Docket No. 71-9365/TAC No. L24686

Change	Detail	SAR Sections Revised in SAR Rev 4	Pages of SAR Rev 4 Change Pages
Add a step in Chapter 7 to require the user to use the method explained in Appendix 7.6 for determining the allowable contents.	Changed Step 1.b. in Section 7.1.2.1 as follows: *Package contents meet the requirements of Appendix 7.6 and its loading table addressed in Section 7.6.1.1*	7.1.2.1	7-7
Clarification that the acceptance tests are required by the regulations, rather than the NRC.	Changed the 7th bullet item in Section 8.1 as follows: *Robatel Technologies, LLC performs all tests required by the NRC in accordance with 10 CFR 71.93(b) [Ref. 2]*	8.1	8-2
Add a new item requiring measurement of the clearance of the annular gap between the inner and outer shells that are to be filled with lead, prior to lead pouring. This is important for ensuring the minimal thickness of the lead layer.	Added as the 4th bullet in Section 8.1: *Prior to lead pouring, measure the average clearance annular gap between the inner and outer shell of the cask body. Using a gauge, verify that the annular gap is above 86 mm at every point between the two shells. After lead pouring, the maximum annular gap between the lead and the inner and outer shell shall not exceed 0.1 cm.*	8.1	8-2
Both filters and wood shoring may need to be assessed as polyethylene. One part of the SAR indicated that the filters would be modeled as resin, but another section indicated that they can be made from polyethylene, which has a higher G-value than resin.	Additional data was added to Tables 4.4-1, 4.4-2, 4.4-3, 4.4-4, 4.4.4-1 and 7.5.1-1 to clarify the properties of polyethylene/polypropylene. Equations 4.5 (in section 4.4.2), 4.9 (in section 4.4.5), 4.9 (in Section 7.5.2). Sections 4.4.1.1 and 7.5 were revised to include additional information regarding polyethylene/polypropylene filters.	4.4.1.1, 4.4.1.2, 4.4.1.3, 4.4.2, 4.4.5, 7.5.1, 7.5.2	4-17, 4-18, 4-19, 4-20, 4-22, 4-24, 4-32, 4-33, 7-21, 7-23
Gas generation calculation requires all flammable gas generation materials in the package to be appropriately assigned as resin beads or polyethylene. Clarification added as to how waste is assigned when loading the cask.	New paragraph added at the end of Section 4.4: *Package material and content that can generate flammable gas shall be appropriately assigned as part of the ionic resin bead waste or polyethylene container when using the Loading Curve (Figure 4.4.4-1) or detailed analysis (Section 4.4.5) to determine acceptable hydrogen gas generation-related parameters of shipping time and decay heat. For example, waste filters (made of material other than polypropylene or polyethylene) shall be grouped as ionic bead waste and wood*	4.4, 7.5	4-16, 7-20

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	shoring would be grouped as part of the polyethylene container. If filters are made of polyethylene or polypropylene, they are to be included in the secondary container volume for the hydrogen gas generation detailed analysis. New paragraph added to Section 7.5: *Package material and content that can generate flammable gas shall be appropriately assigned as part of the ionic resin bead waste or polyethylene container when using the Loading Curve (Figure 7.5-1 and Table 7.5.1-1) or detailed analysis (Section 7.5.2) to determine acceptable hydrogen gas generation-related parameters of shipping time and decay heat. For example, waste filters (made of material other than polypropylene or polyethylene) shall be grouped as ionic bead waste and wood shoring would be grouped as part of the polyethylene container. If filters are made of polyethylene or polypropylene, they are to be included in the secondary container volume for the hydrogen gas generation detailed analysis.*		
Corrected page 7-22 where t_{max} for equation 4-9 should be in seconds not in EV/s.	The units for t_{max} changed from eV/s to s.	7.5.2	7-23
Additional steps and conditions for use of the RT-100 are added to Chapter 7.	The following steps and conditions are added to Section 7.6: *1. The maximum content density is 1.0 g/cm^3. The source strength density must be ensured at any point of the content. Average density by dividing the total activity by total weight is not acceptable.* *2. No neutron emitting nuclides, except in trace amounts.* *3. The weight of water must be excluded when determining the Ci/gram of content limit.* *4. The source concentration must not exceed the Curies per gram limit determined using the method and the loading tables as prescribed in Appendix 7.6 of this Chapter and no concentration or shift during normal conditions of*	7.6 and 7.6.1.1	7-27 and 7-33

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	transport. *5. The user/shipper must analyze the constituent radioactive nuclides of the content on a per-gram basis.* *6. The user/shipper must determine the allowable content based on the loading tables provided in Section 7.6.1.1.* *7. The user/shipper must ensure the per gram activities at any point within the content does not exceed the limit that is specified according to the loading table.* *8. The allowable content must be determined based on dry resin or filter media. Any potential concentration of sources during loading and transport is not permitted.* *9. The radioactive content is not to exceed 1.0 g/cm^3 and the nuclear physical characteristics, i.e., the gamma attenuation coefficient of the content must not be smaller than that of the carbon material resin.* *10. A comprehensive dose rate measurement is performed prior to transport of the package as described in Section 7.1.3.* *11. A comprehensive dose rate measurement is preformed after arrival at the destination as described in Section 7.2.1.* *12. Compare pre-shipment dose rate measurements to dose rate measurements at the arrival of the package. Stop any further shipment if the measured dose rates show significant differences from the pre-shipment measurement values.* The following text was modified in Section 7.6.1.1: *Verify that the bulk density of the resin or filter media does not exceed 1 g/cm^3 at any point of the content. The weight of water must be excluded when determining the Ci/gram of radioactive content limit.*		

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Added specification that the maximum gap between the lead and the shells holding the lead shell is not to exceed 0.1 cm.	Added requirement to acceptance tests as follows: *Prior to lead pouring, measure the average clearance annular gap between the inner and outer shell of the cask body. Using a gauge, verify that the annular gap is above 86 mm at every point between the two shells. After lead pouring, the maximum annular gap between the lead and the inner and outer shell shall not exceed 0.1 cm.*	8.1	8-2
Deleted section on LSA and SCO materials in Chapter 7.	Statement deleted in Section 8.2.2.2	8.2.2.2	8-22 (bottom of the page)
Portions of the text suggested that use of a secondary container is optional. Use of a secondary container is mandatory. Corrected portions of the text were this requirement was not well defined.	Correction to Section 1.2.1.9: *The waste contents shall be pre-packaged in liners and placed into the cask cavity.* Correction to Section 1.2.2.4: *The contents shall be packaged in secondary containers.* Correction to Section 1.2.2.7: *All contents shall be packaged in a secondary container (liner).* Correction to Section 3.2.3: *The contents include secondary containers and may also include shoring.* Removal of the following phrase in Section 7.1.2.1: *Note that the use of secondary containers is optional, but essentially used as a standard practice to facilitate loading and unloading operations.*	1.2.1.9, 1.2.2.4, 1.2.2.7, 3.2.3, 7.1.2.1	1-5, 1-8, 1-9, 3-12, 7-7

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Additional detail provided in Chapter 7 regarding dose rate measurements. The user is directed to follow RIS 13-04 when taking measurements after the cask is loaded prior to transport, and after transport prior to unloading.	The following text is added to Step 2 of Section 7.1.3 and Step 6 of Section 7.2.1: *Measure the exterior gamma radiation levels following RIS 13-04 to ensure these do not exceed 200 millirem per hour (2 mSv/h) at any point on the vertical planes projected from the outer edges of the trailer, on surface of the impact limiter at the axial center line if the package, and on the lower external surface of the trailer, 10 millirem per hour (0.1 mSv/h) at any point 2 meters (6.6 feet) from the vertical planes projected by the outer edges of the trailer (excluding the underside of the trailer) and 2 millirem per hour (0.02 mSv/h) in the tractor cab, in accordance with 49 CFR 173.441 and 10 CFR 71.47. Measurements shall be made at the axial mid-plane of the cask and below the cask end on the lower external surface of the trailer. Also measure the neutron radiation to ensure there is not unexpected neutron sources in the content.*	7.6, 7.1.3 and 7.2.1	7-9, 7-12 and 7-27
SAR Rev. 3 included the following sentence on page 4-17: *"The loading curve is not applicable in this case and a detailed analysis shall be performed."* This was not appropriate because the loading curve has not been formulated until page 4-29.	This sentence was removed, and more detail was added to Section 4.4.1.3 regarding the grouping of polyethylene or polypropylene filters with the polyethylene secondary container volume.	4.4.1.3	4-20
The definitions of terms used in the hydrogen generation analysis did not clearly explain how waste was characterized when using the equations. More detail was provided.	For clarification, the definitions to the terms in the equations were updated as follows: G_{Ti} = *total radiolytic G value for ionic resin and stainless steel filters [molecules/100eV],* G_{TC} = *total radiolytic G value for polyethylene container, shoring, and polyethylene or polypropylene filters [molecules/100eV],* G_{TW} = *total radiolytic G value for water in waste [molecules/100eV],*	4.4.2, 4.4.3, 4.4.5, 7.5.2	4-22, 4-24, 4-25, 4-26, 4-33, 7-23 and 7-24

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	D_H = *decay heat that is absorbed by the radiolytic materials [eV/s],* D_i = *decay heat that is absorbed by the ionic resin and stainless steel filters [eV/s],* D_C = *decay heat that is absorbed by the polyethylene container, shoring, and polyethylene or polypropylene filters [eV/s],* D_W = *decay heat that is absorbed by the water [eV/s],* α_i = *fraction of G_{Ti} that is equivalent to G_{FGi}, flammable gas released, for the ionic resin and stainless steel filters,* α_C = *fraction of G_{TC} that is equivalent to G_{FGC}, flammable gas released, for the secondary container, shoring, and polyethylene or polypropylene filters in the waste,* α_W = *fraction of G_{TW} that is equivalent to G_{FGW}, flammable gas released, for the water in waste,* F_W = *fraction of decay heat energy absorbed by the water in the waste material,* F_i = *fraction of decay heat energy absorbed by the ionic resin and stainless steel filters in the waste material,* F_C = *fraction of decay heat energy absorbed by the polyethylene container, shoring, and polyethylene or polypropylene filters,* V_i = *volume of dewatered, ionic resin in the waste, including absorbed moisture, and stainless steel filters in the waste material* V_C = *volume occupied by the secondary container, shoring, and polyethylene or polypropylene filters in the waste material*		

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In section 4.4.1.3, adjusted G values are presented for the cask contents. Polyethylene and polypropylene filters are now included in the "waste materials" section. In the hydrogen gas generation analysis, additional explanation added to explain that if these items are present they must be considered as "secondary container/shoring".	The following text is added to Section 4.4.1.3: *If polyethylene or polypropylene filters are loaded into the cask, their volumes shall be accounted for as a polyethylene secondary container in the calculation.*	4.4.1.3	4-20
Page 3-60 updated to correspond to the calculation note RTL-001-CALC-TH-0301, Rev. 1. Additional detail added to describe the maximum pressure under HAC.	Total pressure accounting for combustion of contents was updated: $\boldsymbol{P_T = P_v + P_r + P_f}$ $\boldsymbol{P_T}$ *= 463.2kPa + 50.4kPa + 171.0kPa = 684.6kPa [99.3psia]* The following statement was added: *Since the temperature required to ignite wood are not sustainable, complete combustion is not considered a credible event, therefore, the maximum pressure is taken as 97.47 psia as demonstrated in Section 3.4.3.2.5.*	3.4.3.2.6	3-60