APPENDIX A

TECHNICAL SPECIFICATIONS

FACILITY LICENSE NO. R-71

UNIVERSITY OF CALIFORNIA, LOS ANGELES

NUCLEAR REACTOR

DOCKET NO. 50-142

DATE: October 1, 1984

The Technical Specifications pertain to the UCLA reactor facility and to the reactor which has been rendered permanently inoperable. The current status of the reactor and facility is as follows:

1. The four control blade drive shafts have been severed from the drive mechanisms.

2. The dump valve and the primary water pump have been disabled.

3. The rabbit tube has been removed from the rabbit port.

4. Follower plugs in vertical ports and beam tube apertures have been secured with bead welds.

5. The unirradiated fuel which had been in storage has been returned to the Department of Energy.

By the effective date of this proposed amendment to the Technical Specifications the following additional actions will have been taken:

6. The primary water will be drained from the system.

7. The secondary water will be valved-off and the line to the flow meter and controller will be severed.

8. All irradiated fuel will be removed from the core for temporary storage in the spent-fuel storage pits pending the completion of shipping arrangements to return the fuel to the Department of Energy.

Except that certain of the actions that have been taken or will be taken are irreversible, these initial decommissioning actions are similar to those that would be taken during major core maintenance and fall within the scope of the operating license.

The dimensions, measurements or other numerical values of these specifications may differ from the measured values as a result of normal construction and manufacturing tolerances or from variations in the normal accuracy of instrumentation.

I. Definitions

~~A. Reactor Shutdown~~

~~The reactor is shut down when all of the following conditions are met:~~

~~1. All control blades are fully inserted and the reactor is subcritical by a margin greater than 0.007 $\Delta\rho$. When calculating the subcritical margin, no credit shall be taken for experiments, temperature effects or xenon poisoning.~~

~~2. The console key switch is in the off position, the key is removed and under the control of a licensed operator.~~

~~3. No maintenance or work is in progress that could reduce the subcritical margin.~~

~~B. Reactor Operation~~

~~Reactor operation shall mean any conditions wherein the reactor is not shut down.~~

~~C. Reactor Scram~~

~~A reactor scram is the gravity drop of all control blades.~~

~~D. Experiment~~

~~An experiment shall be any of the following:~~

1. Any apparatus, device or material placed in the reactor core region, in the exposure facilities, or in a beam of radiation originating from the reactor core.

2. Any operation designed to measure or observe reactor parameters or characteristics.

~~E. Reactor Safety System~~

The reactor safety system is that combination of measuring channels which forms the automatic protective system for the reactor or provides information which requires manual protective action to be initiated.

F. Operable

Operable means a system or component is capable of performing its intended function in a normal manner.

G. Operating

Operating means a system or component is performing its intended function in a normal manner.

H. Operability Test

Operability test means qualitatively verifying the operability of the channel by observation of channel behavior or by the introduction of an externally generated signal.

I. Calibration

Calibration means adjusting a channel output such that it responds, within acceptable range and accuracy, to known values of the parameter which the channel measures. Calibration shall encompass the entire channel including equipment actuation, alarm or trip.

II. Site and Reactor Room

A. Site

1. The reactor shall be housed in a reinforced concrete building in the School of Engineering and Applied Science, University of California, Los Angeles, California.

2. The restricted area shall encompass the Nuclear Energy Laboratory which is comprised of the reactor room, control room, and surrounding support facilities.

B. Reactor Room

1. The reactor room shall have an independent ventilation and air-conditioning system.

2. All gases which may cause a hazard through neutron activation shall be exhausted from experiments or experimental facilities installed in or adjacent to the core or surrounding graphite to the environment via a common exhaust duct.

3. Air withdrawn from the reactor room shall be diluted to a volume rate of approximately 14,000 CFM, monitored for gaseous activity and particulate contamination, and exhausted to the atmosphere through a stack approximately 107 feet above ground level.

~~4. In the event that the limits for Argon 41 contained in 10 CFR Part 20, Appendix B, Table II, with a reduction factor of 460 are exceeded in the stack, the ventilation system shall be secured and shall cause the automatic damper system to seal the reactor room, and the reactor shall be shut down.~~

~~5. The 10-ton crane shall not be used in such a way that the control blade drive units could suffer damage by dropping or swinging a load.~~

6. Doors penetrating the reactor room are within the restricted area. All doors leading into the reactor room ~~shall have a flashing alarm light indicating reactor operation and~~ shall be under a lock and key security system.

III. Reactor Systems

A. Reactor Core

1. The core shall consist of a maximum of 24 assemblies of up to 11 plates each. These assemblies are contained in six aluminum boxes surrounded by graphite. The boxes are arranged in two parallel rows of three boxes each, separated by about 30 centimeters of graphite.

2. A fuel plate shall be enriched uranium-aluminum alloy fuel clad with aluminum. There shall be nominally 14.5 grams of uranium per fuel plate.

3. A neutron source shall be provided during reactor startup.

B. Primary Coolant System

1. The primary coolant shall be demineralized light water.

2. The primary coolant flow rate shall be greater than 15 gpm for reactor operation at power levels above 1 watt.

3. The average primary coolant outlet temperature shall not exceed 200°F.

4. The resistivity of the primary coolant shall be measured prior to each startup. The resistivity shall not be less than 0.5 megohm centimeters.

5. The primary coolant quick-dump valve shall be activated manually and upon receipt of an automatic shutdown signal prior to each startup to assure proper operation.

C. Reactor Control System

1. Four cadmium-tipped semaphore-type blades shall be used for reactor control. The control blades shall be protected by shrouds to assure freedom of motion.

2. The reactor shall not be made critical unless all control blade drives are operable.

3. The reactor shall not be made critical unless the interlocks in Table I are operable.

4. Tests, limits and frequencies of tests for the control system shall be as listed in Table II.

5. Following maintenance or modification to the reactor control system, an operability test of the affected portion of the system, including verification of control blade drive speed, shall be performed before the system is considered operable.

D. Reactor Safety System

1. The reactor shall not be made critical unless the reactor safety system is operable in accordance with Table III.

2. Tests for operability shall be made in accordance with Table IV.

3. The neutron channels shall be calibrated against an independent measure of core power at intervals not exceeding 12 months.

4. The following channels shall be calibrated at intervals not exceeding 12 months, or any time a change in channel performance is noted.

   a. log N period channel

   b. power level safety channels

   c. linear power level channel

5. Following maintenance or modifications to the reactor safety system, an operability test and calibration of the affected channel shall be performed before the reactor safety system is considered operable.

E. Pneumatic Sample Transfer System

1. A Pneumatic Sample Transfer System may be installed in the west vertical experimental port of the reactor.

2. All operations of the Pneumatic Sample Transfer System will be in accordance with approved procedures.

3. No sample shall be pneumatically inserted or removed from a critical reactor if the resultant stable positive period will be less than 20 seconds.

~~IV. Reactivity~~

A. The core excess reactivity at cold critical, without xenon poisoning, shall not exceed 0.023 ρ.

B. The primary coolant void and temperature coefficients of reactivity shall be negative.

C. The minimum shutdown margin, with the most reactive control blade fully withdrawn, shall be 0.018 ρ.

D. The reactivity insertion rate for a single control blade shall not exceed 0.0005 ρ/sec.

E. Items C and D shall be verified in accordance with Table II, Test 2.

V. Radiation Monitoring System

A. The reactor room shall be continuously monitored by at least two area radiation monitors. The monitors shall be capable of audibly warning personnel of high radiation levels. The output of these monitors shall be continuously indicated.

B. During reactor operations or core alterations, exhaust air drawn from the reactor room shall be continuously monitored for gross concentrations of radioactive gases.

C. The radiation monitors in items A and B shall be calibrated semiannually.

D. The release of radioactivity from the reactor facility shall be kept to as low a level as practical.

~~E. The concentration of Argon 41 released to the atmosphere shall~~ not exceed the limits of 10 CFR Part 20, Appendix B, Table II, Column 1 with a reduction factor of 460 defined as the product of (1) a reactor use factor, (2) an occupancy factor, and (3) a dilution factor. The Commission shall be notified if, over any one year period, the reactor use factor, the occupancy factor or the dilution factor change so as to increase the effective reduction factor.

VI. Fuel Handling and Storage

~~A. New fuel may be stored in its shipping container or in other~~ appropriate containers. Hot fuel shall be stored in steel-lined storage pits located in the concrete floor of the high bay. Fuel elements or fueled devices shall be stored and handled in a geometry such that k_{eff} is less than 0.8 under optimum conditions of moderation and reflection.

B. Irradiated fuel elements or fueled devices shall be stored so that temperatures do not exceed design values.

~~VII. Experiments~~

A. The reactor supervisor and the resident health physicist shall review and approve in writing all proposed experiments prior to their performance.

B. The following conditions shall govern the performance of experiments:

1. The reactivity worth of any single unconstrained experiment shall not exceed 0.006 ρ.

2. An experiment shall not be inserted or removed unless all the control blades are fully inserted or its absolute reactivity worth is less than that which would cause a 20-second positive stable period.

3. No explosive materials shall be irradiated.

4. The sum of the absolute reactivity worths of experiments shall not exceed 0.0023 ρ.

VIII. Administrative Requirements

A. The Chancellor of the University, the Dean of the School of Engineering and Applied Science, the Director of the Nuclear Energy Laboratory, and the reactor supervisor shall have line responsibility for the administrative control of the reactor facility, safeguarding the general public and facility personnel from radiation exposure and adhering to all requirements of the facility license and the Technical Specifications.

B. The reactor supervisor shall be responsible for ~~the safe operation of the reactor, the scheduling and supervision of experiments utilizing the reactor, the~~ control of the reactor fuel, the keeping of logs and records, the maintenance of the physical condition of the reactor and the training of operating personnel. ~~The reactor supervisor shall maintain the necessary records to assure compliance with Section V.E.~~

~~C. The reactor supervisor and health physicist shall review~~ and approve in writing all proposed experiments prior to their performance. They shall submit to the Director of the Nuclear Energy Laboratory or to the Radiation Use Committee all new experiments and all proposed changes to the facility which might affect its safety.

~~D. A minimum of two qualified persons, one a licensed~~ operator, shall be in the laboratory at all times during reactor operation, except for precritical console checkouts. A person is considered qualified when he receives and understands a briefing on the facility emergency procedures.

~~E. A licensed senior operator shall be readily available on call during all reactor operations.~~

F. Line responsibility for radiological safety at the Nuclear Energy Laboratory shall include successively the Campus Radiation Safety Committee, the ~~Environmental Health and Safety Office~~ and the ~~Nuclear Energy Laboratory health physicist~~. The Campus Radiation Safety Committee shall be independent of the line organization for reactor operation in item A. Note 1 Note 2

G. The ~~Nuclear Energy Laboratory health physicist~~ shall be responsible for implementing and enforcing the radiological safety program at the Nuclear Energy Laboratory. Note 2

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Note 1: to read "Office of Research & Occupational Safety"

Note 2: to read "health physicist assigned to the Nuclear Energy Laboratory"

H. There is a Radiation Use Committee which reviews and approves new experiments and proposed alterations to the reactor. The Committee shall review and audit reactor operations for safety. This committee shall be composed of the reactor supervisor and radiation health physicist, ex officio, and three other members having expertise in reactor technology. Committee members shall be appointed by the Dean of the School of Engineering and Applied Science. A quorum shall be three members. The Radiation Use Committee ~~shall meet at least semiannually and~~ shall keep written records of its meetings. The Committee shall report directly to the Dean of the School of Engineering and Applied Science. The Radiation Use Committee shall:

1. Review proposed changes to the facility or procedures, when such changes have safety significance, and shall determine whether they involve an amendment to the facility license, a change in the Technical Specifications incorporated in the facility license, or an unreviewed safety question pursuant to 10 CFR 50.59, and recommend action.

~~2. Review proposed tests or experiments significantly different from any previously approved and determine whether they involve an unreviewed safety question pursuant to 10 CFR 50.59, and recommend action.~~

~~3. Review facility operations, procedures and records for safety considerations and recommend improvements where appropriate. In addition to a continuing review of these matters, an intensive in depth review of facility operations shall be made at least annually.~~

4. Review the circumstances of all abnormal occurrences and violations of Technical Specifications and proposed measures to preclude a recurrence, and recommend remedial action.

I. Any action recommended by the Radiation Use Committee, which may affect the operation and/or safety of the University community beyond the Nuclear Energy Laboratory facility, shall be brought to the attention of the Campus Radiation Safety Committee which shall have veto power to such a recommendation.

J. Procedures

The facility shall be ~~operated and~~ maintained in accordance with approved written procedures. All procedures and major changes thereto shall be reviewed and approved by the Director of the Nuclear Energy Laboratory prior to being effective. Changes which do not change the original intent of a procedure may be approved in writing by the reactor supervisor. Such changes shall be recorded and submitted to the Director for routine review. The following types of written procedures shall be maintained:

~~1. Normal startup, operation and shutdown procedures for the reactor. These procedures shall include applicable checkoff lists and instructions.~~

2. Procedures which delineate the ~~operator~~ action required in the event of ~~specific malfunctions and~~ emergencies.

3. Radiological control procedures for all facility personnel.

4. A laboratory emergency procedure to guide the behavior and action of all personnel in the event of an emergency condition. ~~Semiannual evacuation drills for facility personnel shall be conducted to assure that facility personnel are familiar with the emergency plan.~~

~~5. Procedures for the installation, operation and removal of experiments where reactor safety is~~ concerned.

6. Procedures for handling irradiated ~~and unirradiated~~ fuel elements.

~~7. Procedures for operation of the Pneumatic Sample Transfer System.~~

K. Records

In addition to requirements of applicable regulations, and in no way substituting therefor, the following minimum records shall be maintained:

~~1. Reactor operations, including unscheduled shutdowns and tests and experiments performed.~~

2. Abnormal occurrences.

~~3. Principal maintenance activities and the reasons therefor.~~

~~4. Reviews of changes made to the facility or procedures and reviews of tests and experiments performed without prior approval by the U. S. Nuclear Regulatory Commission pursuant to 10 CFR 50.59.~~

5. Shipments of radioactive materials.

6. Releases of gaseous and liquid wastes to the environs.

7. Facility radiation and contamination surveys.

8. Fuel inventories and fuel transfers.

9. Radiation exposures for all facility personnel.

L. Action to be Taken in the Event of an Abnormal Occurrence

1. Any abnormal occurrence shall be promptly reported to the reactor supervisor and shall be reviewed by the Radiation Use Committee. A report of the occurrence shall be prepared, including an evaluation of the cause(s) and recommendations for appropriate action to prevent or reduce the probability of recurrence. The results of the investigation shall be maintained as part of the permanent records.

2. All abnormal occurrences shall be reported to the U. S. Nuclear Regulatory Commission in accordance with Section M.1. of these specifications.

3. Abnormal occurrences shall include, but not necessarily be limited to, the following:

   a. a violation of the Technical Specifications or the facility license;

~~b. an uncontrolled or unanticipated reactivity change;~~

c. an uncontrolled or unanticipated release of radioactivity from the site;

~~d. a safety system component malfunction or other system or component malfunction which renders or threatens to render the safety system incapable of performing its intended safety function;~~

~~e. an observed inadequacy in the implementation of either administrative or procedural controls, such that the inadequacy causes or could have caused the existence or development of an unsafe condition with regard to reactor operation; and~~

~~f. abnormal degradation of reactor fuel as revealed by periodic inspection.~~

M. Reporting Requirements

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

1. A report not later than the following working day (by telephone or telegraph to the Director, NRC Region V Inspection & Enforcement Office) and a report within 10 days (in writing to the Director, Division of Operating Reactors, USNRC, Washington, D. C. 20555) of:

   a. Abnormal occurrences as defined in Section L.

   b. Releases of radioactivity from the facility above the permissible limits specified in 10 CFR Part 20, Appendix B, Table II, as modified in accordance with Section V.E.

2. A report within 30 days (in writing to the Director, Division of Operating Reactors, USNRC, Washington, D. C. 20555) of:

a. Significant changes in the facility organization.

~~b. Significant changes in the transient or accident analyses described in the safety analysis report, as amended.~~

~~c. Substantial variances of safety related operating characteristics from previously predicted or measured values.~~

3. A routine report (in writing to the Director, Division of Operating Reactors, USNRC, Washington, D. C. 20555) at the end of each 12-month period providing the following information:

~~a. A narrative summary of reactor operating experience, including the energy generated by the reactor (in megawatt-hours).~~

~~b. A discussion of unscheduled shutdowns, including the corrective action taken to preclude recurrence.~~

~~c. A summary of the preventive and corrective maintenance operations performed having safety significance.~~

d. A discussion of the changes in the facility and procedures, ~~and the tests and experiments~~, carried out without prior approval by the U. S. Nuclear Regulatory Commission pursuant to 10 CFR Part 50, Section 50.59.

e. A summary of the nature and amount of radioactive material released to the environs.

f. The results of any environmental surveys performed outside the facility.

g. A summary of significant (above 500 mRem) radiation exposures received by facility personnel and visitors in any one year, including the dates and times of significant exposures.

~~h. The results of the Environmental Program shall be included in the NEL facility annual report sent to the Commission and available to Commission inspectors upon request.~~

TABLE I

Control Blade Withdrawal Inhibit Interlocks

1. Startup channel count rate less than 1 count per second.
2. Log N period amplifier selector switch not in operate position.
3. Reactor period less than 6 seconds.

TABLE II

Control System Tests

	Test	Limit	Frequency
1.	Drop time of each control blade (from full withdrawn position)	1 second from initiation of blade drop to full insertion	annual (14 month maximum interval)
2.	Reactivity worth of each control blade, reactivity insertion rate of each control blade, and shutdown margin		annual (14 month maximum interval)
3.	Operability test of interlocks listed in Table I	operable	prior to each startup

TABLE III

Reactor Safety System

Safety System Trips	Drop Blades	Dump Valve Open
Period less than 3 seconds	yes	yes
Power at 125% of full power	yes	yes
Manual scram	yes	yes
Loss of electrical power to control console	yes	yes
Primary cooling system		
Loss of pump power	yes	no
Low water level in core	yes	no
No flow	yes	no
Shield tank system		
Low water level	yes	no
Ventilation system		
Loss of power to ventilation fans	yes	no

TABLE IV

Safety System Operability Tests

Component or Scram Function	Frequency
Log N period channel	Prior to the first startup of each day and after repair or de-energization
Power level safety channels	
Loss of primary coolant pump power	
Loss of primary coolant level	
Loss of shield tank water level	
Loss of power to ventilation fans	