



Department of Energy
Washington, DC 20585

SAFETY EVALUATION REPORT

**Revision 6, Certificate of Compliance USA/9516/B(U)F-85 (DOE)
Mound 1KW Package, Docket 99-16-9516**

Summary

Revision 6 upgrades the Certificate with the -85 designator. The -85 designator means that the package complies with the Federal regulations that became effective April 1, 1996, and which are based on the 1985 (Amended 1990) International Atomic Energy Agency (IAEA) Safety Standards, Safety Series 6 (SS 6). The Mound 1KW package was found to be in compliance with the 1985 (Amended 1990) IAEA SS 6 with Revision 0 of this Certificate issued in 1993, but there are small differences between the 1985 (Amended 1990) SS 6 and the April 1, 1996, Federal regulations. The Supplement to Revision 6B of the Safety Analysis Report for Packaging (SARP) demonstrates compliance with the 1996 Federal regulations.

The record of the staff finding of compliance with the 1996 Federal regulations is presented in tabular form on the following pages.

Part 71 1996	Part 71 1983	Change	Relevance to Mound 1KW
71.4	71.53	Natural or depleted uranium irradiated in a thermal reactor only is now defined not to be fissile material. Previously it was considered fissile exempt.	Not applicable to Mound 1KW package which carries heat source plutonium.
71.13	71.13	Provisions for previously approved packages have been updated to reflect revised rule implementation. Additional restrictions based on criticality now apply for addition of new contents to a previously approved package. Packages now need serial numbers.	Condition 5.d(13) requiring serial numbering of the Mound 1KW packages is added with Revision 6 of the Certificate.
71.18	71.18	Additional restrictions on special moderators have been included in general license provisions.	Moderation of graphite components in Mound 1KW package has been considered in criticality analysis from Revision 0 of the Certificate forward.
71.22	71.22	Additional restrictions on special moderators have been included in general license provisions.	Mound 1KW package is not shipped under general license provisions.
71.43(c)	71.43(c)	Containment standards have been modified to add a requirement that the positive fastening device cannot be opened by pressure that may arise within the package.	Mound 1KW welded containment vessels have no fastening device.
71.43(g)	71.43(g)	Allowed package surface temperature for exclusive-use shipments has been increased to 85°C (185°F) from 82°C (180°F).	Results in greater margin from surface temperature limit for Mound 1KW package.

Part 71 1996	Part 71 1983	Change	Relevance to Mound 1KW
71.47(a)	71.47(a)	Allowable radiation levels for shipments are now defined for external surface of package rather than for <u>accessible</u> external surface.	No change required; Mound 1KW is shipped exclusive use.
71.47(b)	71.47(b)	Allowable radiation levels for shipments are now defined for external surface of package rather than for <u>accessible</u> external surface.	No change required; radiation rate at external surface of Mound 1KW is less than 1000 mrem/hr.
71.51(a)(2)	71.51(a)(2)	Allowable release of Kr-85 under hypothetical accident conditions has been decreased from 10,000 Ci to 2700 Ci (10 A ₂)	Kr-85 is not present in Mound 1KW package.
71.53	71.53	Additional restrictions on fissile material exemptions have been included.	Mound 1KW package is not shipped under fissile material exemption.
71.55(b)(3)	71.55(b)(3)	Full reflection must now be applied to the containment system itself as well as to the package (whichever is more reactive).	Criticality analysis starting with Revision 0 of the Certificate considered full reflection from water inside the Mound 1KW cask against SCV.
71.59	71.57, 71.59, 71.61	Fissile Class designation has been replaced by a criticality transport index similar to that for previous Fissile Class II. Transport index now controls the number of packages allowed in one shipment and the method of transport (e.g., exclusive use) required.	The Supplement to Revision 6B of the SARP points out that the criticality analysis starting with Revision 0 of the Certificate has shown that infinite arrays of both damaged and undamaged Mound 1KW packages are below the subcritical limit on k _{eff} of 0.95 with required margins. Therefore under 71.59 the transport index is 0. The staff agrees with this position
71.61	N/A	Deep-water immersion design requirement has been added for spent fuel packagings with activity greater than 37 PBq.	Not applicable to Mound 1KW package because it does not carry spent fuel.

Part 71 1996	Part 71 1983	Change	Relevance to Mound 1KW
71.63	71.63	Vitrified glass has been exempted from double containment under certain conditions.	Not applicable to Mound 1KW package because it does not carry vitrified glass.
71.71(c)(7)	71.71(c)(7)	Requirement that free drop of Fissile Class II packages be preceded by corner drop has been removed.	Deleted test.
71.71(c)(8)	71.71(c)(8)	Requirement for corner drop of lightweight packages has been expanded to include fissile material packages.	Not applicable to Mound 1KW package because it exceeds the definition of lightweight, 50 kg.
71.73(c)(2)	N/A	Requirement for dynamic crush test has been added for certain lightweight, low-density packages with large quantities of radioactive material.	Dynamic crush test was performed on Mound 1KW package. There was no leakage. Crush test and criticality analysis done without the personnel cage in place around the cask. The Supplement to Revision 6B of the SARP claims that the Mound 1KW package passed the dynamic crush test. The staff agrees with this position
71.73(c)(4)	71.73(c)(3)	Requirements for fuel source geometry have been added. Actual convection during fire and insulation after fire must also be considered.	Temperature and time in the furnace test of Mound 1KW package exceeded the requirements of both the 1983 and 1996 regulations.
71.73(c)(5)	71.73(c)(4)	Time period for the 0.9-m immersion test of fissile packages has been eliminated.	Mound 1KW package is gas leaktight pre- and post-HAC. There is no water inleakage.
71.73(c)(6)	71.73(c)(5)	Time period for the 15-m immersion test of all packages has been eliminated.	Mound 1KW package is gas leaktight pre- and post-HAC. There is no water inleakage.
71.85(c)	71.85(c)	Requirement for serial numbers on packages has been added.	Condition 5.d(13) requiring serial numbering of the Mound 1KW packages is added with Revision 6 of the Certificate.

Part 71 1996	Part 71 1983	Change	Relevance to Mound 1KW
Appendix A (II), and Table A-2	Appendix A (I)(2), I(3), II(1)	Determination of A_1 or A_2 values for nuclides not listed in Table A-1 must now be approved by NRC unless general values from Table A-2 are used. Previous rule provided method to calculate A_1 and A_2 that did not require NRC approval, as well as other general values.	Table A-1 values used for Mound 1KW package.
Table A-1	Table A-1	Numerous A_1 and A_2 values have been changed to adopt IAEA values (in SI units). Total number of nuclides listed increased from 284 to 378. 144 A_1 values increased, 73 decreased. 129 A_2 values increased, 95 decreased.	The Supplement to Revision 6B of the SARP recognizes that the A_2 values for Pu have increased which reduces the number of A_2 in the Mound 1KW package but not enough to affect design requirements. Content limits are controlled by heat generation and number of Curies, not by A_2 s in package. The staff agrees with this position.

Conclusion

The staff agrees with the claim in the Supplement to Revision 6B of the SARP that the Mound 1KW package complies with the Federal regulations that became effective April 1, 1996. Therefore, upgrading the Certificate with the -85 designator is appropriate.



Michael E. Wangler, Director
Package Approval and Safety Program
Office of Site Operations, EM-70

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