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July 17, 2003

US Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Docket No. 50-186
The Curators of the University of Missouri
License No. R-103

The attached document provides the Missouri University Research Reactor (MURR) Licensee Event Report (LER) for an airlock door malfunction that occurred on June 21, 2003, which resulted in a deviation from MURR Technical Specification 3.5.a. This report is submitted in accordance with Technical Specification 6.1.h (2).

Please contact Les Foyto, Interim Reactor Manager at 573-882-5276 if you have questions regarding this report.

Sincerely,

for R.A. Butler

Ralph A. Butler, P.E.
Interim Director

RAB:dcp

Enc.

DIANE PURCELL
Notary Public - State of Missouri
County of Boone
My Commission Expires Jan. 31, 2006

xc: Mr. Alexander Adams, Jr., US NRC
Mr. Craig Bassett, US NRC Region II
Dr. James S. Coleman, Vice Provost of Research, University of Missouri
Reactor Advisory Committee
Reactor Safety Subcommittee

IE22
A020

Licensee Event Report No. 03-02 – July 17, 2003
University of Missouri Research Reactor

Introduction

On June 21, 2003, with the reactor operating at 10 MW, the reactor containment building inner airlock door did not shut far enough during a closing cycle to ensure a satisfactory seal with its inflated gasket. This condition was immediately reported to the Lead Senior Reactor Operator (LSRO) who, upon investigation, instructed the console operator to place the rod control Master Control Switch in the "Off" position. This action immediately scrammed the reactor and placed the reactor in a secured condition. Failure of the personnel airlock door to provide an adequate seal resulted in a deviation from Technical Specification 3.5.a; one of two Limiting Conditions for Operation regarding containment integrity.

Technical Specification 3.5.a requires that containment integrity be maintained at all times except when the reactor is secured, and irradiated fuel with a decay time less than sixty days is not being handled. One of the requirements for reactor containment integrity to exist is that one of the two personnel airlock doors must be fully closed with its gasket inflated, thus providing a satisfactory seal. The reactor operated out of compliance with this Limiting Condition for Operation for less than one minute.

Description of Personnel Airlock Door System

The personnel airlock for the reactor containment building is part of the "Containment System" as described in Section 3.0 of the MURR Hazards Summary Report. The airlock consists of two electric-motor-driven horizontal sliding doors and an intervening vestibule. The inner door, designated as Door 276, and the outer door, designated as Door 277, allow the entrance of personnel from the laboratory building main corridor, through the airlock, to the second level of the containment building. The doors are constructed of steel and designed to withstand a 2.0 psig overpressure. Each door is suspended from an overhead rail by two adjustable one-ton trolleys. A 3-phase motor connected through a gear reducer to a chain drive assembly drives the door open and closed. A pad-type friction brake system, which is an integral part of the drive motor, functions to slow down the rate of travel of the door just prior to its full open or closed position. The motor brake can be adjusted by a setscrew that applies more or less tension between the brake pad and the motor rotor, thus helping to minimize the amount of mechanical shock absorbed by the drive system from over or under travel.

The airlock door control circuit is designed and interlocked to ensure that one door is always closed and sealed. The interlock consists of a relay logic circuit which detects door "closed" from a separate rotary limit switch assembly for each door, as well as seal inflation pressure for each door. When the door is in the fully closed position, the rotary

limit switch actuates an air supply valve, inflating a gasket mounted in the door facing, sealing the door. This logic circuit enables one door to open only if the other door indicates closed and sealed.

Additionally, the reactor containment building is maintained at a slightly negative pressure with respect to the surrounding laboratory building. This ensures that the direction of airflow is into the containment building should a leak develop in the building structure.

Event description

On Saturday, June 21, 2003, at 0244, an operator was exiting the reactor containment building through the personnel airlock. The operator depressed the outer airlock door "open" button, actuating the door control circuit, causing the inner airlock door to close behind him. The relay logic circuit, sensing that the inner door had closed, actuated the air supply valves, causing the inner door gasket to inflate and the outer door gasket to deflate, and signaled the outer door to open. After the outer airlock door had fully opened, the operator noticed that the inner door had not fully closed and was approximately 2-inches from the fully shut position. In addition, the sound of air flowing past the gasket seal could be heard. The operator immediately informed the LSRO of the condition and the reactor was shutdown and secured by 0245.

Upon investigation, it was determined that the inner airlock door had closed far enough to activate the relay logic circuit and cause the inner door gasket to inflate, but not far enough to ensure a satisfactory seal with the door's surface, thus resulting in a momentary loss of containment integrity. After some troubleshooting efforts, it was discovered that the inner door motor brake setting had changed, causing a greater amount of brake pad pressure, hence friction, on the motor rotor consequently preventing the door from reaching the fully shut position. Brake tension was loosened by turning the adjustment setscrew approximately $1/16^{th}$ of one turn in the counterclockwise direction. The door was then cycled five times to verify proper adjustment and operability.

Safety Analysis

The basis for Technical Specification 3.5.a is to ensure that the reactor containment building can be isolated at all times except when plant conditions are such that the probability of release of radioactivity is negligible. When the personnel airlock door system malfunctioned, resulting in a deviation from the Limiting Conditions for Operation, a reactor scram was immediately performed to make negligible the already low probability of release of radioactivity while operating the reactor.

We recognize that our Limiting Conditions for Operation for reactor containment integrity do not include Action requirements (similar to Specifications 3.0.2 and 3.0.3 of

power plant Standard Technical Specifications) that would allow the implementation of an Action requirement (in this case, a prompt shutdown) within a specified time interval as constituting compliance with the specification. Technically, the moment a failure occurs we are in non-compliance. Section 6 of American National Standards Institute/American Nuclear Society (ANSI/ANS) 15.1, "The Development of Technical Specifications for Research Reactors," recommends the submission of a special report (Licensee Event Report) for "operation in violation of limiting conditions for operation established in the technical specifications unless prompt remedial action is taken" (6.7.2(1)(c)(ii)).

MURR staff has submitted to the NRC a request for change to Technical Specification 3.5.a, which establishes a reasonable time period in which to take remedial actions and still meet compliance with the Technical Specifications. This change will alleviate the generation of a Licensee Event Report for conditions that do not represent a safety concern for the reactor or the general public.

Corrective Actions

When the Limiting Condition for Operation regarding containment integrity was not satisfied with respect to the personnel airlock doors (Technical Specification 3.4.a), the reactor was immediately scrammed and placed in the secured condition. This is the fastest way to restore Technical Specification compliance.

A locking nut was installed on the adjustment screw to help prevent any system vibration from changing the tension setting of the motor brake. The personnel airlock was placed back into service and considered operable at 0420, June 21, 2003. The reactor was refueled and returned to 10 MW operation with Reactor Manger's approval at 0826, June 21, 2003.

This event has been entered into the MURR Corrective Action Program as CAP 03-0048 and any additional improvements or corrective actions will be considered. This type of airlock door failure had never previously occurred at MURR. The implementation of a preventative maintenance procedure to periodically check the condition of the locking nut will be considered by the engineering staff. Additionally, an Engineering Firm that specializes in airlock door systems visited our facility earlier this year to perform an assessment of our airlock door system. We expect a report listing recommendations for improving the material condition of our system within the next month.

If additional information is desired please call me at 573-882-5276.

Les Foyto
Interim Reactor Manager
University of Missouri Research Reactor