BC 322A | 5.431E-08 | 5.431E-07 | 34.27 | 100[c] | 34.27 | 100[c] |

[a] Constrained by total decay heat that will comply with design pressure limit (see Table 7-1).
[b] No decay heat limit or activity limit due to unknown G value; compliance must be demonstrated by measurement of hydrogen generation rate per Section 4 of Attachment B.
[c] Constrained by package limit of 100 watts.