

February 16, 2010

Colonel Patricia Lillis-Hearne, Director
Armed Forces Radiobiology
Research Institute
National Naval Medical Center
8901 Wisconsin Avenue
Bethesda, MD 20889-5603

SUBJECT: ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE - NRC ROUTINE,
ANNOUNCED INSPECTION REPORT NO. 50-170/2010-201

Dear Colonel Lillis-Hearne:

This letter refers to the inspection conducted on January 11-15, 2010, at the Armed Forces Radiobiology Research Institute Research Reactor Facility. The inspection included a review of activities authorized for your facility. The enclosed report presents the results of that inspection.

Areas examined during the inspection are identified in the report. Within these areas, the inspection consisted of selective examinations of procedures and representative records, interviews with personnel, and observations of activities in progress.

Based on the results of this inspection, the U. S. Nuclear Regulatory Commission (NRC) has determined that a Severity Level IV violation of NRC requirements occurred. This violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A of the Enforcement Policy. The NCV is described in the subject inspection report. If you contest the violation or significance of the NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to: the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington DC 20555-0001.

In accordance with Title 10 of the *Code of Federal Regulations* Section 2.390 "Public inspections, exemptions and requests for withholding" a copy of this letter, its enclosure, and your response (if any) will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (Agencywide Documents Access and Management System (ADAMS)). Adams is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

P. Lillis-Hearne

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Should you have any questions concerning this inspection, please contact Patrick J. Isaac, Inspector, at 301-415-1019.

Sincerely,

/RA By John J. Donohue Acting For/
Johnny H. Eads, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

Docket No. 50-170
License No. R-84

Enclosure: NRC Inspection Report No. 50-170/2010-201
cc w/encl: See next page

Armed Forces Radiobiology Research

Docket No. 50-170

cc:

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Test, Research, and Training
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U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION

Docket No: 50-170

License No: R-84

Report No: 50-170/2010-201

Licensee: Armed Forces Radiobiology Research Institute

Facility: AFRRRI Reactor Facility

Location: Bethesda, MD

Dates: January 11-15, 2010

Inspector: Patrick J. Isaac

Approved by: Johnny H. Eads, Chief
Research and Test Reactors Oversight Branch
Division of Policy and Rulemaking
Office of Nuclear Reactor Regulation

EXECUTIVE SUMMARY

Armed Forces Radiobiology Research Institute
AFRRI Research Reactor Facility
NRC Inspection Report No. 50-170/2010-201

The primary focus of this routine, announced inspection included the onsite review of selected aspects of the Armed Forces Radiobiology Research Institute (AFRRI, the licensee's) Class II research reactor facility safety programs including organization and staffing; operations logs and records; requalification training; surveillance and limiting conditions for operation; emergency planning; maintenance logs and records; fuel handling logs and records. The licensee's programs were acceptably directed toward the protection of public health and safety, and in compliance with NRC requirements.

Organization and Staffing

- The licensee's organization and staffing was in compliance with the requirements specified in the Technical Specifications (TS) Section 6.0.

Operations Logs and Records

- Operational activities were consistent with applicable TS and procedural requirements.

Requalification Training

- Operator requalification was up-to-date and was being performed as required by the AFRRI Reactor Operator Requalification Program.

Surveillance and Limiting Conditions for Operation

- The program for Surveillance and limiting condition for operation confirmation was implemented in accordance with TS Sections 3.0 and 4.0 requirements.

Emergency Planning

- The emergency preparedness program was conducted in accordance with the Emergency Plan.

Maintenance Logs and Records

- Maintenance activities ensured that equipment remained consistent with the Safety Analysis Report and TS requirements.

Fuel Handling Logs and Records

- Fuel handling and inspection activities were completed and documented as required by TS and facility procedures.

REPORT DETAILS

Summary of Facility Status

The Armed Forces Radiobiology Research Institute (AFRRI, the licensee's) one megawatt Training Research Isotope Production General Atomics (TRIGA) Mark II research reactor located on the campus of the National Naval Medical Center (NNMC) operated in support of the Institute's mission of research, experiments, education, reactor operator training and periodic equipment surveillance immediately prior to the inspection. During the inspection the reactor was maintained in a shutdown status as a precaution because of repair activities on the roof over the reactor bay.

1. Organization and Staffing

a. Inspection Scope (Inspection Procedures (IP) 69001

To verify that the licensee's organization and staffing were as stated in Section 6.1 of the AFRRI Technical Specifications (TS), Amendment No. 24 to License No. R-84, dated September 18, 2001, the inspector reviewed:

- Organizational structure
- Management responsibilities
- Staffing requirements for safe operation of the research reactor facility
- Reactor Logbook Number 130, November 02, 2007 to October 21, 2008
- Reactor Logbook Number 131, October 22, 2008 to May 7, 2009
- Reactor Logbook Number 132, May 8, 2009 to present

b. Observations and Findings

The structure and functions of the licensee's organization at the AFRRI facility had not functionally changed since the last U. S. Nuclear Regulatory Commission (NRC) inspection. The licensee's current organizational structure and assignment responsibilities were consistent with those specified in the TS Section 6.1. All positions reviewed were filled with qualified personnel. Review of records verified that management responsibilities were generally administered as required by TS Section 6.1.2 and applicable procedures. The inspector determined from the reactor console logbook that minimum staffing and on-call requirements were in compliance with TS Section 6.1.3.2, Operations.

c. Conclusions

The licensee's organization and staffing was in compliance with the requirements specified in the TS Section 6.0.

2. Operations Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed selected aspects of the following to verify compliance with TS Sections 2, 3, and 6 and applicable procedure requirements for operation:

- AFRRRI Malfunction Log, April 22, 2008 to present
- Reactor Logbook Number 130, November 02, 2007 to October 21, 2008
- Reactor Logbook Number 131, October 22, 2008 to May 7, 2009
- Reactor Logbook Number 132, May 8, 2009 to present
- AFRRRI Operational Procedure 8, Reactor Operations, Rev. dated May 1, 1998
- AFRRRI Operational Procedure 8, TAB D, K-Excess, January 16, 1992
- AFRRRI Operational Procedure 8, TAB E, Steady State Operations, November 24, 1997
- AFRRRI Operational Procedure 8, TAB H, Weekly Operational Instrument Checklist, AFRRRI Form 66 (R), November 22, 2006
- Weekly Operational Instrument Checklist, January 16, 2009 to January 8, 2010
- Daily Operational Startup Checklist, January 7, 2009 to December 28, 2009

b. Observations and Findings

The operating logs and records were well maintained and provided a clear indication of operational activities, changes in reactivity, and maintenance actions or malfunctions that had occurred. The logs and records indicated that shift staffing, including on-call personnel, was as required by TS 6.1.3.2. Logs and records also showed that operational conditions and parameters were consistent with license and TS requirements. Information on the operational status of the facility was recorded in log books and on checklists as required by procedure. Operational problems and events noted in the logs were reported, reviewed, and resolved as required. Operations logs and records also documented that shift staffing met the minimum requirements.

c. Conclusions

Operational activities were consistent with applicable TS and procedural requirements.

3. Requalification Training

a. Inspection Scope (IP 69001)

To verify that the licensee was complying with the requirements of the operator requalification program, the inspectors reviewed selected aspects of:

- Reactor Operator Requalification Program for the Armed Forces Radiobiology Research Institute TRIGA Reactor Facility, revised June 27, 2001
- Effective dates of current operator licenses
- Operator training records maintained on "Requalification Program Checklist" forms in individual folders for each operator
- Medical examination records for the past two years
- Operator Requalification Training Classes for 2008
- Operator Requalification Training Classes for 2009
- TS Training Class, November 6, 2008
- 2009 Requalification Written Examination administered December 15, 2009
- Periodic Supervisor Evaluation of Reactor Operator, December 31, 2009

b. Observations and Findings

There were four NRC licensed Senior Reactor Operators (SROs) on staff at the facility and one person in training. As of the date of the inspection, all the operators' licenses were current. A review of the logs and records showed that training was being conducted in accordance with the licensee's NRC-approved requalification and training program. Requalification program data such as attendance at training sessions and completion of examinations was documented as required. Records of quarterly reactor operations, reactivity manipulations, other operations activities, and Reactor Supervisor activities were being maintained. Records indicating the completion of the annual operations tests and supervisory observations were also maintained. Biennial written examinations were being completed and documented as required as well. The inspector also noted that operators were receiving the required biennial medical examinations.

c. Conclusions

Operator requalification was up-to-date and was being performed as required by the AFRRRI Reactor Operator Requalification Program.

4. Surveillance and Limiting Conditions for Operation

a. Inspection Scope (IP 69001)

To determine that surveillances and Limiting Conditions for Operations (LCOs) verifications were being completed as required by TS Sections 3.0 and 4.0, the inspector reviewed:

- AFRRRI Malfunction Log from April 22, 2008 to present
- Reactor Logbook Number 130, November 02, 2007 to October 21, 2008
- Reactor Logbook Number 131, October 22, 2008 to May 7, 2009
- Reactor Logbook Number 132, May 8, 2009 to present

- Licensee Event report dated September 3, 2008
- Daily Operational Startup Checklist, January 7, 2009 to December 28, 2009
- Weekly Operational Instrument checklist, January 16, 2009 to January 8, 2010
- Calibration Procedures for the AFRRRI Reactor Facility
- Maintenance Procedures for the AFRRRI Reactor Facility
- TRIGA Tracker Report
- Annual Maintenance Report for Year 2008, dated January 9, 2009
- Annual Maintenance Report for Year 2009, dated January 6, 2010
- AFRRRI Operational Procedure 8, Tab D, K-excess, January 16, 1992
- AFRRRI Operational Procedure 8, Tab B, Daily Operational Startup Checklist, November 22, 2006
- AFRRRI Operational Procedure 8, Tab B1 Daily Safety Checklist, November 22, 2006

b. Observations and Findings

(1) Surveillances

Daily, weekly, monthly, quarterly, semi-annual, and other periodic checks, tests, and verifications for TS required LCOs were being completed as required. The inspector verified that Fuel Temperature calibration was performed as required per T.S. 4.2.3b, Transient Rod Drive inspection was performed as required per T.S. 4.1d, and the Pu-Be Ion chamber was calibrated per the requirements of T.S. 3.2.1 and T.S. 4.2.3. All surveillance and LCO verifications reviewed were completed on schedule as required by TS 4.0, Surveillance Requirements, and in accordance with licensee procedures. A computer-based system, the TRIGA Tracker system, was used to track completion of the various required surveillance and LCO verifications. Checklists for surveillance activities were completed and filed to document the date those activities were completed and by whom. These checklists and associated forms provided acceptable documentation of the results and proper control of reactor operational tests and surveillance. The Annual Shutdown Maintenance Checklist documented all of the annual TS surveillance requirements.

(2) Licensee Reported TS Violation Concerning Operations Without the required Gas Stack Monitor

To operate the reactor, TS Section 3.5.1 requires that the Gas Stack Monitor (GSM) be operable, to sample and measure the gaseous effluent in the building exhaust. Due to a noisy pump, on July 23, 2008, the GSM was placed out of service unless required to perform reactor operations. A logbook entry was made to inform the operators of the condition and to warn them to place the GSM back in service prior to operating the reactor. The GSM is typically left on 24 hours per day, seven days per week, so

that turning it on prior to performing a reactor operation was an unusual requirement. Approximately one week later, on July 29, 2008, an operator, performing a K-excess measurement, failed to place the GSM back in service and, contradictory to the TS requirements, the reactor was operated for 4 minutes at a power of 5 watts. No releases were expected at such low power levels. The error was discovered by a routine review of the logbook on August 6, 2008, verified by the Reactor Facility director on August 7, 2008, and reported to the NRC on August 8, 2008.

The licensee determined that the root cause of this event was lack of attention to detail and provided remedial training to all licensed operators. In addition, to prevent a similar occurrence, the licensee installed a strobe light in the control room to alert the operator if the pump were to be turned off in the future, and the startup checklists were modified to verify that the strobe light is operational prior to daily operations. A review of the past 10 years did not reveal any similar events. On August 26, 2008, the pump and the motor for the GSM were replaced, annual calibration completed, and the system returned to normal full-time operation.

The inspector reviewed training records to verify that remedial training was administered to the operators as mentioned in the above paragraph. The inspector interviewed the operator involved in the event and verified an adequate understanding of the TS requirements for reactor operations. The inspector also reviewed maintenance and surveillance records to verify that the replacement pump was tested and able to perform its intended function.

The licensee was informed that this non-repetitive, licensee-identified and corrected violation is being treated as a Non-Cited Violation (NCV), consistent with Section VI.A.8 of the NRC Enforcement Policy (NCV 50-170/2010-201-01).

c. Conclusions

The program for Surveillance and LCO confirmation was implemented in accordance with TS Sections 3.0 and 4.0 requirements.

5. Emergency Preparedness

a. Inspection Scope (IP 69001)

The inspector reviewed the implementation of selected portions of the emergency preparedness program including:

- AFRRRI Emergency Drill conducted on March 27, 2009
- AFRRRI Emergency Drill conducted on December 3, 2009
- AFRRRI Reactor Facility Emergency Plan, December 2003
- AFRRRI Emergency Drill Final Report, December 3, 2009

- AFRRRI Emergency Drill Final Report, March 27, 2009
- AFRRRI Training Files for Emergency Command Post and Emergency Response Team Personnel
- Officer of the Day Annual training conducted December 30-31, 2009
- AFRRRI Security Guard Emergency Refresher Training conducted December 21 and 26, 2009
- AFRRRI Emergency Supplies
- AFRRRI Inter-Agency Support Agreement with National Naval Medical Center (NMMC), dated February 17, 2000

b. Observations and Findings

The inspector reviewed the Emergency Plan of record, implementing procedures for the plan, the reports of the two previous emergency drills, the status of recommended follow-up actions from the previous drill, reference documents for use in responding to emergency situations, the agreement document for services committed to AFRRRI by the NMMC in the event of an emergency, and training records for individuals assigned duties in the event of an emergency.

The inspector verified that inventories of emergency supplies were maintained per procedure and that radiation monitoring devices designated for emergency use were available, functional, and within their calibration period.

The inspector participated as an observer in the emergency drill conducted on December 3, 2009. Communication capabilities with emergency support groups were tested during the drill and were acceptable. The drill objectives were met and drill findings and remedial actions were discussed following the drill.

c. Conclusions

The emergency preparedness program was conducted in accordance with the Emergency Plan.

6. Maintenance Logs and Records

a. Inspection Scope (IP 69001)

To determine that maintenance was being completed as required by the TS and applicable procedures, the inspector reviewed:

- AFRRRI Malfunction Log from April 22, 2008 to present
- Reactor Logbook Number 130, November 02, 2007 to October 21, 2008
- Reactor Logbook Number 131, October 22, 2008 to May 7, 2009
- Reactor Logbook Number 132, May 8, 2009 to present
- Licensee Event report dated September 3, 2008
- Daily Operational Startup Checklist, January 7, 2009 to December 28, 2009

- Weekly Operational Instrument checklist, January 16, 2009 to January 8, 2010
- Maintenance Procedures for the AFRRRI Reactor Facility
- TRIGA Tracker Report
- Annual Maintenance Report for Year 2008, dated January 9, 2009
- Annual Maintenance Report for Year 2009, dated January 6, 2010

b. Observations and Findings

The inspector verified through records that annual, semi-annual, quarterly, and monthly requirements were performed on their respective frequency. In addition, the inspector verified that Fuel Temperature calibration was performed as required per T.S. 4.2.3b, Transient Rod Drive inspection was performed as required per T.S. 4.1d, and the Pu-Be Ion chamber was calibrated per the requirements of T.S. 3.2.1 and T.S. 4.2.3. Routine and preventive maintenance were well controlled and documented in the TRIGA Tracking system. Use of maintenance and malfunction logs satisfied procedural requirements. On March 16, 2009, a fuel element containing a failed thermocouple was replaced by a spare element. Calibration of the fuel temperature channel and power monitoring channels were verified before the reactor was returned to service. On August 7, 2009, the reactor was declared inoperable due to the malfunction of the Transient Rod anvil which could not be raised. Investigation revealed a short in the Transient Rod motor windings. Because the motor was no longer manufactured, the licensee completed a Title 10 of the *Code of Federal Regulations* Section 50.59 review and replaced the motor (AC) with a DC drive motor. The system was tested, calibrated, and returned to service.

c. Conclusions

Maintenance activities ensured that equipment remained consistent with the Safety Analysis Report and TS requirements.

7. Fuel Handling Logs and Records

a. Inspection Scope (IP 69001)

The inspector reviewed the following to verify compliance with TS Section 6.3.f, [Procedures] Reactor core loading and unloading:

- AFRRRI Fuel Element Record File
- Fuel Inventory Sheet
- AFRRRI Operational Procedure 7, Reactor Core Loading and Unloading, May 15, 1991
- Control Room Reactor Fuel Inventory Map
- Reactor Logbook Number 130, November 02, 2007 to October 21, 2008
- Reactor Logbook Number 131, October 22, 2008 to May 7, 2009
- Reactor Logbook Number 132, May 8, 2009 to present

b. Observations and Find

The inspector reviewed selected records for fuel movements conducted due to a failed fuel element thermocouple and for the periodic surveillance measurements and inspection of the reactor fuel. For a random sample of elements, the inspector verified that fuel moves and measurements were accurately recorded in each of the various records referenced above and that fuel locations were consistent with records. A written and properly approved procedure was used in the conduct of the fuel moves.

c. Conclusions

Fuel handling and inspection activities were completed and documented as required by TS and facility procedures.

8. Exit Interview

The inspector presented the inspection results to licensee management at the conclusion of the inspection on January 15, 2010. The inspector described the areas inspected and discussed in detail the inspection observations. No dissenting comments were received from the licensee. The licensee acknowledged the findings presented and did not identify as proprietary any of the material provided to or reviewed by the inspector during the inspection.

PARTIAL LIST OF PERSONS CONTACTED

Licensee

P. Lillis-Hearne, Colonel	Director, AFRRRI
C. Lissner	Deputy Scientific Director
S. Miller	Reactor Facility Director
H. Spence	Reactor Operations Supervisor
W. D. Tomlinson	Senior Reactor Operator

INSPECTION PROCEDURES USED

IP 69001 Class II Research and Test Reactors

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

50-170/2010-201-01 NCV Reactor Start-up with TS required Gas Stack Monitor not in service

Closed

None

Discussed

None

PARTIAL LIST OF ACRONYMS USED

ADAMS	Agencywide Document Access and Management System
AFRRRI	Armed Forces Radiobiology Research Institute
10 CFR	Title 10 of the <i>Code of Federal Regulations</i>
IP	Inspection Procedure
LCO	Limiting Condition for Operation
NRC	U. S. Nuclear Regulatory Commission
SRO	Senior Reactor Operator
TS	Technical Specifications
TRIGA	Training Research Isotope Production General Atomics