Robatel Technologies, LLC RT-100 Application for Contents Modification March 11, 2014

Docket No. 71-9365

AGENDA

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Meeting between Robatel Technologies, LLC (Robatel) and the Nuclear Regulatory Commission
March 11, 2014
1:00 p.m. - 2:30 p.m.
3WFN 13-A-28

1. Introduction.
2. Review of Proposed Contents for the Model No. RT-100 Package.
3. Presentation of a Revised Shielding Evaluation.
4. Estimated Timeframe for Submittal of a Revised SAR.
5. Opportunity for Public Comments.
6. Conclusion.

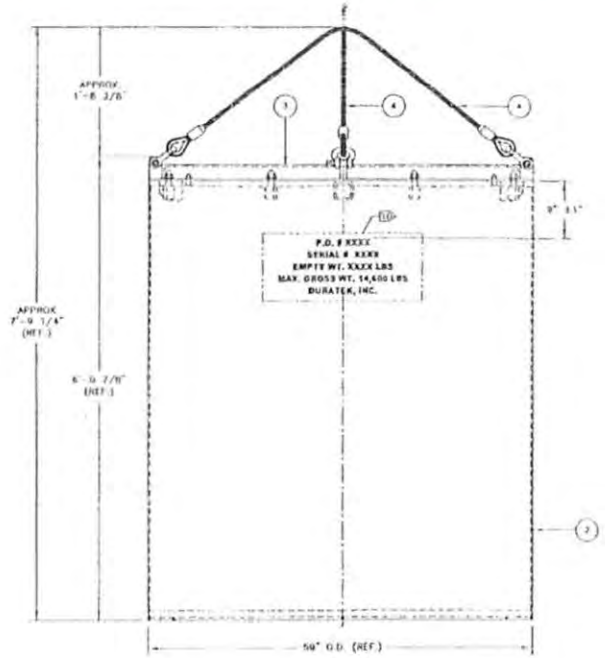
Content Specification

Activated metal (light water reactor internals)

Total 3000 Curies

Typical radionuclide contribution:

500 - 2000 Ci Co-60
≤3000 Ci Fe-55, Ni-63



① LINER ASSEMBLY-SIDE VIEW

"In accordance with 10 CFR 71.33(b), the description of the contents should be complete with respect to the chemical and physical form of the material, as well as its radioactive content (radionuclides and quantity). The Division of Spent Fuel Storage and Transportation's Interim Staff Guidance-20 (SFST-ISG-20), "Transportation Package Design Changes Authorized Under 10 CFR Part 71 Without Prior NRC Approval," states that the content description must be consistent with the assumptions made about the contents in the package evaluation (e.g., in the containment, shielding, and criticality evaluations). These features must be described in sufficient detail to provide a basis for evaluating the package." (RIS 2013-04)

Measured and estimated dose rate (mR/hr) using Microshield

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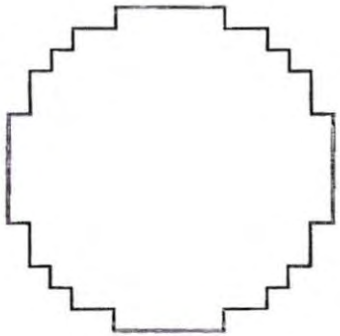
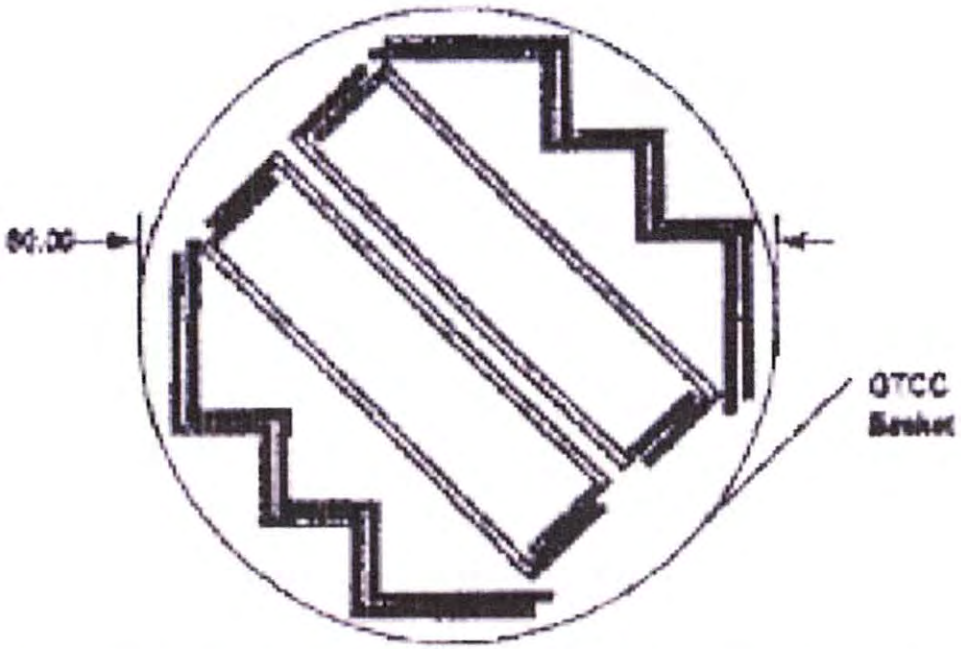
Container ID	Contact Dose rate in 2005	Measured Dose rate in 2005	Corrected Dose rate on contact	Dose rate @ 3 meter in 2005	Corrected Dose rate @ 3 meter
08-0175	2.00E+03	5.00E+03	5.40E+02	8.76E+01	3.10E+01
99-0128	2.70E+03	3.00E+03	2.10E+03	1.50E+02	1.10E+02
99-0130	1.10E+03	1.50E+03	8.30E+02	5.75E+01	4.44E+01
99-0134	1.00E+04	5.00E+04	7.70E+03	4.61E+02	3.60E+02
99-0315	1.00E+04	1.50E+04	8.80E+03	5.54E+02	4.30E+02
99-0316	3.40E+03	5.00E+03	2.60E+03	1.66E+02	1.30E+02
RVI-008	1.50E+05	7.00E+04	5.20E+04	9.10E+03	3.10E+03
RVI-009	1.10E+04	2.90E+04	3.80E+03	6.50E+02	2.20E+02
RVI-010	1.00E+04	1.30E+04	3.60E+03	6.10E+02	2.10E+02
RVI-011	1.20E+04	2.10E+04	3.90E+03	6.75E+02	2.30E+02
RVI-016	2.00E+05	4.16E+05	6.50E+04	1.20E+04	4.00E+03
RVI-017	2.00E+05	6.20E+05	6.40E+04	1.10E+04	4.00E+03
RVI-018	2.00E+05	4.16E+05	6.40E+04	1.10E+04	4.00E+03
RVI-019	1.70E+05	1.00E+06	4.80E+04	8.87E+03	3.45E+03
RVI-021	5.00E+04	7.20E+04	1.60E+04	3.00E+03	1.00E+03
RVI-022	5.50E+04	5.00E+04	1.80E+04	3.70E+03	1.27E+03
RVI-026	6.20E+04	4.00E+04	1.50E+04	4.20E+03	1.50E+03
RVI-027	6.30E+04	3.50E+04	2.10E+04	4.25E+03	1.50E+03
RVI-029	6.50E+04	1.00E+05	2.30E+04	4.50E+03	1.60E+03
RVI-033	6.70E+04	5.00E+04	2.30E+04	4.70E+03	1.60E+03
RVI-034	6.70E+04	4.50E+05	2.30E+04	4.70E+03	1.60E+03
RVI-035	6.50E+04	4.50E+05	2.20E+04	4.50E+03	1.55E+03
RVI-037	5.50E+04	5.00E+04	1.90E+04	3.80E+03	1.30E+03

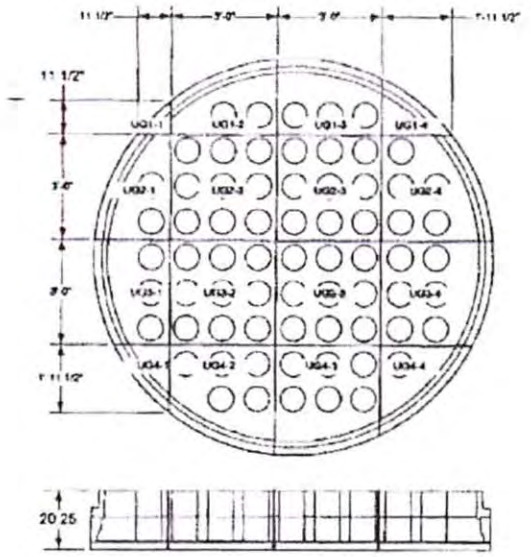
Core Barrel Baffle Assembly

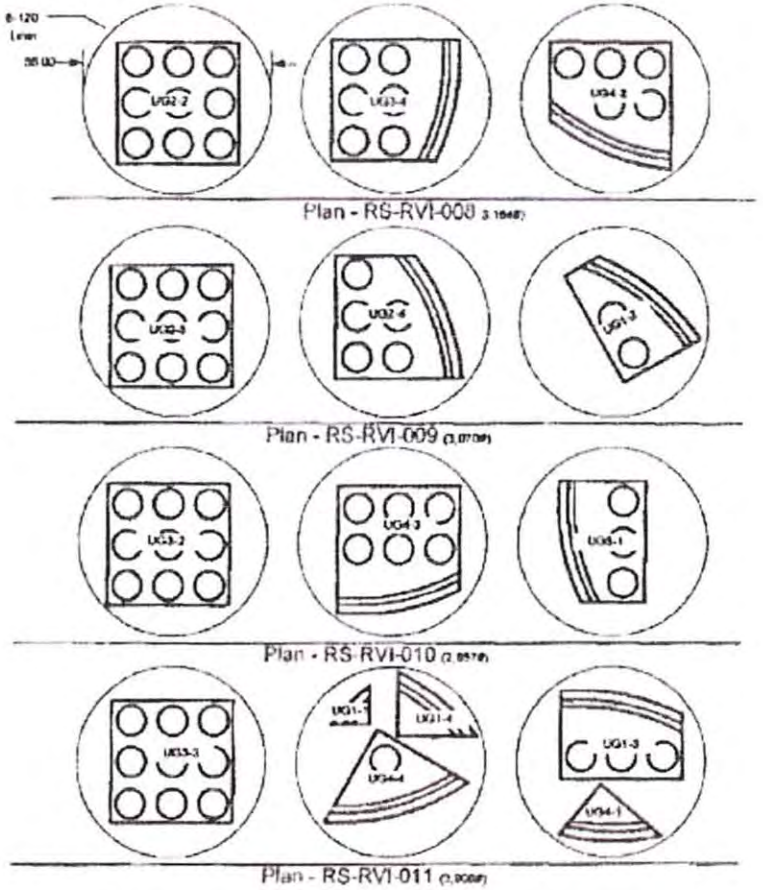




Plan - RS-RVI-001 (28.630in)

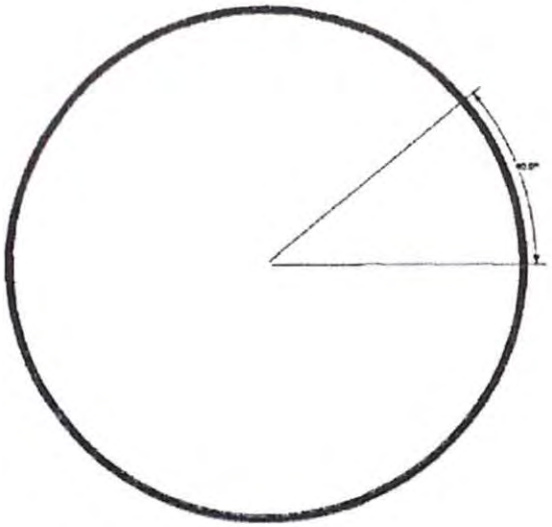
Upper Grid

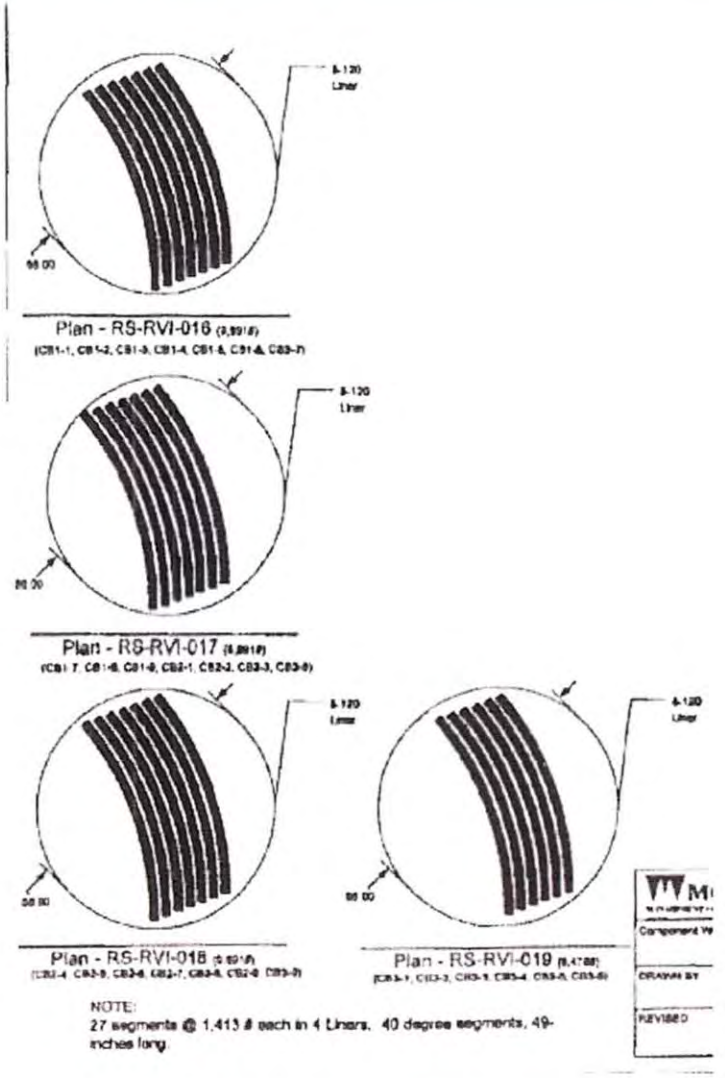




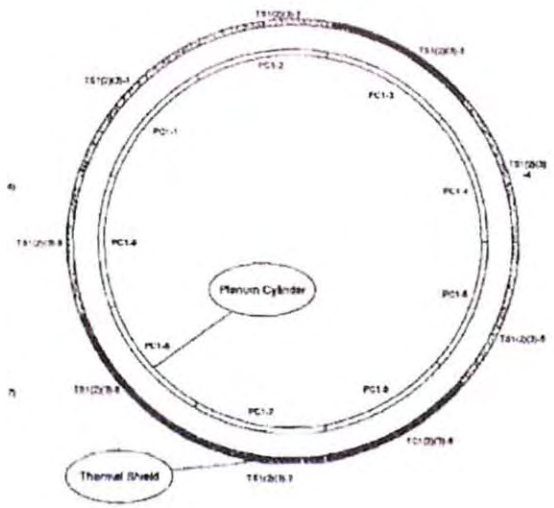
NOTE:
Segment UG2-1 is packaged in RS-RVI-026 along with segments from the lower internals.

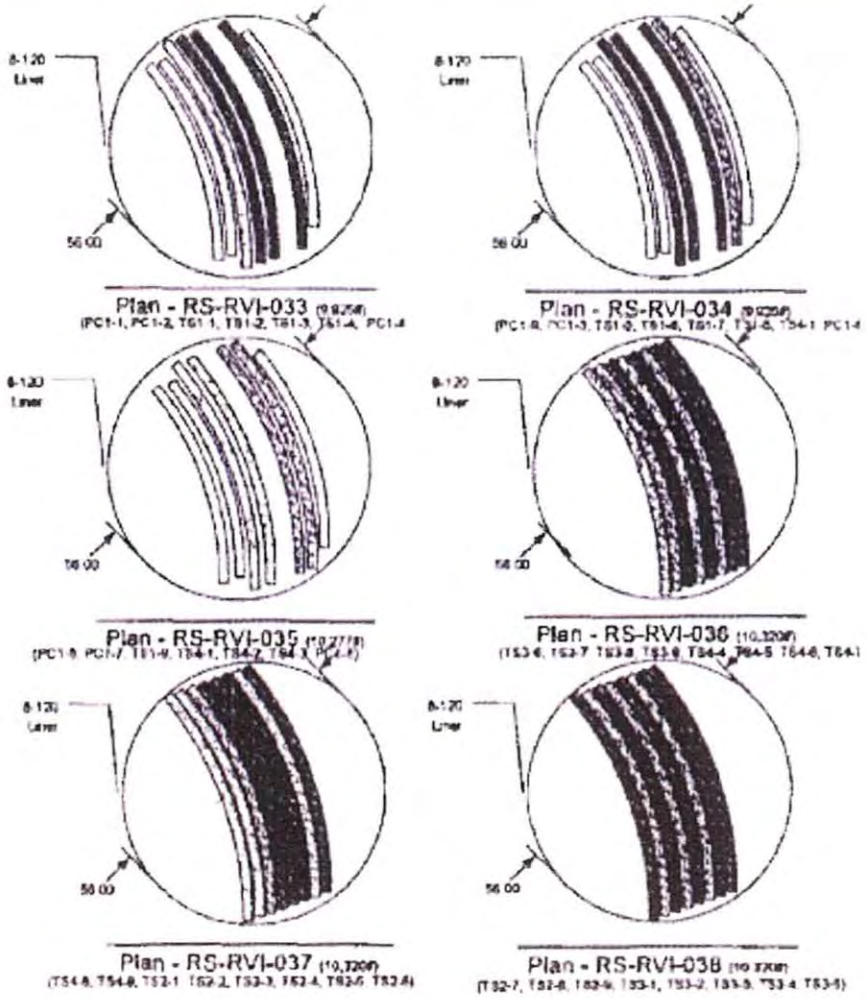
Core Barrel



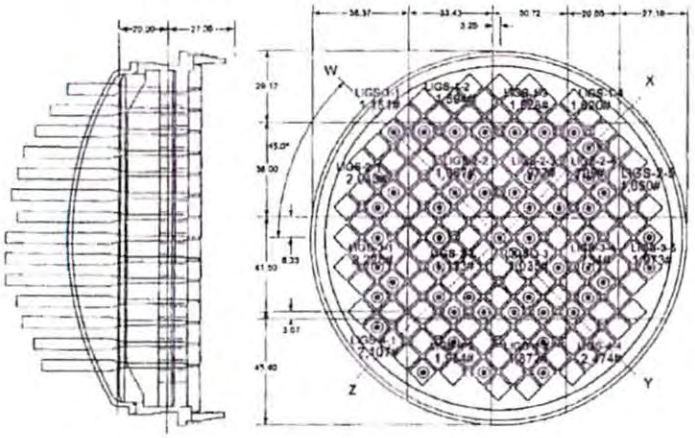

Plan - RS-RVI-016
Plan - RS-RVI-017
Plan - RS-RVI-018
Plan - RS-RVI-019
NOTE:
27 segments @ 1,413 # each in 4 Liners. 40 degree segments, 49-inches long

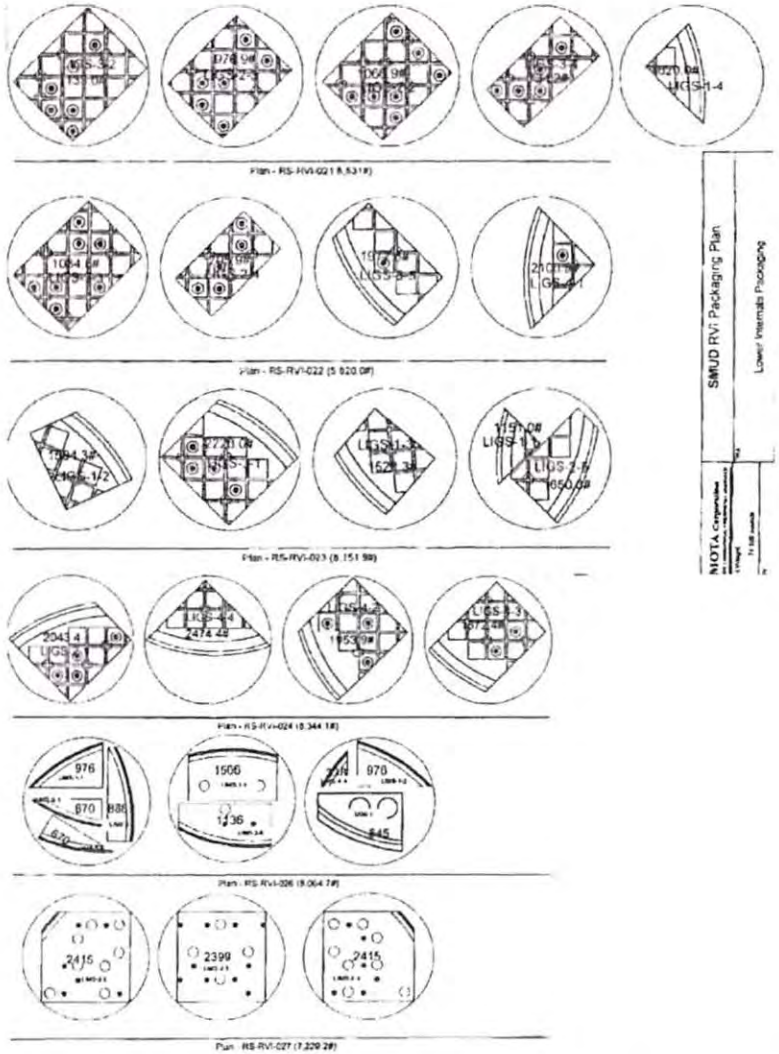
Thermal Shield/Plenum Cylinder





Lower Internals





Transport Requirements – External Radiation Levels

Section 71.47 "Conditions normally incident to transportation "

Surface	2 mSv/h (200 mrem/h)
1 m (40 in)	
Non-exclusive	0.1 mSv/h (10 mrem/h)
2 m (6.6 ft)	
Exclusive	

Section 71.51(a)(1) ("Normal conditions of transport") — no significant increase in external surface radiation levels

Section 71.51(a)(2) ("Hypothetical accident conditions")

1 m (40 in)	10 mSv/h (1 rem/h)

"package design must include an evaluation that demonstrates the package satisfies the dose rate limits in 10 CFR 71.47 for NCT and 71.51(a)(2) for HAC. SFST-ISG-20 states that the evaluation may be based on a representative loading to allow flexibility in the contents that can be loaded for Type B packages in which exact contents are not known." (RIS 2013-04)

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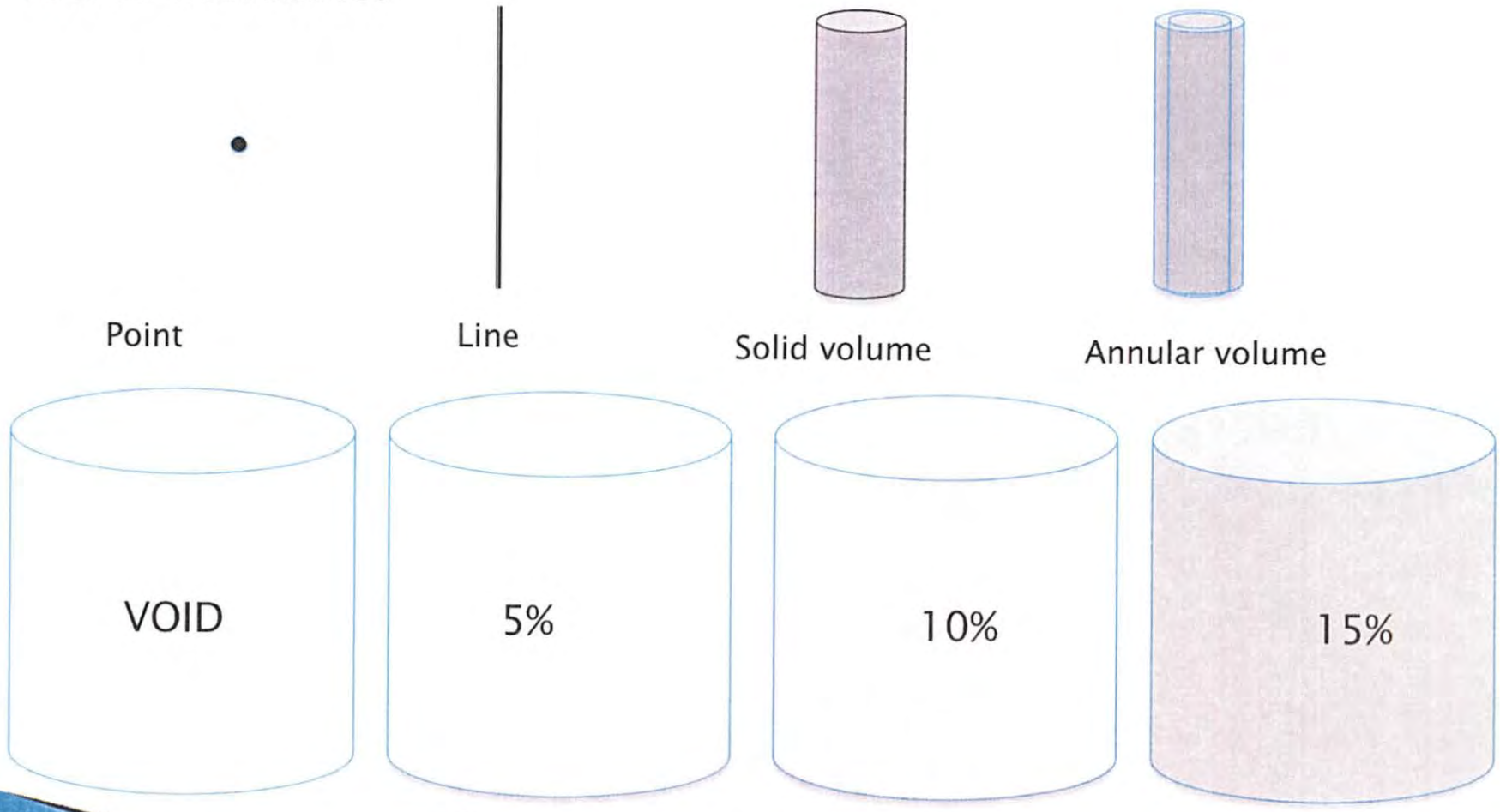
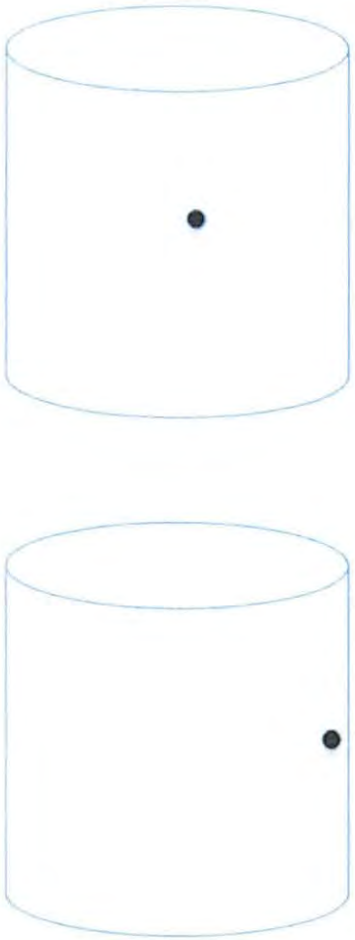
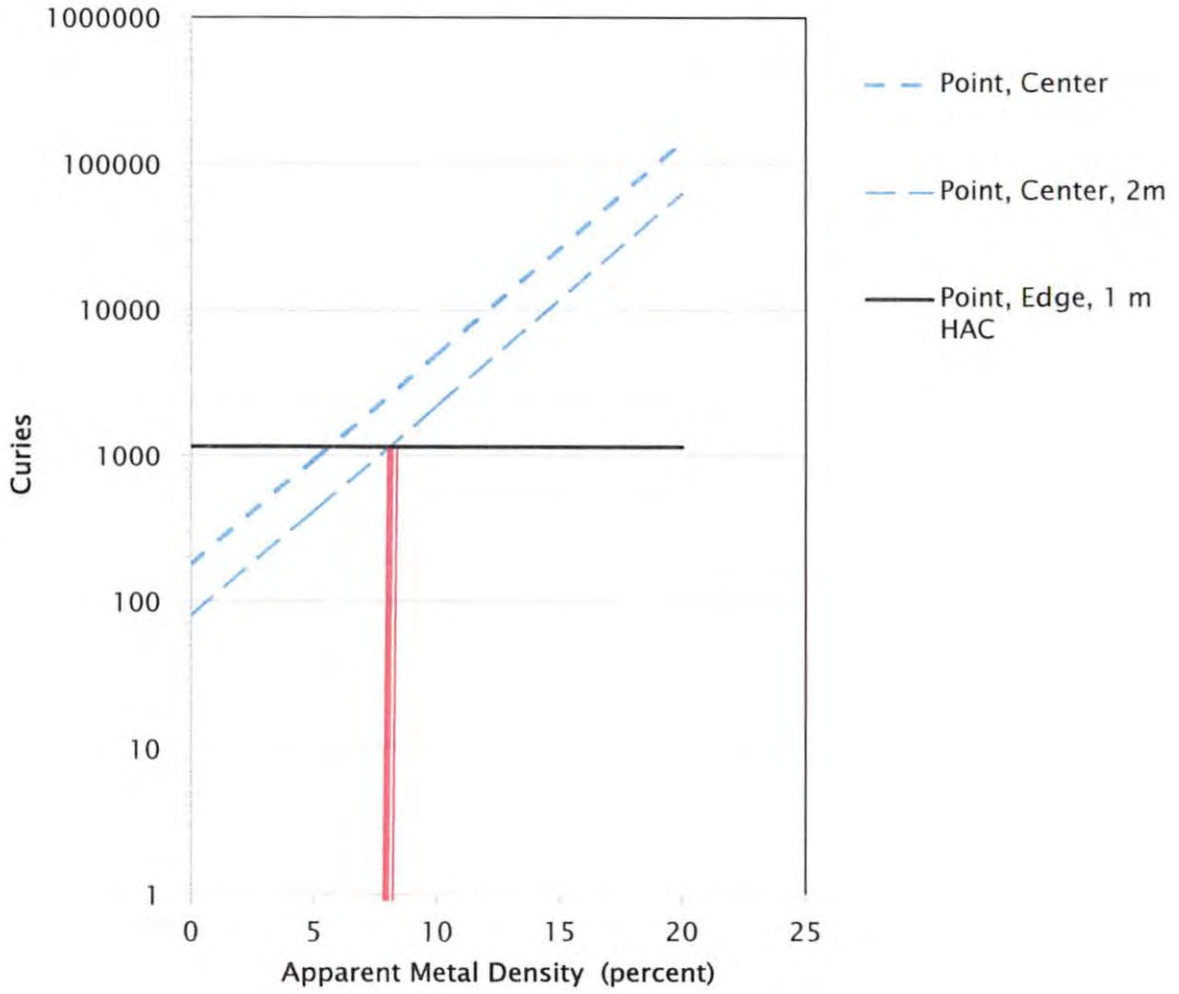
Source Geometries



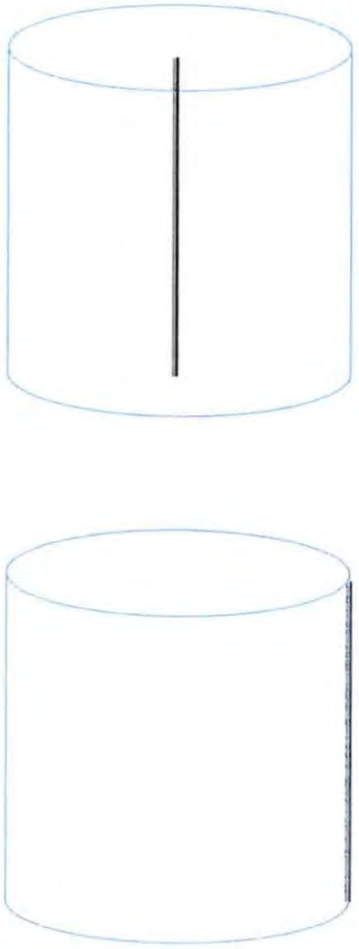
Contents - Apparent Density

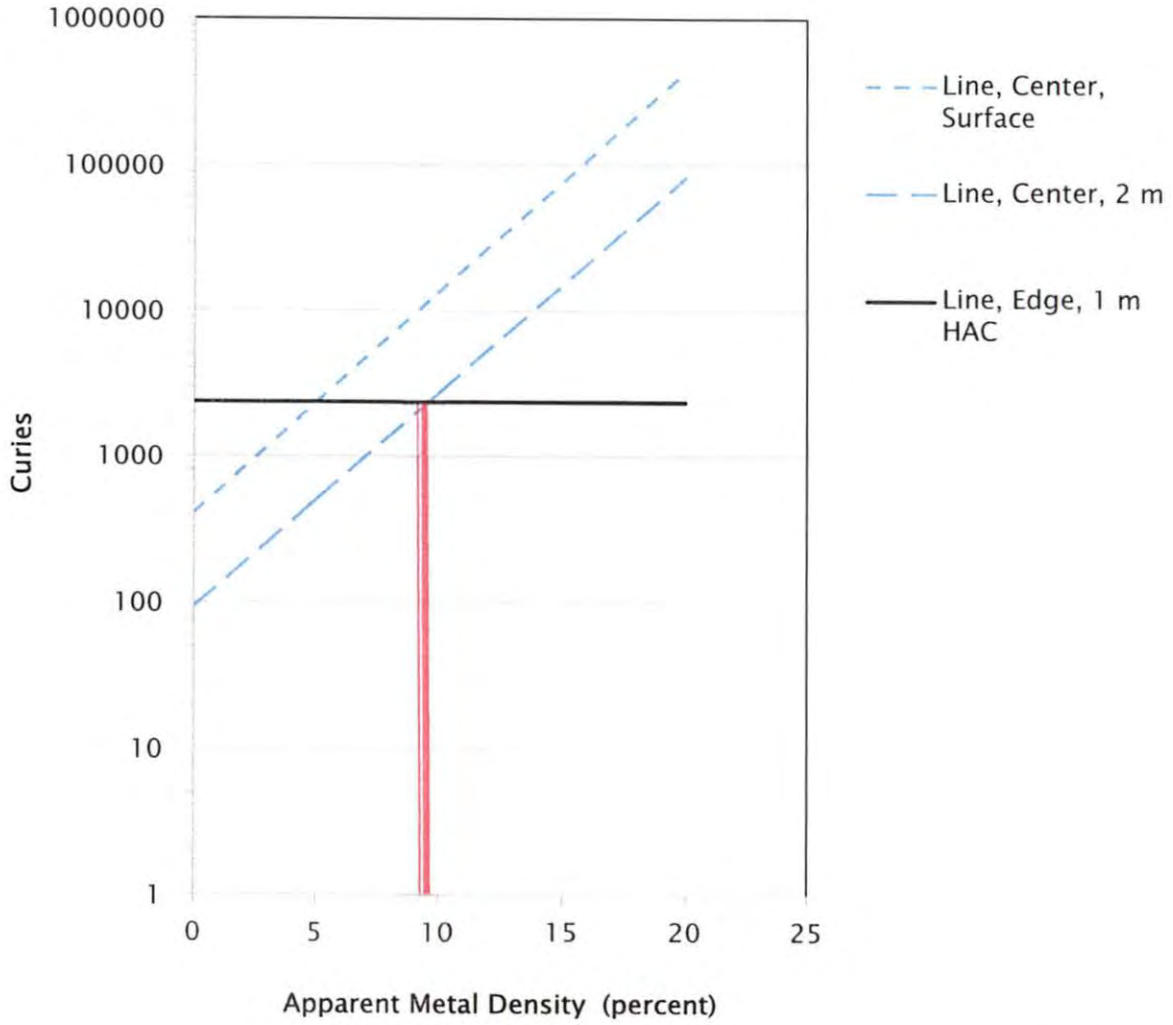
Point Source





Line Source




1000000
100000
10000
1000
100
10
1
Curies
0
5
10
15
20
25
Apparent Metal Density (percent)
Line, Center, Surface
Line, Center, 2 m
Line, Edge, 1 m HAC

Contents Summary

- Curie limit is sensitive to attenuation provided by the content material. and location of the source.
- Section 71.47 "Conditions normally incident to transportation " 2 m external radiation limit will set the assumptions for attenuation from the contents media material.
- Placing the total curie content at the edge of the cask results in too restrictive of a curie limit for "Conditions normally incident to transportation "
- Not representing the attenuation provided by the content material (steel) results in too restrictive a curie limit. At least an apparent density that is 10% of the actual steel density is credible and required to set a reasonable curie limit.
- HAC not need to consider attenuation by media.
- NCT does need to consider attenuation by media.
- A combination of source term types could be used to set a curie limit.

Shielding Evaluation – Issues

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1) Relationship between the dose rate and the particle type, energy, and location regardless of the medium the particle transverses.

2) Application of scaling factor that was applied to determining the limiting distributed source strength density for each of the radionuclides, instead doing a full parametric study and performing calculations at the optimum material composition and density.

3) Variance reduction techniques and longer run time to ensure the results pass MCNP statistical diagnostics.

4) Calculation of neutron source contribution to the overall external radiation levels.

Variance Reduction

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- Current analysis uses MCNP Weight Windows Generator (WWG)
- MCNP DXTRAN feature
- Use deterministic methods for WWG
- Use ring or point detectors instead of segmented surfaces

Application for Modification

Subpart D–Application for Package Approval
§71.31 Contents of application.
(a) An application for an approval under this part must include, for each proposed packaging design, the following information:
(b) Except as provided in §71.13, an application for modification of a package design, whether for modification of the packaging or authorized contents, must include sufficient information to demonstrate that the proposed design satisfies the package standards in effect at the time the application is filed.

Incorporate by reference in the existing Certificate of Compliance a calculation report that would be consolidated into the Safety Analysis Report.

March 11	Presentation of method for activated metal.
April 1	Pre-application for modification of contents to include activated metal
April 30	Submit application for activated metal
August 31	Revised CoC issued