

AEROTEST OPERATIONS, INC.

DOCKET NO. 50-228

AEROTEST RADIOGRAPHY AND RESEARCH REACTOR (ARRR)

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 5  
License No. R-98

1. The Nuclear Regulatory Commission (NRC or the Commission), having previously made the findings set forth in Amended Facility Operating License No. R-98 issued on January 28, 1981, has now found that:
  - A. The application for indirect transfer of license and conforming amendments to Amended Facility Operating License No. R-98, filed by Aerotest Operations, Inc., and Nuclear Labyrinth, LLC, dated May 30, 2012, and supplemented on July 19 and October 15, 2012; January 10, 2013; and April 21, June 16, August 22, and October 10, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954 (the Act), as amended, and the rules and regulations of the Commission as stated in Title 10, Chapter I, "Nuclear Regulatory Commission," of the *Code of Federal Regulations* (10 CFR Chapter I).
  - B. Construction of the facility has been substantially completed in conformity with Construction Permit No. CPRR-86, and the application, as amended, the provisions of the Act and the rules and regulations of the Commission;
  - C. The facility will operate in conformity with the application, as amended, the provisions of the Act, and the rules and regulations of the Commission;
  - D. There is reasonable assurance: (i) that the activities authorized by this operating license can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the rules and regulations of the Commission;
  - E. Aerotest Operations, Inc. is technically and financially qualified to possess, use, and operate the facility in accordance with the rules and regulations of the Commission;

Amendment No. 5

- F. The issuance of this operating license will not be inimical to the common defense and security or to the health and safety of the public, and does not involve a significant hazards consideration;
  - G. The receipt, possession, and use of byproduct and special nuclear material as authorized by this license will be in accordance with the Commission's regulations in 10 CFR Parts 30 and 70, including Sections 30.33, 70.23, and 70.31;
  - H. The licensee is qualified to be the holder of the license; and
  - I. The transfer of the license is otherwise consistent with applicable provisions of law, regulations, and orders by the Commission pursuant thereto.
2. Facility Operating License No. R-98, issued to Aerotest Operations, Inc., is hereby indirectly transferred to Nuclear Labyrinth, LLC, and the license is amended to read as follows:
- A. This license applies to the Aerotest Radiography and Research Reactor (ARRR), a pool-type nuclear reactor owned by Aerotest Operations, Inc. The facility is located at the Aerotest Operations site near San Ramon, California, and is described in the application dated September 14, 1964 (the application), and in supplements thereto, including the application for transfer of license dated April 24, 1974, and the application for indirect transfer dated May 30, 2012.
  - B. Subject to the conditions and requirements incorporated herein, the Commission hereby licenses Aerotest Operations, Inc.:
    - (1) Pursuant to Section 104c of the Act and 10 CFR Part 50, "Licensing of Production and Utilization Facilities," to possess the reactor at the designated location in San Ramon, California, in accordance with the procedures and limitations set forth in this license;
    - (2) Pursuant to the Act and 10 CFR Part 70, "Special Nuclear Material," to possess (1) up to 5.0 kilograms of contained uranium-235, (2) such special nuclear material as may have been produced by previous operation of the reactor, and (3) such special nuclear material (in TRIGA fuel elements) produced by operation of other reactors as may have been previously transferred to Facility Operating License No. R-98 prior to December 6, 2018, provided actions involving special nuclear material are limited to those related to fuel storage and decommissioning; and
    - (3) Pursuant to the Act and 10 CFR Part 30, "Licensing of Byproduct Material," (1) to possess a 2 curie americium-beryllium neutron startup source, (2) to possess, but not separate, such byproduct material as may have been produced by previous operation of the reactor, and (3) to possess, but not separate, such byproduct material (in TRIGA fuel elements) produced by operation of other reactors as may have been previously transferred to Facility Operating License No. R-98 prior to December 6, 2018, provided actions involving byproduct material are limited to those related to fuel storage and decommissioning.

C. This license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is not authorized to operate the facility at any power.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 6, are hereby incorporated in the license. The licensee shall maintain the facility in accordance with the Technical Specifications.

(3) Physical Security Plan

The licensee shall maintain in effect and fully implement all provisions of the NRC-approved physical security plan, including amendments and changes made pursuant to the authority of 10 CFR Section 50.54(p). The approved security plan consists of the document withheld from public disclosure pursuant to 10 CFR 73.21, entitled "Security Plan for ARRR," dated September 28, 2020.

(4) Certified Fuel Handler Training and Requalification Program

Whenever the licensee possesses TRIGA fuel elements pursuant to License Condition 2.B.(2), the licensee shall maintain in effect and fully implement all provisions of the NRC-approved Certified Fuel Handler Training and Requalification Program, including changes made to the program without NRC approval as permitted by the program. The approved program consists of the document entitled "ARRR CFH Training/Requalification Program," dated March 30, 2021. Certified Fuel Handlers qualified in accordance with the program may approve licensee action permitted by 10 CFR 50.54(x).

D. Reports

In addition to reports otherwise required under the license and applicable regulations:

- (1) The licensee shall report in writing to the Commission within 10 days of its observed occurrence any incident or condition relating to the operation of the facility which prevented or could have prevented a nuclear system from performing its safety function as described in the Technical Specifications or in the Hazards Summary Report.
- (2) The licensee shall report to the Commission in writing within 30 days of its observed occurrence any substantial variance disclosed by operation of the facility from performance specifications contained in the Hazards Summary Report or the Technical Specifications.
- (3) The licensee shall report to the Commission in writing within 30 days of its occurrence any significant change in transient or accident analysis, as described in the Hazards Summary Report.

E. Records

In addition to those otherwise required under this license and applicable regulations, the licensee shall keep the following:

- (1) Reactor operating records, including power levels.
- (2) Records of in-pile irradiations.
- (3) Records showing radioactivity released or discharged into the air or water beyond the effective control of the licensee as measured at the point of such release or discharge.
- (4) Records of emergency reactor scrams, including reasons for emergency shutdowns.

- F. This amended license is effective as of the date of issuance and until the Commission notifies the licensee in writing that the license is terminated.

FOR THE ATOMIC ENERGY COMMISSION

*R/A*

Karl R. Goller, Assistant Director  
for Operating Reactors  
Directorate of Licensing

Attachment:  
Change No. 8 to the Technical  
Specifications

Date of Issuance: October 22, 1974

APPENDIX A

LICENSE NO. R-98

TECHNICAL SPECIFICATIONS FOR THE

AEROTEST RADIOGRAPHY AND RESEARCH REACTOR (ARRR)

1.0 Definitions

1.1 Permanent Shutdown

The reactor is permanently shut down when the reactor is maintained in permanent shut down configuration.

1.2 Permanent Shutdown Configuration

Core lattice containing no fuel or reflector elements and control rods disabled fully inserted.

1.3 Operable

A system or component shall be considered operable when it is capable of performing its required function in its normal manner.

1.4 Operating

A component or system is operating if it is performing its required function in its normal manner.

1.5 Experiment

Experiment shall mean any apparatus, device, or material installed in the core or experimental facilities (except for underwater lights, fuel storage racks and the like) which is not a normal part of these facilities.

1.6 Experimental Facilities

Experimental facilities shall mean Glory Hole, vertical tubes, pneumatic transfer systems, central thimble, beam tubes, thermal column, and in-pool irradiation facilities.

1.7 Reactor Safety Circuits

Reactor safety circuits shall mean those circuits, including their associated input circuits, which are designed to initiate a reactor scram.

1.8 Core Lattice

The array of machined positions for fuel or reflector elements in the grid plates.

1.9 Core Structure

The upper and lower grid plates connected by structural members.

2.0 Reactor Site

2.1 The reactor and associated equipment is located within an exclusion area.

2.2 A steel, locked perimeter fence shall surround the ARRR facility, forming an exclusion area. The minimum distance from the center of the reactor pool to the boundary of the exclusion area fencing shall be 50 feet. The restricted area, as defined in 10 CFR 20, shall consist of the entire exclusion area.

3.0 Reactor Building

3.1 The reactor shall be housed in a steel building capable of meeting the following functional requirements:

3.1.1 All circulating fans and air conditioning systems except the system which supplies air to the control room shall have the capability to be shut off from a single control in the control room,

3.1.2 Ventilation shall be achieved by gravity ventilators located on the roof of the building, and

3.1.3 A positive air pressure shall be maintained in the control room with respect to the reactor room.

4.0 Reactor Pool (Primary System)

4.1 The minimum depth of water above the top of the core structure shall be 16 ft. The maximum bulk water temperature shall be 130°F and the minimum 40°F.

4.2 The conductivity of the primary coolant shall be measured at least once quarterly. Corrective action shall be taken to avoid exceeding a conductivity of 5 µmho/cm.

## 5.0 Reactor Core

### 5.1 Fuel Elements

No fuel elements shall be allowed in the core lattice.

### 5.2 Reflector Elements

No reflector elements shall be allowed in core lattice.

### 5.3 Control Elements

Control elements shall be disabled and fully inserted in core lattice.

## 6.0 Storage Safety Systems

Safety systems instruments that are related to the safe and secure storage of the irradiated fuel shall be operable when relevant if the irradiated fuel is present in the facility. Those safety system instruments are noted by an asterisk (\*) in Table 1. A service period not to exceed thirty days shall be allowed to facilitate any required repairs, replacements, maintenance, and/or calibration to any of the instruments listed in Table 1.

## 7.0 Radiation Monitoring

- 7.1 A fixed gamma monitor employing Geiger tube detectors shall be located on the wall connecting the control room and the reactor room. This monitor shall serve as an area radiation monitor and will annunciate through an automatic monitoring system to the San Ramon, California, Fire Department and actuate a siren within the reactor building on high radiation level. The monitor shall have a minimum range of 0 to 20 mr/hr. The annunciation and the siren actuation shall be tested monthly.
- 7.2 A gas sample shall be continuously withdrawn from above the reactor and below the pool cover in the vicinity of the reactor bridge. The gas-effluent shall be monitored by a beta-gamma detector which shall have a continuous readout in the control room. An annunciator shall indicate when the gas exceeds 2 mr/hr.
- 7.3 A water radioactivity monitor shall be attached to the process water cleanup system loop adjacent to the demineralizer and shall provide continuous indication in the control room. High radiation levels within the demineralizer or pool water shall annunciate an audible alarm in the control room. The range of the monitor shall be from 0.1 to 100 mr/hr.
- 7.4 Portable survey instruments (gamma, beta) for measuring beta-gamma dose rates in the range of 0.01 mr/hr to 50 r/hr shall be available at the facility.

- 7.5 Portable survey instrument (neutron) for measuring fast and thermal neutron dose rates from 0.1 mrem/hr to 1.0 rem/hr shall be available at the facility.
- 7.6 Radiation dosimeters (gamma, neutron) shall be placed at several locations within the reactor building for area radiation analysis.
- 7.7 Instrumentation with readout in the control room shall be operating to permit continuous indication of pool water temperature and pool water conductivity. Alarms shall be operable to indicate low water flow, low pool water and bridge crane location. Table 1 contains alarm setpoints for sensors.

## 8.0 Experimental Facilities

### 8.1 Large-Component Irradiation Box

Not in pool and shall not be authorized for use.

### 8.2 Pneumatic Transfer Facility

Not in core lattice and shall not be authorized for use.

### 8.3 Glory Hole Facility

Not in pool and shall not be authorized for use.

### 8.4 Neutron Radiography Facility

Shall not be authorized for use.

8.4.1 The beam tube shall consist of a two-section tapered tube having a rectangular cross-section. The upper and lower sections of the tube shall be equipped with a fill and drain line.

8.4.2 All components contacting the pool water shall be fabricated from aluminum or stainless steel.

8.4.3 The beam catcher shield shall consist of a movable radiation shield.

### 8.5 Thermal Column

Shall be authorized for reflector element storage only.

8.5.1 The thermal column shall be positioned remotely on steel locating pins immediately adjacent to the core structure.

8.5.2 The thermal column shall be composed of a three-foot cube of graphite encased in aluminum containing five rows of 1.5 in. diameter irradiation holes. The rows shall be placed 6 inches apart and contain seven holes per row.



8.6 Vertical Tube

Shall not be authorized for use.

8.7 Other Irradiation Facilities

Shall not be authorized for use.

9.0 Experiment Limitation

No experiments shall be authorized.

10.0 General Operating Limitations

No reactor operation shall be authorized.

11.0 Fuel Transfer and Storage

11.1 The fuel storage pits located in the floor of the reactor room shall accommodate a maximum of 19 fuel elements (700 gm U-235) in storage racks dry or flooded with water. The fuel storage pits shall be secured with a lock and chain when fuel is present except during fuel transfer operations.

11.2 Additional fuel storage racks may be located in the reactor tank. Each of these storage facilities shall be so designed that for all conditions of moderation  $k_{\text{eff}}$  shall not exceed a value of 0.8.

11.3 A fuel handling tool shall be used in transferring fuel elements of low radioactivity between the storage pits and the reactor; a shielded transfer cask shall be used for the transfer of highly radioactive fuel elements. The fuel handling tool shall remain in a locked cabinet under the cognizance of the Certified Fuel Handler Supervisor when not authorized for use.

11.4 The transfer of irradiated fuel in the reactor tank, storage pits and facility shall be conducted by a minimum staff of two; a Certified Fuel Handler (CFH) and an additional person trained in radiation safety. The staff shall monitor the operation using a hand held Gamma/Beta radiation monitoring instrument. The Radiation Safety Officer or designee shall be present for irradiated fuel transfers outside of the reactor tank.

11.5 No more than one fuel element that is not in storage shall be allowed in the facility. The only movement of the fuel elements shall be for fuel element inspections, canister surveillances, rearrangement of fuel elements in storage, or final placement in the transportation cask.

11.6 CFH or CFH Supervisor does not need to be at the facility on a daily basis. They are only required when there is a transfer/movement of fuel.

## 12.0 Administrative Requirements

### 12.1 Organization (Figure 1) showing reporting and communication lines

- 12.1.1 Aerotest Operations President (Level 1) shall have the responsibilities for all activities associated with obligations and processes associated with operating Aerotest Operations which includes complying with license and Technical Specifications, facility physical security and safety programs. The President of Aerotest Operations, Inc. shall report to the Board of Directors of Aerotest Operations, Inc.
- 12.1.2 The Reactor Administrator (Level 2) shall have the responsibilities of ensuring security and safety of the Aerotest facility. He/she shall enforce, review and amend procedures associated with security and safety programs. The reactor administrator shall be responsible to the President, Aerotest Operations, Inc. The Reactor Administrator shall have a minimum of 5 years of experience in reactor operations, 2 years of experience with personnel and environmental/occupational radiation monitoring programs, and 2 years of experience with complying with government regulations. Successfully completed college-level work in the nuclear and radiation related fields of study may be considered In lieu of the experience requirement.
- 12.1.3 The Certified Fuel Handler Supervisor (Level 3) is a non-licensed operator who has qualified in accordance with the ARRR CFH Training/Requalification Program and shall have the responsibility of handling fuel and in all matters pertaining to fuel handling operations and to these Technical Specifications, the Certified Fuel Handler Supervisor shall be responsible to the Reactor Administrator, Aerotest Operations, Inc. The CFH Supervisor shall have at least 5 years of experience in irradiated fuel movements and demonstrated knowledge of the relevant NRC regulations and ALARA principles. Successfully completed college-level work in the nuclear and radiation related fields of study may be considered in lieu of the experience requirement. Maintain health/medical requirements required for the CFH job. The biennial CFH Health Questionnaire will be used to assess health/medical requirements.
- 12.1.4 The Radiation Safety Officer (Level 3) shall review and approve all procedures involving radiological safety. He/she shall enforce rules, regulations and procedures relating to radiological safety, conduct routine radiation surveys and is responsible to the President, Aerotest Operations, Inc. The Radiation Safety Officer shall have a minimum of 2 years of experience in personnel and environmental/occupational radiation monitoring programs. Successfully completed college-level work in the nuclear and radiation related fields of study may be considered in lieu of the experience requirement.

- 12.1.5 The Certified Fuel Handler (Level 4) is a non-licensed operator who has qualified in accordance with ARRR CFH Training/Requalification Program. Fuel handling obligations include maintenance, periodic fuel inspections and/or putting the spent fuel in transportation casks for fuel shipment from facility. The CFH only handles fuel when needed and only handles 1 fuel element at a time. The CFH does not make decisions on fuel handling, decommissioning or radiation; those are made by the Reactor Administrator or Radiation Safety Officer (RSO). The CFH shall have at least 2 years of experience in irradiated fuel movements and demonstrated knowledge of the relevant NRC regulations and ALARA principles. Successfully completed college-level work in the nuclear and radiation related fields of study may be considered in lieu of the experience requirement. Maintain health/medical requirements required for the CFH job. The biennial CFH Health Questionnaire will be used to assess health/medical requirements.
- 12.1.6 The Reactor Safeguards Committee shall be composed of not less than five members, of whom no more than three are members of Aerotest Operations, Inc. The committee shall meet on call of the chairman and they shall meet at least annually. The committee shall be responsible for, but not limited to the following:
- 12.1.6.1 Reviewing and approving nuclear safety standards associated with the use of the facility;
  - 12.1.6.2 Reviewing ARRR facility's procedures and modifications;
  - 12.1.6.3 Determining whether proposed changes to the facility or procedures are allowed without prior authorization by the NRC, as detailed in 10 CFR 50.59;
  - 12.1.6.4 Conducting periodic audits of procedures, maintenance, equipment performance, and records;
  - 12.1.6.5 Reviewing all reported violations of these Technical Specifications, evaluating the causes of such events and the corrective action taken and recommending measures to prevent reoccurrence and;
  - 12.1.6.6 Reporting their findings and recommendations concerning the above to the President, Aerotest Operations, Inc.

## 12.2 Procedures

12.2.1 Detailed written procedures shall be provided and followed for the following operations:

12.2.1.1 Fuel Handling operations;

12.2.1.2 Normal operating of all systems and components involving nuclear safety of the ARRR facility;

12.2.1.3 Actions to be taken to correct specific and foreseen potential malfunctions of systems or components, including responses to alarms and suspected primary system leaks;

12.2.1.4 Preventative or corrective maintenance operations which could have an effect on the safety of the facility.

12.2.2 Temporary procedures which do not change the intent of previously approved procedures may be utilized on approval by the Reactor Administrator. Such procedures shall be subsequently reviewed by the Reactor Safeguards Committee.

## 12.3 Records

Records shall be maintained as required by the facility license and applicable regulations.

TABLE 1  
SAFETY SYSTEM FUNCTIONS

TECH SPEC #	SENSOR OR TRIP DEVICE	NO. OF SWITCHES OR SENSORS	ANNUNCIATOR AND ALARM SET POINT
7.7	Pool Water Temperature*	1	$\leq 130^{\circ}$ F
7.7	Pool Water Conductivity*	1	$\leq 5 \mu\text{mho/cm}$
7.7	Low Pool Water*	1	$\leq 1$ ft max decrease
7.7	Bridge Crane Location*	1	When located off storage position
7.1	Area Radiation Monitor	1	$\leq 10$ mr/hr
7.3	Water Radioactivity*	1	$\leq 20$ mr/hr
7.7	Low Water Flow*	1	$\geq 4$ gpm
7.2	Gas Effluent Monitor*	1	$\leq 2$ mr/hr
7.4	Portable Survey Instruments (Gamma, Beta)	1	Between .01 mrem/hr and 50 rem/hr
7.5	Portable Survey Instrument (Neutron)	1	Between .01 mrem/hr and 1.0 rem/hr
7.6	Radiation Dosimeters (Gamma, Neutron)	As needed	N/A

\* Safety system instruments that are related to the safe and secure storage of the irradiated fuel shall be operable when relevant if the irradiated fuel is present in the facility.

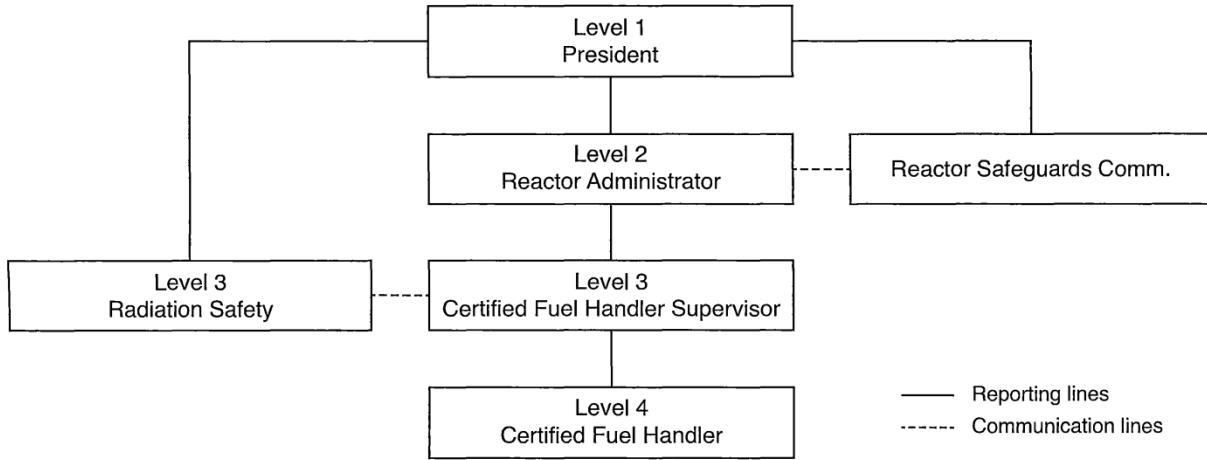


Figure 1 – ARRR ANSI/ANS-15.1 Organization