



MIT NUCLEAR REACTOR LABORATORY

AN MIT INTERDEPARTMENTAL CENTER

David E. Moncton
Director

Mail Stop: NW12-208a
138 Albany Street
Cambridge, MA 02139

Phone: 617 253-8333
Fax: 617 253-7300
Email: dem@mit.edu

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

Subject: Response to Apparent Violation in NRC Investigation No. 1-2013-004;
EA-13-170

Reference: Letter from Mark Lombard, Director Division of Spent Fuel Storage and
Transportation, Office of Nuclear Material Safety and Safeguards to Dr. David E.
Moncton, Director, Massachusetts Institute of Technology, Nuclear Reactor
Laboratory, U.S. Nuclear Regulatory Commission Office of Investigations Report
No. 1-2013-004.

Dear Sir or Madam:

On January 31, 2014, the Massachusetts Institute of Technology ("MIT") Nuclear Reactor Laboratory ("NRL") received the referenced letter. By this letter, the U.S. Nuclear Regulatory Commission ("NRC") informed MIT NRL that based on an NRC investigation, an apparent violation of NRC regulations had been identified. NRC requested MIT NRL to contact Robert Temps, NRC Senior Safety Inspector, Rules, Inspections, & Operations Branch within 10 days of the date of the letter and notify him NRC whether MIT would attend a Predecisional Enforcement Conference ("PEC"), utilize Alternative Dispute Resolution, provide a written response, or accept the violation as characterized in the letter. MIT NRL informed Mr. Temps by the requested date that its choice was to submit a written response. On February 7, 2014, counsel for MIT NRL contacted Mr. Temps and requested permission for MIT NRL to provide its written response on February 28, 2014. On February 10, 2014, Mr. Temps notified counsel that the requested extension was approved.

The following constitutes MIT NRL's written response to the apparent violation in NRC Investigation No. 1-2013-004; EA-13-170. There are no new regulatory commitments contained in this response. Should you have any questions concerning this submittal, please contact the undersigned at (617)253-8333.

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I. The Reason for the Apparent Violation

A. Background

As noted in the referenced letter, the apparent violation occurred in connection with a December 2011 shipment of used fuel assemblies from the MIT NRL using the Battelle Energy Alliance (“BEA”) Research Reactor package, referred to as the BRR package. The BRR package is used to transport fuel elements that have been irradiated in various test and research reactors, including the MIT NRL. The BRR package has three openings: the entrance through which fuel is loaded and unloaded; a vent port, and a drain port. Butyl rubber o-rings are used to seal each opening. The loaded BRR package is tested for leakage prior to shipping to ensure the o-rings’ integrity.

On December 5, 2011, testing of the BRR package found unacceptable leakage from the drain port – a penetration at the lower end of the package through which water is drained. Further assessment found that the replacement o-ring sent with the BRR package was not the correct part. MIT postponed the shipment and attempted to procure the correct o-ring – Rainier NAS1523C10N – from various sources, including Rainier and the BRR package manufacturer and Certificate of Compliance (“CoC”) holder, Areva Federal Systems LLC (“AFS”). Rainier informed MIT that o-ring NAS1523C10N would not be available for some time. MIT identified and obtained Parker Hannifin o-rings having the correct dimensions and made from butyl rubber MIT believed to be equivalent to the Rainier rubber used in NAS1523C10N. Equivalency of the Parker Hannifin o-ring with the Rainier o-ring was assumed based on the Parker Hannifin o-ring having the same material specification (M4AA710 A13 B13 F17 F48 Z) as the Rainier rubber, and meeting most of the same testing specifications (*i.e.*, durometer, tensile strength and elongation, heat resistance, compression set, cold temperature resistance). However, the Parker Hannifin rubber did not undergo a TR10 cold temperature resilience test. The BRR package passed subsequent leak testing after installation of the Parker Hannifin o-ring. MIT informed AFS via email that it procured the Parker Hannifin replacement o-ring and provided AFS the portion of the BRR package Safety Analysis Report (“SAR”) that appeared to support the acceptability for using an equivalent o-ring. MIT shipped the BRR package on December 9, 2011 without incident.

After the BRR package had left the MIT NRL, AFS informed MIT that because the Parker Hannifin o-ring was not specified in the SAR, shipping the BRR package with that o-ring would be considered a violation. AFS also pointed out that the portion of the SAR MIT referenced to support use of an o-ring equivalent to Rainier was not a final SAR version. Accordingly, pursuant to the requirements of 10 CFR §71.95, MIT submitted written reports to the NRC notifying the NRC that the December 9, 2011 shipment was not in accordance with the BRR package Certificate of Compliance (“CoC”). Although not specified, the use of the Parker Hannifin o-ring was not consistent with CoC drawing 1910-01-01-SAR, Rev. 4, item 7, which requires the drain port seal to be Rainier Rubber R0405-70. The NRC staff reviewed the MIT’s §71.95 report and concluded that “the seals used in the shipment, while from a different manufacturer, are essentially identical to the seals that were specified on the drawings referenced in the certificate of compliance.”

B. Contributing Factors

MIT thereafter reviewed the event and identified a number of factors that contributed to the error.

- Spare / replacement o-rings of the correct size were not included with the BRR package shipped to MIT and replacements were not available from any source for a period of time. Shipping the wrong o-ring to MIT appears to have been due, at least in part, to the incorrect o-ring part number being specified on one of the BRR package drawings.
- MIT assumed incorrectly that substituting the Parker Hannifin o-ring for the Rainier o-ring to seal the BRR package drain port for the December 9, 2011 fuel shipment was not prohibited by Part 71. MIT understands that such a substitution effectively amounted to a design change to the BRR package, and a design change to an approved package can only be made by the CoC holder after NRC review and approval. MIT's assumption arose from a less than full understanding of and sensitivity to the limits placed on Part 71 general licensees, specifically a general licensee's authority under Part 71 is strictly limited to using the package only under the terms and of the approved CoC. Contributing to this lack of full understanding was the infrequency of fuel shipments from MIT NRL, and the first-time use of the BRR package. An additional factor underlying these causes was insufficient sensitivity to the nuclear safety culture traits of "Questioning Attitude," "Decision Making," and "Work Processes."
- MIT assumed incorrectly that the use of an o-ring which was technically equivalent to the Rainier o-ring was authorized by the BRR package SAR. MIT's conclusion was based on the following language contained in a draft version of the SAR, namely "[t]he butyl rubber compound used for the containment seals is fabricated from Rainier Rubber compound R0405-70 [25], or equivalent material meeting the requirements of ASTM D2000 M4AA710 A13 B13 F17 F48 Z Trace Element." The referenced statement, however, does not appear in the final SAR version. MIT's reliance on a draft version of the SAR resulted from less than effective document control processes. MIT also failed to give sufficient weight to information AFS provided during the time MIT was assessing how to remedy the receipt of the incorrectly sized o-ring, including AFS' views regarding o-ring specifications contained in the SAR and associated drawings, and equivalent o-ring material. An additional factor underlying these issues was insufficient sensitivity to the nuclear safety culture traits of "Questioning Attitude," "Decision Making," and "Work Processes" as noted above.

II. The Corrective Steps That Have Been Taken and the Results Achieved

The following steps have been taken to prevent the recurrence of this and similar events:

- In March of 2012, AFS revised the BRR package drawing(s) to identify the correct size and manufacturer o-ring used to seal the BRR package drain port.

- In February of 2013, MIT senior management established an expectation for MIT NRL management personnel to bring questions or concerns regarding NRC regulatory compliance to the MIT NRL's Compliance Officer for independent review
- MIT covered the areas of Nuclear Safety Culture and procedural compliance during the 2013 annual walkthrough examination given to each licensed operator and senior operator.
- In March of 2013, MIT revised procedure PM 3.3.4.1, "Fuel Shipping Supervisory Checklist." The procedure was revised to address, among other things, the control and availability of BRR package documents and replacement / spare parts.
 - The revised PM 3.3.4.1 now requires the supervisor responsible for fuel shipment activities to verify and document that the most current approved versions of the BRR package SAR and CoC and MIT shipping procedures are readily available and have been uploaded to the NRL master computer file for use by all personnel.
 - In addition, MIT has on file and readily available the most current approved versions of the BRR package SAR and CoC. Also on file and available are the most recent updates of the BRR Fabrication / Assembly Drawing #1910-01-100, 1 through 4.
 - The revised PM 3.3.4.1 also requires confirmation from the sender of the empty BRR package that a sufficient number of spare parts which meet the requirements of the SAR and CoC will be included with the package.
 - As an additional precaution, the MIT NRL currently has the following parts which are listed on BRR Package Assembly SAR Drawing #1910-01-01 Revision 4 date-stamped 11/23/2010 Sheet 1 of 4, and BRR Fabrication / Assembly Drawing #1910-01-100 Revision 2 dated 03/12/2012, Sheet 1 of 4:
 - sealing washer NAS1523C-10N -- two units
 - sealing washer NAS1523C-6N -- four units
 - O-ring butyl, 20.125 -- one unit
 - O-ring butyl, 17.88 -- one unit
- From June through September 2013, MIT NRL worked with the other BRR package stakeholders: AFS, the U.S. Department of Energy Idaho National Laboratory, and the University of Missouri Research Reactor Center, to review and update BRR package SAR Chapter 7.1, "Procedures for Loading the Package." Particular focus was on the steps to perform the BRR package pre-shipment drying and leak test activities.
 - On October 22, 2013, AFS submitted the revised SAR to the NRC for review and requested it be approved.

Finally, note that since the occurrence of the event that forms the basis for the NRC's issuance of the referenced apparent violation, one additional shipment has taken place in full compliance with the SAR.

III. The Corrective Steps That Will Be Taken

In addition to the steps already taken to prevent recurrence, the following actions will be taken:

- The individuals who perform the leak tests prior to BRR package shipments (who are contracted to DOE INL, the owner of the BRR package), have informed MIT that after the BRR package SAR revision is approved by the NRC, they will use the updated Chapter 7 as the step-by-step procedure for BRR package pre-shipment leak testing. This will ensure that such activities occur in strict conformance with the SAR.
- During the next used fuel shipment from the MIT NRL, MIT will monitor the activities of the DOE leak test technicians and assess their use of the updated leak testing procedure (*i.e.*, SAR Chapter 7). MIT will provide their observations to the technicians and INL.
- After the BRR package SAR revision is approved by the NRC, MIT NRL will issue PM 3.3.4.4, "BRR Cask Leak Test Procedure" to align with and refer to the leak testing steps listed in the revised SAR.
- To better equip NRL personnel to identify and prevent situations that could result in potential regulatory violations, MIT will provide training encompassing the following areas and will include a discussion of the events associated with the apparent violation:
 - NRC's Nuclear Safety Culture ("NSC") policy, with a particular focus on the following NSC traits:
 - Personal Accountability;
 - Questioning Attitude; and
 - Decision Making.
 - The MIT expectation for strict compliance with procedural and regulatory requirements; and
 - NRC's completeness and accuracy requirement and MIT expectations for implementation of this requirement.

IV. The Date When Full Compliance Will Be Achieved

MIT is presently in full compliance with the NRC regulations and its license conditions controlling the shipment of irradiated nuclear fuel from MIT NRL.

Please do not hesitate to contact me if you require further information.

Sincerely,



David E. Moncton