

March 4, 2016

ATTN: Document Control Desk
Director, Division of Spent Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

REFERENCE: Docket 71-9338

University of Missouri-Columbia Research Reactor

Amended Facility License R-103

SUBJECT: Written report, in accordance with 10 CFR 71.1, as required by 10 CFR 71.95(b) regarding conditions in the Certificate of Compliance that were not met during shipment for the Safkeg – HS 3977A, USA/9338/B(U) – 96.

Dear Sir or Madam,

The University of Missouri Research Reactor (MURR) submits this letter to report a condition pursuant to 10 CFR 71.95(b) regarding the use of the Safkeg–HS 3977A, DOT Competent Authority USA/9338/B(U)–96, Revision 0, NRC Docket No. 71-9338.

The following is a description of the event, reported in accordance with 10 CFR 71.95(c):

(1) Brief abstract of the event

The conditions contained in the Certificate of Compliance (CoC) for the Safkeg–HS 3977A, DOT Competent Authority USA/9338/B(U)–96, were not met in their entirety for multiple shipments of irradiated solid metal Iridium-192/Iridium-194. Specifically, contrary to Section 5(b)(2) of the CoC, mixtures of nuclides were shipped where the sum of proportionate amounts of each nuclide with respect to quantities shown in Section 5(b)(2)(i) Table 1, exceeded unity. The cause was due to the Safety Analysis Report (SAR) content limits, which are less restrictive, being used in the unity calculation instead of the CoC limits. Immediate corrective actions were taken to ensure all future shipments from the date of identification were within the limits as specified in the CoC.

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(2) Narrative description of the event

For most radioactive shipments the MURR shipping group uses an Excel spreadsheet to assist them in comparing the nuclides present and their respective activities against DOT limits and the limits for a specific cask and insert. While reviewing the use of the HS cask for a new type of shipment an error in the spreadsheet was discovered. For iridium-194 packaged in the Insert Design Number 3982, the value in the spreadsheet reflected the limit indicated in the Safety Analysis Report rather than the limit indicated in section 5(b)(2)(i) of the CoC.

The respective limits are shown below:

	<u>Spreadsheet Value</u>	<u>SAR Value</u>	<u>CoC Limit</u>
Iridium-194	3.87E+1 TBq	3.87E+1 TBq	2.05E+00 TBq

The spreadsheet was revised to correct the limit for iridium-194 and was confirmed for use. The revised spreadsheet was first used on January 11, 2016, to prepare a routine iridium shipment containing 7.111 E+1 TBq of Ir-192, 1.574 TBq of Ir-194 and 8.668E-4 TBq of Na-24 packaged in the Safkeg-HS 3977A with the Insert Design #3982. While the quantities of each nuclide were within their respective cask limits, the spreadsheet indicated that the combination of the three exceeded unity, with a value of 1.193. The spreadsheet correctly indicated the shipment should be rejected. The shipment was delayed and an investigation of the issue was initiated.

A review of all iridium shipments using the HS cask was initiated and it was discovered that over the 16 months of use, 41 shipments exceeded unity. Between November 17, 2015 and December 29, 2015, six (6) HS casks were transported between Columbia, Missouri, USA and Petten, Netherlands. Between September 1, 2014 and December 29, 2015 thirty-five (35) HS casks were transported between Columbia, Missouri and Edgerly (Vinton) Louisiana, USA.

The cause of these events was that the spreadsheet used to confirm insert/cask acceptability for individual shipments contained incorrect source data. Upon implementation of the HS container, the spreadsheet was designed using the content limits found within the SAR, which were greater than those of the CoC for several isotopes. Because the source data was that of the SAR and not the CoC, the unity calculation result was incorrect in a non-conservative manner. This resulted in shipments that inadvertently exceeded the unity requirement of the Certificate of Compliance.

(3) Assessment of safety consequences of the event

The basis for the content limit of Ir-194 as described in the Safety Evaluation Report is to limit the external package surface dose rate to levels acceptable for transportation in non-exclusive use fashion. As no shipment exceeded the dose rate limits of 200 mrem/hr contact or 10 TI (the highest contact dose rate was 48 mrem/hr and the highest TI was 1.8) the intent of the content limits continued to be met on all shipments and there was no safety consequence. Surface dose rate and TI measurements are performed concurrently by two qualified technicians prior to each shipment.

Also, no shipments exceeded the cask decay heat load limit of 30 watts. The highest heat load for any shipment was less than 50 percent of the rated capacity at 12.56 watts. Furthermore, no radioactive contamination was identified during swipe testing performed by the package recipients post shipment indicating package integrity was maintained.

Although we believe there to be no safety consequences, we acknowledge the seriousness of this occurrence and the importance of preventing recurrence.

(4) Description of corrective actions

MURR has initiated a Corrective Action Program Report (CAP-16-0006) to track completion of the below corrective actions.

No.	Description	Status
1	An extent of condition review was initiated to determine what shipments were impacted by the errors found in the spreadsheet.	Complete
2	The Cask Certificate holder was contacted to discuss the issues identified.	Complete
3	The spreadsheet was revised to correct errors identified.	Complete
4	The spreadsheet was comprehensively reviewed to assure that all source data is correct for all cask and insert combinations.	Complete
5	Shipping personnel were trained on the proper use and functions of the revised spreadsheet.	Complete
6	This operating experience and a review of the cask NRC Safety Evaluation Report was added to the shipping technician initial qualification process.	Complete

(5) Reference to similar events

MURR is not aware of any similar events.

(6) Licensee contact

For further discussion of this incident, please contact:

Nathan Hogue
Reactor Health Physics Manager
573-882-5358 or hoguen@missouri.edu.

(7) Extent of exposure of individuals

There was no exposure to individuals as a result of this event nor was there any occurrence of loss or dispersal of radioactive material.

Sincerely,



Ralph A. Butler, P.E.
Executive Director

xc: Mr. Alexander Adams, U.S. NRC
Mr. Johnny Eads, U.S. NRC
Croft, Certificate Holder
Reactor Advisory Committee
Reactor Safety Subcommittee