



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

CORNELL UNIVERSITY ZERO POWER REACTOR

DOCKET NO. 50-97

AMENDMENT TO FACILITY LICENSE

Amendment No. 4
License No. R-89

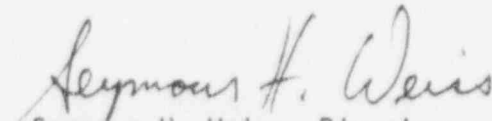
1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application filed by Cornell University (the licensee), dated November 1, 1996, as supplemented on November 27, and December 11, 1996, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the regulations of the Commission as presented in 10 CFR Chapter I;
 - B. The facility will be maintained in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment 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;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;
 - E. This amendment is issued in accordance with 10 CFR Part 51 of the regulations of the Commission and all applicable requirements have been satisfied; and
 - F. Prior notice of this amendment was not required by 10 CFR 2.105 and publication of notice for this amendment is not required by 10 CFR 2.106.

2. Accordingly, the license is amended by changes to the following paragraphs which are hereby amended to read as follows:

2. B. 1. Pursuant to Section 104(c) of the Act and 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," to possess, but not operate the Zero Power Reactor in accordance with the procedures and limitations described in the application and this license.
 2. Pursuant to the Act and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material," to possess up to 40.0 kilograms of uranium 235 contained in uranium enriched in the isotope uranium 235;
 3. Pursuant to the Act and 10 CFR Part 30, "Rules of General Applicability to Domestic Licensing of Byproduct Material," and Part 70 "Domestic Licensing of Special Nuclear Material" to possess, but not to separate such byproduct material and special nuclear material as may have been produced by past operation of the reactor.
2. C. 1. The licensee shall not operate the reactor nor store or place fuel into the reactor grid plate or tank.
 2. The Technical Specifications contained in Appendix A, as revised through Amendment No. 4, are hereby incorporated into the license. The licensee shall maintain the facility in accordance with the Technical Specifications as amended.

3. This license amendment is effective on the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Seymour H. Weiss, Director
Non-Power Reactors and Decommissioning
Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Enclosure:
Appendix A Technical
Specifications

Date of Issuance: February 12, 1997

ENCLOSURE TO LICENSE AMENDMENT NO. 4

FACILITY LICENSE NO. R-89

DOCKET NO. 50-97

Revise Appendix A Technical Specifications as follows:

Remove

Insert

All Pages

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APPENDIX A
TECHNICAL SPECIFICATIONS
FOR THE
CORNELL UNIVERSITY ZERO POWER REACTOR
FACILITY LICENSE R-89
DOCKET NO. 50-97

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1. DEFINITIONS

The following frequently used terms are defined to aid in the uniform interpretation of these specifications.

1.1 Reportable Occurrences. A reportable occurrence is any of the following:

- (1) release of fission products from the fuel
- (2) an observed inadequacy in the implementation of either administrative or procedural controls, such that the inadequacy has caused the existence or development of an unsafe condition
- (3) an uncontrolled or unanticipated release of radioactivity.

1.2 Operable. A system or component is operable when it is capable of performing its intended function in a normal manner.

1.3 Operating. A system or component is operating when it is performing its intended function in a normal manner.

1.4 FSR. "Final Safeguards Report to the U.S.A.E.C. for the Cornell University Zero Power Reactor", CURL-4, May 1962, with added Appendix F, August 1962, and Supplement No. 1, March 1981.

2. SAFETY LIMITS AND LIMITING SAFETY SYSTEM SETTINGS

Not applicable. Fuel is not permitted on the grid plate and tank (see Section 5.3).

3. LIMITING CONDITIONS FOR OPERATION

3.1 Safety Channels

Applicability

This specification applies to the ZPR cell radiation monitor.

Objectives

The objective is to require that there is adequate monitoring of radiation fields in the ZPR cell to 1) guard against personnel exposure and 2) warn of the accidental criticality of stored ZPR fuel.

Specifications

- a) At a minimum, the ZPR cell radiation monitor shall be operable continuously, except as necessary for repair or calibration, as long as ZPR fuel is stored in the cell.

- b) The radiation monitor shall have it's operability checked on a semi-annual basis.
- c) The radiation monitor shall have an audible alarm indicating a radiation level above the setpoint value.

Bases

10 CFR 70.24 requires that each area in which licensed special nuclear material is handled, used or stored have a monitoring system which will "energize clearly audible alarm signals if accidental criticality occurs." The ZPR cell radiation monitor meets the requirements of 10 CFR 70.24 (a)(2).

4. SURVEILLANCE REQUIREMENTS

4.1 Radiation Monitors

Applicability

This specification applies to the surveillance requirements for the ZPR cell and control room radiation monitors. The ZPR cell radiation monitor acts as a criticality monitor for the ZPR fuel stored in the ZPR cell fuel storage rack, meeting the requirements of 10 CFR 70.24(a)(2).

Objective

The objective is to ensure that the radiation monitors are operable and to verify that calibrations and alarm settings are within prescribed limits.

Specifications

- a. The alarm set points for the Zero Power Reactor cell and control room radiation monitors shall be verified on a semi-annual basis.
- b. Acceptance criteria for check tests and calibrations shall be those specified in approved check lists or written procedures.

Bases

Verification of alarm set points for the radiation monitors ensures that adequate warnings of potential radiation exposure are provided. The ZPR cell radiation monitor also monitors the stored ZPR Fuel and acts as a criticality alarm.

4.2 Maintenance

Applicability

This specification applies to the surveillance requirements following maintenance of control or safety systems.

Objective

This objective is to ensure that a system is operable within specified limits before being used after maintenance has been performed.

Specifications

Following maintenance or modification of a control or safety system or component, it shall be verified that the system is operable within specified limits prior to its return to service.

Bases

This specification ensures that work on the system or component has been properly carried out and that the system or component has been properly reinstalled or reconnected before reliance for safety is placed on it.

5. DESIGN FEATURES

5.1 Reactor Fuel

The Zero Power Reactor fuel elements are described in Chapter 5 of the May 1962 FSR:

- 1) 740 normal fuel elements with active fuel length of 48 inches.
- 2) 60 decappable fuel elements of the same length for experimental studies.
- 3) 100 short fuel elements which may contain up to 18 inches of fuel pellets.
- 4) 15 fuel follower control rod elements.

The fuel material is 2.1 a/o enriched UO_2 in the form of sintered pellets and UO_2 powder. The 815 sealed fuel elements contain pellets with somewhat less than 1900 kg UO_2 (35 kg U-235). In addition there are less than 37 kg UO_2 in spare pellets and special forms and 53 kg UO_2 in powdered form for auxiliary purposes. The total fuel material contains less than 36 kg U-235.

All fuel is clad in aluminum seamless tubing of 0.666 inch outside diameter and 0.028 inch wall thickness and is sealed either by welded end plugs or, in the case of the decappable element, by O-ring seals.

The short fuel elements are designed for use in mini-sized subcritical lattices. They will not be used, however, without prior application to and approval by NRC.

The UO_2 in powdered form was purchased for potential use in fabricating special pellet shapes for experiments and also for use in performing chemical analyses. Neither use will be made, however, without prior application to and approval by NRC.

In addition to the reactor fuel described above, (see license amendment No. 2, April 3, 1968) we possess and store 1365 kg of contained natural uranium in the form of 800 aluminum clad, UO_2 fuel elements. These fuel elements cannot be used in the reactor core without modification and application to and approval by NRC.

5.2 Reactor Cell

The Zero Power Reactor is located in a concrete cell which serves as the biological shield. The reactor cell can be isolated from the rest of the building: all pipe and conduit penetrations of the cell wall are sealed, the access plugs and penetrations of the cell wall are sealed, the access plugs and personnel door are gasketed, and the inlet and exhaust ventilation ducts can be closed. Failure of electricity or air results in closure of the duct valves.

5.3 Fuel Storage

All fuel material is located and stored in locked rooms: the isotope and fuel storage room or the reactor cell. The only exception to this is when fuel material is in transit between the locked rooms or when limited amounts are outside of the locked rooms for maintenance purposes. Exposed (unclad and unsealed) fuel pellets are handled only in fume hoods equipped with high efficiency particulate air filters.

All fuel will be stored outside of the reactor grid plate and tank in a configuration such that K_{eff} is no greater than 0.8 for all possible conditions of moderation and reflection. No fuel will be stored in, or otherwise placed into, the reactor grid plate or tank.

6. ADMINISTRATIVE CONTROLS

6.1 Organization and Responsibilities of Personnel

- a. The Director of the Nuclear Science and Engineering Program shall be responsible for the appointment of responsible and competent persons as members of the Ward Laboratory Safety Committee and as Director of Ward Laboratory, subject to the approvals delineated below.
- b. The Ward Laboratory shall be under the supervision of the Laboratory Director, who shall have overall responsibility for safe, efficient, and competent use of its facilities in conformity with all applicable laws, regulations, terms of facility licenses, and provisions of the Ward Laboratory Safety Committee. He shall also have responsibility for maintenance and modification of Laboratory facilities. He shall hold a professorial rank in the Nuclear Science and Engineering Program and shall be appointed by the Director of the Program with the approval of the Dean of the College of Engineering. He shall report to the Director of the Program.
- c. The Reactor Supervisor shall serve as the deputy of the Laboratory Director in all matters relating to the enforcement of established rules and procedures (but not in matters such as establishment of rules, appointments, and similar administrative functions). He should have at least two years of technical training beyond high school and shall possess a Senior Operator's license. He shall have had reactor operating experience and have a demonstrated competence in supervision. He shall be appointed by the Laboratory Director with the approval of the Program Director, and shall report to the Laboratory Director.
- d. The Responsible Person on Duty shall be responsible for enforcing all applicable rules, procedures, and regulations while he is on duty, for ensuring adequate exchange of information between operating personnel when shifts change, and for reporting all malfunctions, accidents, and other potentially hazardous occurrences and situations to the Reactor Supervisor and/or Laboratory Director. Responsible Persons shall possess a Senior Operator's license, shall be appointed by the Laboratory Director with the approval of the Laboratory Safety Committee, and shall report to the Reactor Supervisor.
- e. The Director of Radiation Safety or his deputy shall (in addition to other radiation protection duties defined by the Director of Life Safety Services) be responsible for overseeing the safety of

Ward Laboratory operations from the standpoint of radiation protection. He shall be appointed by the Director of Life Safety Services with the approval of the University Radiation Safety Committee. He shall report to the Director of Life Safety Services, whose organization is independent of the Ward Laboratory organization, as shown on Chart I.

6.2 Review and Audit

- a. There will be a Ward Laboratory Safety Committee which shall review ZPR reactor status during the possession-only phase, and through the decommissioning process, to assure that the reactor facility is used in a manner within the terms of the facility license and consistent with the safety of the public and persons within the laboratory.
- b. The responsibilities of the Committee include, but are not limited to, the following:
 1. Review and approval of rules, procedures, and proposed Technical Specifications;
 2. Review and approval of all proposed changes in the facility that could have a significant effect on safety and of all proposed changes in rules, procedures, and Technical Specifications, in accordance with procedures in Section 6.3;
 3. Determination of whether a proposed change, test, or experiment would constitute an unreviewed safety question or a change in the Technical Specifications (Ref. 10 CFR 50.59);
 4. Review of the operation and operations records of the facility;
 5. Review of unusual or abnormal occurrences and incidents which are reportable under 10 CFR Part 20 and 10 CFR Part 50;
 6. Inspection of the facility, review of safety measures, and audit of operations at a frequency not less than once a year; and
 7. Approval of appointments of Responsible Persons.
- c. The Committee shall be composed of:
 - (1) two persons proficient in reactor and nuclear physics;
 - (2) two persons proficient in chemistry or chemical engineering;
 - (3) one person proficient in radiation biology;
 - (4) the Laboratory Director, ex officio;
 - (5) the Director of Radiation Safety or his deputy, ex officio;and

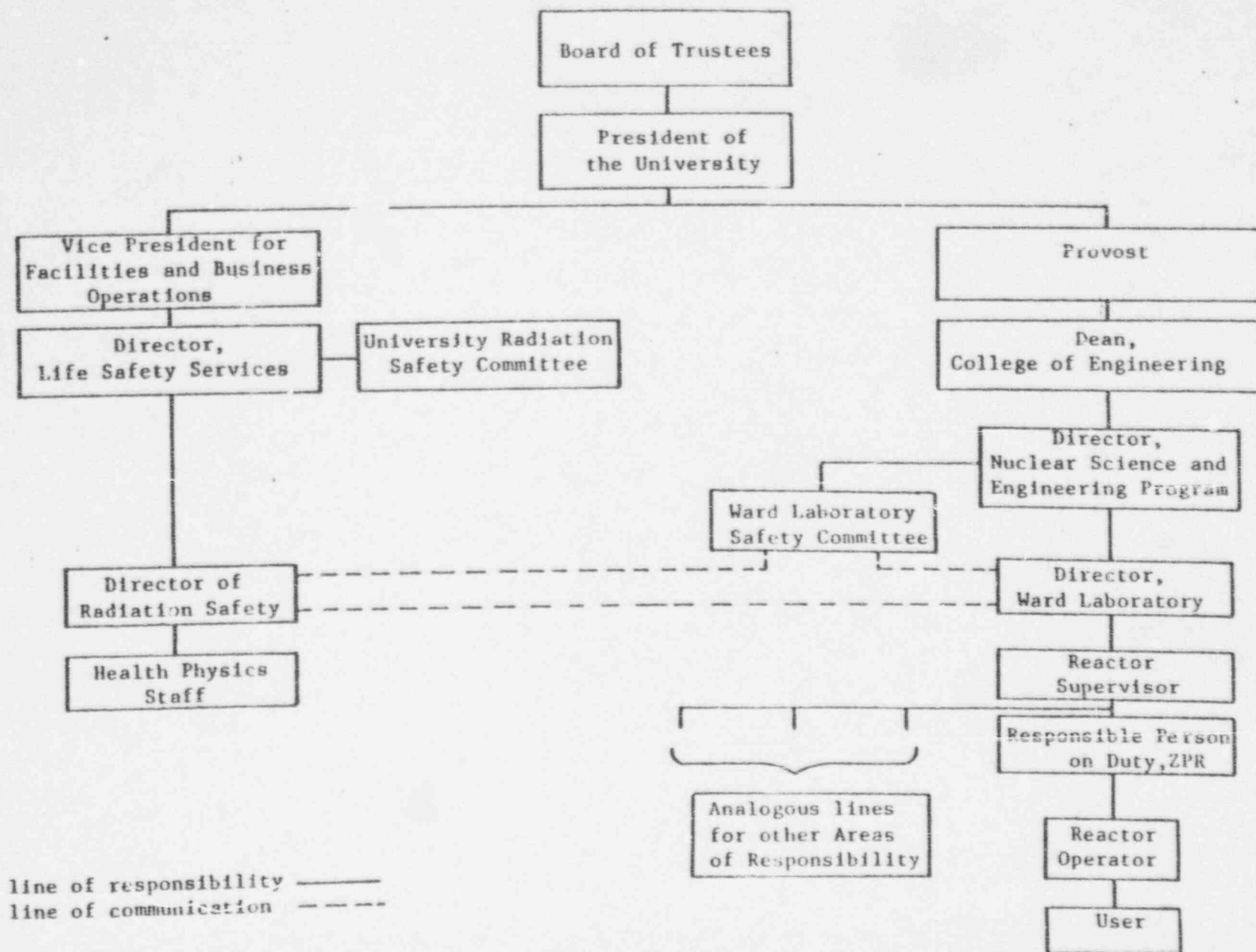


Chart I. Organizational Structure

- (6) the Director of the Nuclear Science and Engineering Program or his deputy, ex officio.

The same individual may serve under more than one category above, but the minimum membership shall be seven. All members (except the Director of Radiation Safety) shall be chosen from the faculty.

- d. The Committee shall have a written statement defining its authority and responsibilities, the subjects within its purview, and other such administrative provisions as are required for its effective functioning. Minutes of all meetings and records of all formal actions of the Committee shall be kept.
- e. The chairman of the Committee shall be elected by the Committee from its members, except that the Laboratory Director shall not serve as Chairman. A quorum shall consist of not less than a majority of the full Committee and shall include the chairman or his designee.
- f. The Committee shall meet a minimum of three times a year.

6.3 Procedures

- a. Determination as to whether a proposed activity in categories 1, and 2 in Section 6.2 above does or does not have a significant safety effect and therefore does or does not require approved written procedures shall require the concurrence of:
 - (1) the Laboratory Director;
 - (2) at least one other member of the Laboratory Safety Committee, to be selected for relevant expertise by the Laboratory Director. If the Director and the Committee member disagree, or if in their judgement the case warrants it, the proposal shall be submitted to the full Committee; and
 - (3) the Director of Radiation Safety, or his deputy, who may withhold agreement until approval by the University Radiation Safety Committee is obtained.

Determinations that written procedures are not required shall subsequently be reviewed by the Laboratory Safety Committee. The time at which determinations are made, and the review and approval of written procedures, if required, are carried out, shall be a reasonable interval before the proposed activity is to be undertaken.

- b. Determination that a proposed change in the facility does or does not have a significant safety effect and therefore does or does not require review and approval by the full Committee shall be made in the same manner as for proposed activities under a above.

6.4 Emergency Plan and Procedures

An emergency plan shall be established and followed in accordance with NRC regulations. The plan shall be reviewed and approved by the Laboratory Safety Committee prior to its submission to the NRC. In addition, emergency procedures that have been reviewed and approved by the Laboratory Safety Committee shall be established to cover all foreseeable emergency conditions potentially hazardous to persons within the Laboratory or to the public, including, but not limited to, those involving an uncontrolled reactor excursion or an uncontrolled release of radioactivity.

6.5 Physical Security Plan

A physical security plan for protection of the reactor plan shall be established and followed in accordance with NRC regulations.

6.6 Action to be Taken in the Event of a Reportable Occurrence

In the event of a reportable occurrence, as defined in Section 1.1 of the specifications, the following action shall be taken:

- a. A report shall be made which shall include an analysis of the cause of the occurrence, efficacy of corrective action and recommendations for measures to prevent or reduce the probability of recurrence.

This report shall be submitted to the Laboratory Safety Committee for review.

- b. A report shall be submitted to the NRC in accordance with Section 6.8 of these specifications.

6.7 Plant Operating Records

- a. In addition to the requirements of applicable regulations, in 10 CFR 20 and 10 CFR 50, records and logs shall be prepared and retained for a period of at least 5 years for the following items as a minimum.

1. Normal plant operation, including power levels;
2. Principal maintenance activities;

3. Reportable occurrences;
 4. Equipment and component surveillance activities;
 5. Experiments performed with the reactor;
 6. All emergency reactor scrams, including reasons for emergency shutdowns.
- b. The following records shall be maintained for the life of the facility:
1. Gaseous and liquid radioactive effluents released to the environs;
 2. Off-site environmental monitoring surveys;
 3. Fuel inventories and transfers;
 4. Facility radiation and contamination surveys;
 5. Radiation exposures for all personnel;
 6. Updated, corrected and as-built drawings of the facility.

6.8 Reporting Requirements

All written reports shall be sent within the prescribed interval to the NRC, Washington, D.C. 20555, Attn: Document Control Desk, with a copy of the Regional Administrator, Region I.

In addition to the requirements of applicable regulations, and in no way substituting therefore, reports shall be made to the NRC as follows:

- a. A report within 24 hours by telephone and telegraph to the NRC Operation Center and Region I;
 1. Any accidental release of radioactivity above permissible limits in unrestricted areas, whether or not the release resulted in property damage, personal injury, or exposure; and
 2. Any reportable occurrences as defined in Section 1.1 of these specifications.
- b. A report within 10 days in writing to the NRC Operation Center and Region I;

1. Any accidental release of radioactivity above permissible limits in unrestricted areas, whether or not the release resulted in property damage, personal injury or exposure; the written report (and, to the extent possible, the preliminary telephone and telegraph reports) shall describe, analyze and evaluate safety implications, and outline the corrective measures taken or planned to prevent recurrence of the event; and
 2. Any reportable occurrence as defined in Section 1.1 of these specifications.
- c. A routine report in writing to NRC within 60 days after completion of the first calendar year of operating and at intervals not to exceed 12 months, hereafter, providing the following information.
1. A brief narrative summary of (1) changes in facility design related to reactor safety occurring during the reporting period, and (2) results of surveillance tests and inspections;
 2. A summary of each change to the facility or procedures, tests, and experiments carried out under the conditions of Section 50.59 of 10 CFR Part 50;
 3. A summary of the nature and amount of radioactive effluents released or discharged to the environs beyond the effective control of the licensee as measured at or prior to the point of such release or discharge;
 4. A description of any environmental surveys performed outside the facility; and
 5. A summary of radiation exposures received by facility personnel and visitors, including the dates and time of significant exposure, and a brief summary of the results of radiation and contamination surveys performed within the facility.