10 CFR 71.95 REPORT EVALUATION FORM

Docket No.:	71-9338
Package Model No.:	3977A
Report Submitted By:	Ralph A. Butler, Missouri University Research Reactor
Report Date:	March 4, 2016
Report ADAMS Accession No.:	ML16067A118

Review the incoming report to determine if additional Commission or staff action is warranted. The review should consider whether the report identifies a generic defect or problem with the package design and the safety significance of the issue. Note that a high safety significance represents a potential for significant radiation exposure, medium safety significance represents a potential for some moderate radiation exposure, and low safety significance represents little or no potential for radiation exposure.

1. The report identifies:

__ Significant reduction in the effectiveness of a package during use;
__ Defect with a safety significance;
✓ Shipment in which conditions of the approval were not observed.

2. What is the safety significance? ___ High ___ Medium ✓ Low

3. Summary of the report:

In reviewing the use of the Safkeg-HS shipping cask for a new type of shipment, Missouri University Research Reactor (MURR) discovered an error in their methodology for loading the Safkeg-HS as it relates to shipment of Iridium-192 (Ir-192)/Iridium-194 (Ir-194). MURR typically employs a spreadsheet in comparing the nuclides being shipped, and their respective activities, against both Department of Transportation limits and limits associated with the specific Safkeg-HS design insert to be used. MURR determined that the spreadsheet value for Ir-194 associated with Safkeg-HS design insert No. 3982 reflected the value in the safety analysis report (SAR) rather than the value listed in certificate of compliance (CoC) 71-9338. The Ir-194 value in the SAR is 3.78 TBq while the Ir-194 value in the CoC is 2.05 TBq. Using the higher SAR value caused mixtures of nuclides to be shipped in which the sum of proportionate amounts of each nuclide, with respect to quantities shown in Section 5(b)(2)(i) Table 1, exceeded unity for 41 shipments between September 1, 2014 and December 29, 2015.

The basis for the Ir-194 content limit in the certificate of compliance is to insure the external package dose rates remain below the regulatory limits in Section 47 of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 71. Prior to each non-conforming shipment, two qualified technicians performed dose rate measurements. The highest dose rate, on contact with the package, associated with the non-conforming shipments was 48 mrem/hr. In addition, dose rate measurements were taken one meter from the package prior to each non-conforming shipment in order to determine the Transport Index. The highest dose rate one meter from the package was 1.8 mrem/hr which corresponds to a Transport Index of 1.8. Both the contact dose rates and the Transport Indexes determined by MURR for the non-conforming shipments were well below the regulatory limits specified in Section 47 of 10 CFR Part 71. MURR also verified that the heat load limits specified in the CoC were not exceeded. In addition, contamination surveys performed after the shipments were completed did not identify radioactive contamination indicating package integrity was maintained.

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4. Corrective actions taken by the licensee:

MURR performed an extent of condition review and contacted the CoC holder to discuss the issue. The spreadsheet was corrected and comprehensively reviewed to assure that all source data for each Safkeg-HS design insert was correct. Shipping personnel were trained on the functions and proper use of the revised spreadsheet. Also, review of this operating experience and the Nuclear Regulatory Commission's Safkeg-HS safety evaluation report was included as part of the shipping technician initial qualification process.

5. Staff comments:

Although the licensee did not reference the correct document in developing their loading methodology, the dose rate measurements performed by the licensee in accordance with 10 CFR 71.87(j) insured shipments did not pose a safety hazard to the public.

6. Staff conclusion:

_✓_ The report does NOT identify generic design or license/certificate issues that warrant additional Commission or staff action. This report is considered closed.

__ There is a need to take additional action. Provide a summary of the bases and recommended actions:

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R. Sun and A. McIntosh, Project Manager

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