



**UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES**

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March 30, 2020


U.S. Nuclear Regulatory Commission  
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Sir:

Enclosed is the 2019 Annual Operating Report required by the technical specifications for the Armed Forces Radiobiology Research Institute reactor (license R-84, docket 50-170).

Should you need any further information, please contact me at (301) 295-9247.

Enclosure:  
As stated



WALTER D. TOMLINSON  
Reactor Facility Director

ADZD  
NRR

Armed Forces Radiobiology Research Institute  
AFRRI TRIGA Reactor Facility

1 January 2019 - 31 December 2019

To satisfy the requirements of  
U.S. Nuclear Regulatory Commission License No. R-84 (Docket No. 50-170),  
Technical Specification 6.6.a.

Prepared by  
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Reactor Staff

Submitted by  
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# 2019 ANNUAL REPORT

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# 2019 ANNUAL REPORT

## INTRODUCTION

The Armed Forces Radiobiology Research Institute (AFRRI) reactor facility was unavailable for normal operations the entire year undergoing installation, testing, and NRC acceptance of a new instrumentation and control system. The General Atomics contractors completed all installation work in May 2018 and the reactor remains unavailable pending NRC specialist review of a license amendment for the console upgrade. There were no unscheduled shutdowns during 2019.

The annual reactor audit required by the reactor technical specifications was conducted by Ms. Amber Johnson in December 2019. Ms. Johnson is an operator at the University of Maryland – College Park research reactor facility. During the audit she verbally indicated that she had not found any major discrepancies in reactor operations and those conclusions are reflected in her written report.

A comprehensive NRC inspection of reactor facility operations was conducted by Mr. Michael Takacs during February 2019. No violations were noted during that inspection. However, a follow-up inspection in April 2019 resulted in a Level IV violation concerning low-power testing performed during installation of the new console. As a result of that violation, the previous 10 CFR 50.59 analysis for the console upgrade was withdrawn and a license amendment is being developed for NRC approval to allow for return to reactor operation. An NRC assessment of the Safety Conscious Work Environment (SCWE) attribute of AFRRI's safety culture was conducted in August 2018. Recommendations resulting from that assessment and several follow-up NRC visits were implemented throughout the year and will continue into 2020. During the annual scheduled SNM inventory in October 2019, one fission chamber containing approximately 0.1 grams of U-235 could not be located in its normal storage location. This chamber was awaiting disposal and had not been used in the core in many years. The NRC Operations Center was immediately notified on October 24 and a written report was submitted as required soon thereafter. A comprehensive search and radiological survey of the entire AFRRI building was undertaken to hopefully locate the chamber. All reactor staff members and other personnel with reactor area access since the 2018 inventory were interviewed. A reactive NRC inspection concerning this incident was conducted in November with any potential violation delayed pending completion of attempts to locate the item in January 2020.

There were two RRFSS membership changes during the year. There was one reactor staff arrival and no staff departures during the year.

The remainder of this report is written in the format designated in the Technical Specifications for the AFRRI TRIGA Reactor Facility. Items not specifically required are presented in the General Information section. The following sections correspond to the required items listed in Section 6.6.a. of the Technical Specifications.

## GENERAL INFORMATION

All personnel held the listed positions throughout the year unless otherwise specified.

Key AFRRRI personnel (as of 31 December 2019) are as follows:

1. AFRRRI Director – Danielle Wooten, CAPT, USN (effective 13 December)

Radiation Sciences Department (RSD) Chairman – Joshua A. Molgaard, MAJ, USA

Radiation Safety Officer – Jeffrey Divis, LT, USN (effective 24 June)

2. Reactor Facility Director (RFD) – Walter D. Tomlinson (SRO)

NOTE: Mr. Tomlinson was appointed acting RFD on August 31, 2018 on the departure of Mr. Stephen Miller. He became official RFD on September 5, 2019 following NRC approval of a Technical Specification change to the position qualifications.

3. Reactor operations personnel:

Reactor Operations Supervisor – Walter D. Tomlinson (SRO)

Training Coordinator – Harry H. Spence (effective 24 June)

Maintenance Specialist - Walter D. Tomlinson (SRO)

Records Administration Specialist - Harry H. Spence

NOTE: Mr. Spence formerly held an SRO license at the AFRRRI reactor and retired in June 2013. He returned as an unlicensed part-time staff member in February 2016.

4. Other Reactor Operators:

None

5. Operator candidates:

Sacha T. Moore, SFC, USA

Joshua A. Molgaard, MAJ, USA

Jeffrey A. Divis, LT, USN

Benjamin Knibbe, SFC, USA (effective 15 October)

6. Newly licensed operators:

None

7. Additions to staff during 2019:

Benjamin Knibbe, SFC, USA (effective 15 October)

8. Departures during 2019: None

9. There were two change to the Reactor and Radiation Facilities Safety Committee (RRFSC) during 2019. CAPT Danielle Wooten replaced CDR Gerald Burke as Chairperson on 24 June and LT Jeffrey Divis replaced Daniel Shaw as Radiation Safety Officer also on 24 June.

In accordance with the requirements set forth in Section 6.2.1.1. of the Technical Specifications for the AFRRI TRIGA Reactor Facility, the RRFSC consisted of the following members as of 31 December 2019.

Regular members are:

Radiation Safety Officer: - LT Jeffrey Divis, USN

Reactor Facility Director – Walter D. Tomlinson

Reactor Operations Specialist – Leo Bobek

Health Physics Specialist - Joe Pawlovich

Radiation Sciences Department Chairman – MAJ Joshua Molgaard, USA

RRFSC Chairperson and Director's Representative – CAPT Danielle Wooten, USN

Recorder - Harry H. Spence

Two meetings were held in 2019:

14 May

22 October

## SECTION I

### **Changes in the Facility Design, Performance Characteristics, Administrative Procedures, Operational Procedures, Results of Surveillance Tests and Inspections**

A summary of changes to the facility design, performance characteristics, administrative procedures, and operational procedures as well as the results of surveillance testing are provided in this section.

#### A. DESIGN CHANGES

There were no design changes to the reactor facility during 2019 that were reviewed and approved under provisions of 10 CFR 50.59. The NRC subject-matter-expert review of the license amendment for the console upgrade remains pending.

#### B. PERFORMANCE CHARACTERISTICS

There were no changes to the performance characteristics of the core during 2019. Sufficient fuel elements have been withdrawn from the core to ensure that the reactor cannot become critical during the upgrade pending approval of the Technical Specification changes.

#### C. ADMINISTRATIVE PROCEDURES

There were no changes to the Administrative Procedures during 2019.

#### D. OPERATIONAL PROCEDURES

There was one change to the Operational Procedures during 2019:

28 March – The Startup Operational Checklist was revised to conform to processes/nomenclature of the new reactor console. All Technical Specification required checks and tests are maintained in the new version.

#### E. RESULTS OF SURVEILLANCE TESTS AND INSPECTIONS

All maintenance and surveillance tasks during 2019 were accomplished as normally scheduled during the year except those tasks involving the reactor instrumentation, control rod drives, or other related components. All tasks deferred during the instrumentation upgrade will be accomplished before the reactor is returned to normal operation.

There were no reactor malfunctions during 2019.

The 2019 annual reactor audit required by the reactor technical specifications was conducted by Ms. Amber Johnson in December 2019. Ms. Johnson is an operator at the University of Maryland – College Park research reactor facility. During the audit she verbally indicated that she

had not found any major discrepancies in reactor operations and those conclusions are reflected in her written report.

A comprehensive NRC inspection of reactor facility operations was conducted by Mr. Michael Takacs during February 2019. No violations were noted during that inspection. However, a follow-up inspection in April 2019 resulted in a Level IV violation concerning low-power testing performed during installation of the new console. As a result of that violation, the previous 10 CFR 50.59 analysis for the console upgrade was withdrawn and a license amendment is being developed for NRC approval to allow for return to reactor operation. An NRC assessment of the Safety Conscious Work Environment (SCWE) attribute of AFRRI's safety culture was conducted in August 2018. Recommendations resulting from that assessment and several follow-up NRC visits were implemented throughout the year and will continue into 2020. During the annual scheduled SNM inventory in October 2019, one fission chamber containing approximately 0.1 grams of U-235 could not be located in its normal storage location. This chamber was awaiting disposal and had not been used in the core in many years. The NRC Operations Center was immediately notified on October 24 and a written report was submitted as required soon thereafter. A comprehensive search and radiological survey of the entire AFRRI building was undertaken to hopefully locate the chamber. All reactor staff members and other personnel with reactor area access since the 2018 inventory were interviewed. A reactive NRC inspection concerning this incident was conducted in November with any potential violation delayed pending completion of attempts to locate the item in January 2020.



## SECTION II

### Energy Generated by the Reactor Core and the Number of Pulses \$2.00 or Larger

Month	Kilowatt Hours
JAN	0.0
FEB	0.0
MAR	0.0
APR	0.0
MAY	0.0
JUN	0.0
JUL	0.0
AUG	0.0
SEP	0.0
OCT	0.0
NOV	0.0
DEC	<u>0.0</u>
TOTAL	0.0

Total energy generated in 2019: 0.0 kWh

Total energy on fuel elements: 1,158,846.7 kWh

Total energy on FFCRs\*: 426,049.0 kWh

Total pulses this year  $\geq$  \$2.00: 0

Total pulses on fuel elements  $\geq$  \$2.00: 4,219

Total pulses on FFCRs\*  $\geq$  \$2.00: 107

Total pulses this year: 0

Total pulses on fuel elements: 12,201

Total pulses on FFCRs\*: 2,436

\*Fuel-followed control rods

## SECTION III

### **Unscheduled Shutdowns**

There were no unscheduled shutdowns during 2019.

## SECTION IV

### **Safety-Related Corrective Maintenance**

There were no reactor malfunctions or other safety-related corrective maintenance during 2019.

## SECTION V

### **Facility and Procedure Changes as Described in the Final Safety Analysis Report (FSAR), New Experiments or Tests Performed During the Year**

#### A. FACILITY CHANGES AS DESCRIBED IN THE FSAR

There were no changes to the facility as described in the FSAR.

#### B. PROCEDURE CHANGES AS DESCRIBED IN THE FSAR

There were no changes to procedures as described in the FSAR.

#### C. NEW EXPERIMENTS OR TESTS

No new experiments or tests were performed during the reporting period that were not encompassed by the FSAR.

There was one safety evaluation for changes not submitted to the NRC, pursuant to the provisions of 10 CFR 50.59 (see Section I.D. above).

## SECTION VI

### Summary of Radioactive Effluent Released

A. Liquid Waste: The reactor produced no liquid waste during 2019.

B. Gaseous Waste: There were no particulate discharges in 2019.

The total activity of Argon-41 discharged in 2019 was 0.00 curies. The estimated effluent concentration from the release of Argon-41 represents 0.0% of the constraint limit for unrestricted areas (10 CFR 20.1101(d) and Table 2, Appendix B, 10 CFR 20).

Quarterly:	Jan - Mar 2019	0.00 Ci
	Apr - Jun 2019	0.00 Ci
	Jul - Sep 2019	0.00 Ci
	Oct - Dec 2019	0.00 Ci

C. Solid Waste: All solid radioactive waste material is transferred to the AFRRI byproduct license; none was disposed of under the R-84 reactor license.

## SECTION VII

### Environmental Radiological Surveys

All environmental sampling of soil and vegetation yielded radionuclide levels within the background range. The radionuclides that were detected were those expected from natural background and from long-term fallout from nuclear weapons testing.

The calculated annual dose, due to Argon-41 release to the environment for 2019, was 0.00 mRem at the location of maximum public exposure. The maximum exposure is calculated at a location 91 meters from the release point as described in the FSAR. Exposure to the general population at the boundary of the Naval Support Activity Bethesda is significantly less due to the diffusion of Argon-41 in the atmosphere. The constraint limit for exposure to the public established under 10 CFR 20.1101(d) is 10 millirem per year. The exposure dose was calculated using COMPLY code, level 2, which is the most conservative level of COMPLY. Emissions due to reactor operations were 0.00 millirem, or 0.0% of the 10 millirem constraint limit, for the entire year.

The reactor in-plant surveys, specified in Health Physics Procedure (HPP) 3-2, all resulted in readings that were less than the action levels specified in HPP 0-2.

## SECTION VIII

### **Exposures Greater than 25% of 10 CFR 20 Limits**

There were no doses to reactor staff personnel or reactor visitors greater than 25% of 10 CFR 20 occupational and public radiation dose limits.