

**NC STATE UNIVERSITY**

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23 August 2000

U.S. Nuclear Regulatory Commission  
Document Control Room  
One White Flint North  
11555 Rockville Pike  
Rockville, MD 20852-2738

Subject: Changes to PULSTAR Reactor Facility Technical Specifications

Reference: License: R-120  
Docket: 50-297

Dear Sir or Madam:

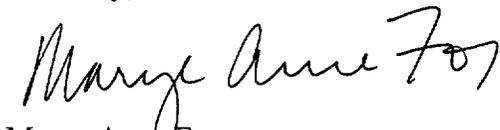
The Nuclear Reactor Program at North Carolina State University requests a revision to the facility technical specifications (TS). The attached document includes a synopsis of the changes, the affected pages and a draft of the proposed changes with new wording double underlined and deleted wording with strikeout font.

The changes may be grouped in two series. First, the TS are changed to address University administrative changes involving the Radiation Protection Committee. The second series of changes provide clarification for review and approval of emergency and security procedures.

Please do not hesitate to contact Mr. Pedro B. Perez, Associate Director of the Nuclear Reactor Program, at 919.515.4602 if you have any questions regarding our proposed changes.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 23 August 2000.

Sincerely,



Marye Anne Fox  
Chancellor

Attachments: As stated

A020

**NCSU PULSTAR Technical Specification Amendment 14  
Change Summary**

- Page 24 - Changed "Protection" to "Safety"  
- Sub paragraph "g" changed to "f"; "f" was previously skipped
- Page 25 - Changed "Protection" to "Safety"
- Page 46 - Changed "Protection" to "Safety"  
- Changed "Protection Office" to "Safety Division"
- Page 48 - Changed "Protection" to "Safety" on Organizational Chart
- Page 49 - Changed "Protection" to "Safety" & "RPC" to "RSC"  
- Redefined membership number, qualifications, and appointments to the Radiation Safety Committee based on the University's Radiation Safety Manual.  
- Removed the requirement that membership to the Reactor Audit and Safety Committee be recommended by the Radiation Safety Committee.
- Page 50 - Changed "RPC" to "RSC"  
- Changed meeting frequency for both committees (RSAC & RSC) to four times per year with not more than six months between meetings.
- Page 51 - Changed "RPC" to "RSC"
- Page 52 - Changed "RPC" to "RSC"  
- Added three subparagraphs (6.3.1, 6.3.2 & 6.3.3) to section 6.3 which expanded the original paragraph 6.3.g for greater detail and clarity.
- Page 54 - Changed "Protection" to "Safety" & "RPC" to "RSC"
- Page 55 - Changed "Protection" to "Safety"
- Page 56 - Changed "Protection" to "Safety"
- Page 60 - Changed "RPC" to "RSC"

**UPDATED SAFETY ANALYSIS REPORT**

**APPENDIX A**

**TECHNICAL SPECIFICATIONS FOR THE  
NORTH CAROLINA STATE UNIVERSITY  
PULSTAR REACTOR**

**FACILITY LICENSE NO. R-120  
DOCKET NO. 50-297**

**ORIGINAL ISSUE DATE: August 25, 1972**

**AMENDMENT 14**

**May 15, 2000**

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- ii. Attempts will be made to identify and limit the quantities of elements having very large thermal neutron absorption cross sections, in order to quantify reactivity effects.
  - iii. Explosive material<sup>(1)</sup>, shall not be allowed in the reactor. Experiments reviewed by the Radiation Safety Committee in which the material is considered to be potentially explosive, either while contained, or if it leaks from the container, shall be designed to maintain seal integrity even if detonated, to prevent damage to the reactor core or to the control rods or instrumentation and to prevent any change in reactivity.
  - iv. Each experiment will be evaluated with respect to radiation-induced physical and/or chemical changes in the irradiated material, such as decomposition effects in polymers.
  - v. Experiments involving flammable<sup>(1)</sup> or highly toxic materials<sup>(1)</sup> require specific procedures for handling and shall be limited in quantity as approved by the Radiation Safety Committee. No cryogenic liquids<sup>(1)</sup> will be allowed within the biological shield of the PULSTAR Reactor.
- f. Credible failure of any experiment shall not result in releases or exposures in excess of the annual limits established in 10 CFR 20.

<sup>(1)</sup>Defined as follows (reference - "Handbook of Laboratory Safety" - Chemical Rubber Company, 4<sup>th</sup> Ed., 1995, unless otherwise noted):

Toxic: A substance that has the ability to cause damage to living tissue when inhaled, ingested, injected, or absorbed through the skin ("Safety in Academic Chemistry Laboratories" - The American Chemical Society, 1994).

Flammable: Having a flash point below 73°F and a boiling point below 100°F. The flash point is defined as the minimum temperature at which a liquid forms a vapor above its surface in sufficient concentration that it may be ignited as determined by appropriate test procedures and apparatus as specified.

Explosive: Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion with substantially simultaneous release of gas and heat, the resultant pressure being capable of destructive effects. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators,

safety fuses, squibs, detonating cord, igniter cord, and igniters.

Cryogenic: A cryogenic liquid is considered to be a liquid with a normal boiling point below -238°F (reference - National Bureau of Standards Handbook 44).

### Bases

Specifications 3.7a, 3.7b, 3.7c, and 3.7d are intended to reduce the likelihood of damage to reactor components and/or radioactivity releases resulting from experiment failure; and, serve as a guide for the review and approval of new and untried experiments by the facility personnel, as well as the Radiation Safety Committee.

Specification 3.7e insures that no physical or nuclear interferences compromise the safe operation of the reactor, specifically, an experiment having a large reactivity effect of either sign could produce an undesirable flux distribution that could affect the peaking factor used in the Safety Limit calculation and/or safety channels calibrations. Review of the experiments using these LCOs and the Administrative Controls of Section 6 will insure the insertion of experiments will not negate the considerations implicit in the Safety Limits and thereby become an Unreviewed Safety Question.

analysis or technical support, and at least two years of supervisory experience. A B.S. degree in Nuclear Engineering or Physics may substitute for one year of the reactor analysis and or technical support experience.

LEVEL 3 - Reactor Operations Manager: The Reactor Operations Manager, who shall be qualified as a Senior Reactor Operator, shall be responsible for assuring that operations are conducted in a safe manner and within the limits prescribed by the facility license, all applicable Nuclear Regulatory Commission regulations, and the provisions of the Radiation Safety Committee. The Reactor Operations Manager reports directly to the Associate Director of the Nuclear Reactor Program.

LEVEL 4 - Operating Staff: This level includes the positions of Chief Reactor Operator, Chief of Reactor Maintenance, and the remaining Senior and Reactor operators. Personnel at this level report to the Reactor Operations Manager (for PULSTAR Reactor related matters).

Reactor Health Physicist: The Reactor Health Physicist is responsible for assuring the safety of reactor operations from the standpoint of radiation protection. The Reactor Health Physicist reports directly to the Nuclear Engineering Department Head and shall function independent of the campus Radiation Safety Division as shown in Figure 6.1-1. He shall possess relevant practical experience in the application of health physics principles.

In all instances, responsibilities of one level may be assumed by designated alternates or by higher levels, conditional upon the appropriate qualifications.

#### 6.1.2 Minimum Staffing

The minimum staffing when the reactor is not secured shall be:

- a. A certified reactor operator (either Senior Operator or Operator) in the Control Room.
- b. A Reactor Operator Assistant (ROA), capable of being at the reactor facility within five minutes upon request of the reactor operator on duty.
- c. A Senior Reactor Operator. This individual may be referred to as the "Designated Senior Reactor Operator (DSRO)" and shall be readily on call, meaning:
  - i. Has been specifically designated and the designation known to the reactor operator on duty.
  - ii. Keeps the reactor operator on duty informed of where he may be rapidly contacted and the phone number.

## NORTH CAROLINA STATE UNIVERSITY PULSTAR REACTOR ORGANIZATIONAL CHART

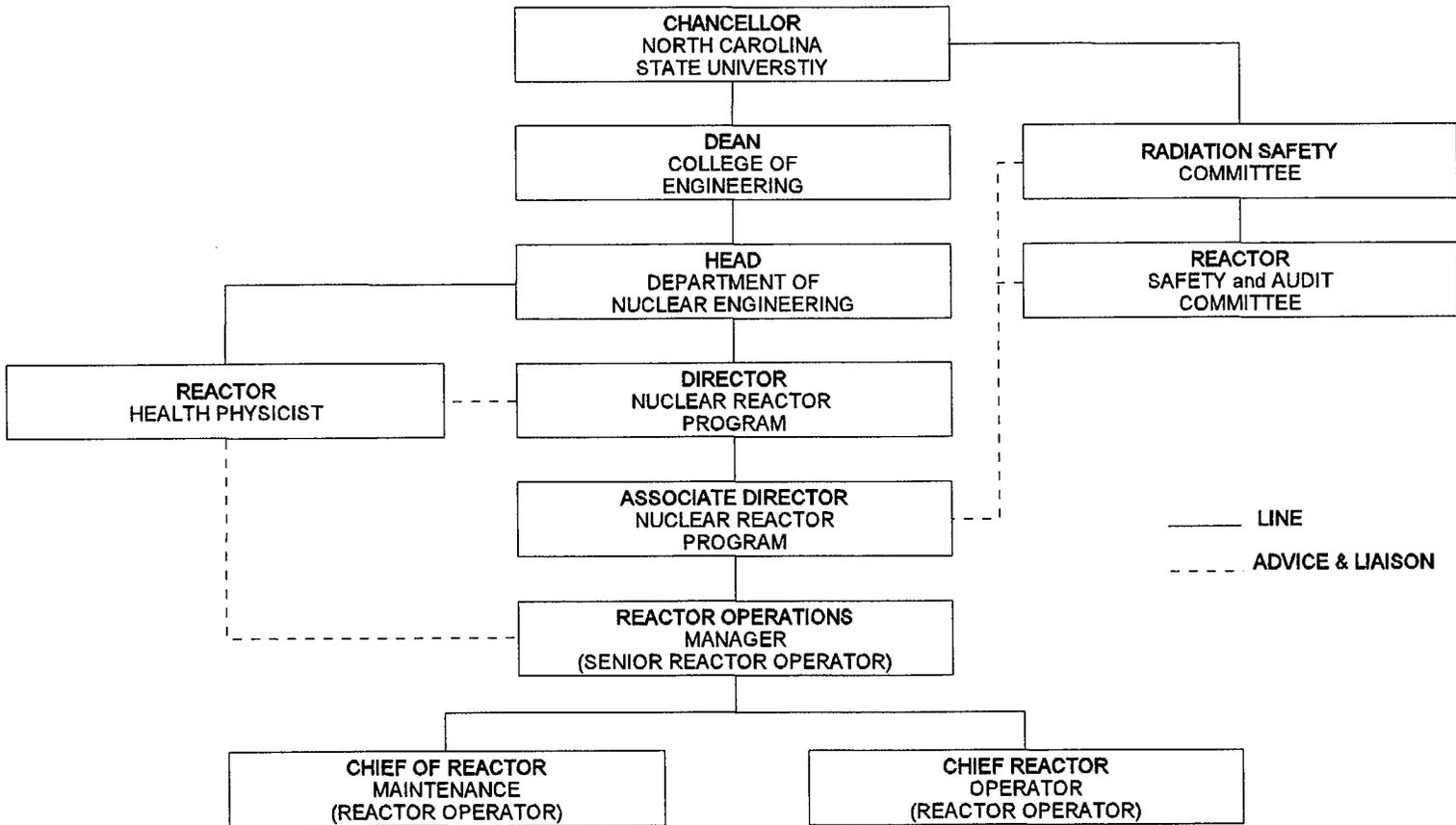


Figure 6.1-1

## 6.2 Review and Audit

### 6.2.1 Radiation Safety Committee and Reactor Safety and Audit Committee

The Radiation Safety Committee (RSC) has the primary responsibility to ensure that the use of radioactive materials and radiation producing devices, including the nuclear reactor, is conducted in the safest possible manner with the minimum effect on members of the University community and the general public. The RSC exercises oversight over the University Radiation Safety Program and performs final review of the actions of the Reactor Safety and Audit Committee (RSAC).

RSAC has the primary responsibility to assist the RSC in ensuring that the reactor is operated in compliance with the facility license and all applicable regulations. RSAC performs an annual audit of the operations and performance of the reactor program.

### 6.2.2 RSC and RSAC Composition and Qualifications

- a. RSC shall consist of at least five voting members from the general faculty who are actively engaged in teaching/research involving radioactive materials or radiation emitting devices. Additionally, two members from the Nuclear Engineering Department/Nuclear Reactor Program will be permanent members. Non-faculty members who are knowledgeable in nuclear science or radiation safety fields may also be voting members. Requirements for membership and appointments to this committee are made by the University through the office of the Vice Chancellor for Finance and Business and the Provost.
- b. RSAC shall consist of at least five persons who have expertise in one or more of the component areas of nuclear reactor safety. These include Nuclear Engineering, Nuclear Physics, Health Physics, Electrical Engineering, Chemical Engineering, Material Engineering, Radiochemistry, and Nuclear Regulatory Affairs. At least three of the members are appointed from the general faculty. These faculty members shall be constituted as follows: Director of the Nuclear Reactor Program shall serve as a permanent member, one member from an appropriate discipline within the College of Engineering, and one member from the general faculty. Appointments are for three years. The remaining RSAC members are the Reactor Health Physicist and a member from the Radiation Safety Division of the Environmental Health and Safety Center who serve as permanent members. An additional member may represent an outside nuclear related agency. At the discretion of RSAC, specialist from other universities and outside establishments may be invited to assist in its appraisals.
- c. A quorum shall consist of not less than a majority of the full RSC or RSAC and shall include the chairman or his designated alternate. Members from the line organization shown in Figure 6.1-1 shall not form a quorum.

- d. RSC and RSAC shall meet at least four times per year, with intervals between meetings not to exceed six months. Both committees may also meet upon call of the Chair.

### 6.2.3 RSC/RSAC Review and Approval Function

The following items shall be reviewed and approved by the RSC or by referral to the RSAC, as needed:

- a. Determinations that proposed changes in equipment, systems, test, experiments, or procedures which have safety significance do not involve an unreviewed safety question.
- b. All new procedures and major revisions thereto having safety significance, proposed changes in reactor facility equipment, or systems having safety significance.
- c. All new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity.
- d. Proposed changes to the Technical Specifications or facility license.
- e. Violations of technical specifications or license. Violations of internal procedures or instructions having safety significance.
- f. Operating abnormalities having safety significance.
- g. Reportable Events (as per technical specification definition 1.22).
- h. Audit reports.

RSC summaries and meeting minutes shall be provided to the Chancellor, Provost, Vice Chancellor for Research, Vice Chancellor for Business and Finance, Faculty Senate, and University Archives.

A summary of RSAC meeting minutes, reports, and audit recommendations approved by RSAC shall be submitted to Dean of the College of Engineering, Head of the Nuclear Engineering Department, Director of the Nuclear Reactor Program, Associate Director of the Nuclear Reactor Program, the RSC, Director of Environmental Health and Safety, and the RSAC prior to the next scheduled RSAC meeting. Recommendations of the annual audit made by RSAC are forwarded to the RSC for concurrence before being implemented.

#### 6.2.4 RSAC Audit Function

The audit function shall consist of selective, but comprehensive, examination of operating records, logs, and other documents. Discussions with cognizant personnel and observation of operations shall also be used as appropriate. The RSAC, under the authority of the RSC, shall be responsible for this audit function. This audit shall include:

- a. Facility operations for conformance to the technical specifications and license, annually, but at intervals not to exceed fifteen months.
- b. The retraining and requalification program for the operating staff, biennially, but at intervals not to exceed thirty months.
- c. The results of action taken to correct those deficiencies that may occur in the reactor facility equipment, systems, structures, or methods of operations that affect reactor safety, annually, but at intervals not to exceed fifteen months.
- d. The Emergency Plan and Emergency Procedures, biennially, but at intervals not to exceed thirty months.
- e. Radiation Protection.

Deficiencies uncovered that affect reactor safety shall be immediately reported to the Head of the Nuclear Engineering Department, Director of the Nuclear Reactor Program and the Associate Director of the Nuclear Reactor Program, and the RSC.

### 6.3 Operating Procedures

#### 6.3.1 Written Procedures

Written procedures shall be prepared, reviewed and approved prior to initiating any of the following:

- a. Startup, operation and shutdown of the reactor.
- b. Fuel loading, unloading, and movement within the reactor.
- c. Maintenance of major components of systems that could have an affect on reactor safety.
- d. Surveillance checks, calibrations and inspections required by the technical specifications or those that may have an affect on reactor safety.
- e. Personnel radiation protection, consistent with applicable regulations and that include commitment and/or programs to maintain exposures and releases as low as reasonably achievable (ALARA).
- f. Administrative controls for operations and maintenance and for the conduct of irradiations and experiments that could affect reactor safety or core reactivity.

Substantive changes to the above procedures shall be made effective only after documented review by the RSC (or RSAC as applicable) and approval by the Associate Director of the Nuclear Reactor Program, or his designated alternate.

Minor modifications to the original procedures which do not change their original intent may be made by the Reactor Operations Manager, but the modifications shall be approved by the Associate Director of the Nuclear Reactor Program within 14 days.

Temporary deviations from procedures may be made by the Senior Reactor Operator (on duty as required by specification 6.1.2 c.) or Reactor Operations Manager, in order to deal with special or unusual circumstances or conditions. Such deviations shall be documented and reported to the Associate Director of the Nuclear Reactor Program, or his designated alternate.

#### 6.3.2 Emergency Plan and Implementing Procedures

- a. The Emergency Plan is approved by the Associate Director of the Nuclear Reactor Program, RSAC, and forwarded to the Nuclear Regulatory Commission.
- b. The implementing procedures for the Emergency Plan are updated and approved by the Associate Director of the Nuclear Reactor Program.

6.3.3 Physical Security Plan and Implementing Procedures

- a. The Physical Security Plan is approved by the Associate Director of the Nuclear Reactor Program and forwarded to the Nuclear Regulatory Commission. This document, pursuant to 10 CFR 2.790, is to be withheld from public disclosure.
- b. The implementing procedures for the Physical Security Plan are updated and approved by the Associate Director of the Nuclear Reactor Program.

#### 6.4 Review of Experiments

##### 6.4.1 New (untried) Experiments

All new experiments or class of experiments, referred to as "untried" experiments, shall be reviewed and approved by the Associate Director of the Nuclear Reactor Program, Reactor Health Physicist, and the Radiation Safety Committee (or RSAC as applicable), prior to initiation of the experiment.

The review of new experiments shall be based on the limitations prescribed by Technical Specifications 3.7 and 3.8 and other Nuclear Regulatory Commission regulations, as applicable. If the Radiation Safety Committee, the Associate Director of the Nuclear Reactor Program, and the Reactor Health Physicist jointly agree that the experiment can be safely performed within the limitations of the technical specifications and other applicable Nuclear Regulatory Commission regulations, then an approved PULSTAR Project Number can be issued by the RSC for the experiment.

##### 6.4.2 Tried Experiments

All proposed experiments are reviewed by the Reactor Operations Manager and the Reactor Health Physicist (or their designated alternates). Either of these individuals may deem that the proposed experiment is not adequately covered by the documentation/analysis associated with an existing approved PULSTAR Project and therefore constitutes an untried experiment that will require the approval process detailed under Technical Specification 6.4.1. If the Reactor Operations Manager and the Reactor Health Physicist concur that the experiment is a tried experiment, then the request is approved and the experiment can be scheduled within the limitations of the reactor operating schedule.

Substantive changes to previously approved experiments shall be made only after review and approval by the Associate Director of the Nuclear Reactor Program, Reactor Health Physicist, and the Radiation Safety Committee (or RSAC as applicable).

6.5 Action to be Taken in Case of Safety Limit Violation

In the event a Safety Limit is violated:

- a. The reactor shall be shut down and reactor operations shall not be resumed until authorized by the Nuclear Regulatory Commission.
- b. The Safety Limit violation shall be promptly reported to the Associate Director of the Nuclear Reactor Program, or his designated alternate.
- c. The Safety Limit violation shall be reported to the Nuclear Regulatory Commission in accordance with specification 6.7.1.
- d. A Safety Limit violation report shall be prepared that describes the following:
  - i. Circumstances leading to the violation including, when known, the cause and contributing factors.
  - ii. Effect of violation upon reactor facility components, systems, or structures and on the health and safety of facility personnel and the public.
  - iii. Corrective action to be taken to prevent recurrence.

The report shall be reviewed by the Radiation Safety Committee and any follow-up report shall be submitted to the Nuclear Regulatory Commission when authorization is sought to resume operation.

6.6 Action to be Taken for Reportable Events (other than SL Violation)

In case of a Reportable Event (other than violation of a Safety Limit), as defined by section 1.22 of these specifications, the following action shall be taken:

- a. Reactor conditions shall be returned to normal or the reactor shall be shutdown. If it is necessary to shutdown the reactor to correct the occurrence, operations shall not be resumed unless authorized by the Associate Director of the Nuclear Reactor Program, or his designated alternate.
- b. The occurrence shall be reported to the Associate Director of the Nuclear Reactor Program, and to the Nuclear Regulatory Commission in accordance with specification 6.7.1
- c. The occurrence shall be reviewed by the Radiation Safety Committee at their next scheduled meeting.

## 6.7 Reporting Requirements

### 6.7.1 Reportable Event

For Reportable Events as defined by section 1.22 of these specifications, there shall be a report not later than the following work day by telephone to the Nuclear Regulatory Commission Operations Center followed by a written report within 14 days that describes the circumstances of the event.

### 6.7.2 Permanent Changes in Facility Organization

Permanent changes in the facility organization involving either Level 1 or 2 personnel (refer to specification 6.1) shall require a written report within 30 days to the Nuclear Regulatory Commission Document Control Desk.

### 6.7.3 Changes Associated with the Safety Analysis Report

Significant changes in the transient or accident analysis as described in the Safety Analysis Report shall require a written report within 30 days to the Nuclear Regulatory Commission Document Control Desk.

### 6.7.4 Annual Operating Report

An annual operating report is required to be submitted no later than August 31st of each year and will cover the period of July 1st through June 30th. The report is transmitted to the Document Control Desk, Nuclear Regulatory Commission, Washington. The annual report shall contain as a minimum, the following information:

- a. A brief narrative summary:
  - i. Operating experience including a summary of experiments performed.
  - ii. Changes in performance characteristics related to reactor safety that occurred during the reporting period
  - iii. Results of surveillance, tests and inspections.
- b. Tabulation of the energy output (in megawatt days) of the reactor, hours reactor was critical, and the cumulative total energy output since initial criticality.

- c. The number of emergency shutdowns and unscheduled SCRAMs, including reasons therefore, and corrective actions.
- d. Discussion of the corrective and preventative maintenance operations performed during the period, including the effect, if any, on the safety of operation of the reactor.
- e. A brief description, including a summary of the analyses and conclusions of changes in the facility or in procedures and of tests and experiments carried out pursuant to Section 50.59 of 10 CFR.
- f. A summary of the nature and amount of radioactive effluent 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, including:

Liquid Waste (summarized by quarter)

- i. Radioactivity released during the reporting period:

- (1) Number of batch releases.
- (2) Total radioactivity released (in microcuries).
- (3) Total liquid volume released (in liters).
- (4) Diluent volume required (in liters).
- (5) Tritium activity released (in microcuries).
- (6) Total (yearly) tritium released.
- (7) Total (yearly) activity released.

- ii. Identification of fission and activation products:

Whenever the undiluted concentration of radioactivity in the waste tank at the time of release exceeds  $2 \times 10^{-5}$   $\mu\text{Ci/ml}$ , as determined by a gross beta-gamma count of the dried residue of a one liter sample, a subsequent analysis shall also be performed prior to release for principle gamma emitting radionuclides. An estimate of the quantities present shall be reported for each of the identified nuclides.

- iii. Disposition of liquid effluent not releasable to the sanitary sewer system:

Any waste tank containing liquid effluent failing to meet the requirements of 10 CFR 20, Appendix B, reported hereunder, to include the following data:

- (1) Method of disposal.
- (2) Total radioactivity in the tank (in microcuries) prior to disposal.
- (3) Total volume of liquid in tank (in liters).
- (4) The dried residue of a one liter sample shall be analyzed for the principal gamma-emitting radionuclides. The identified isotopic composition with estimated concentrations shall be reported. The tritium content shall be included.

Gaseous Waste (summarized on a monthly basis)

- i. Radioactivity discharged during the reporting period (in curies) for:
  - (1) Gases
  - (2) Particulates, with half lives greater than eight days.
- ii. The AEC used and the estimated activity (in curies) discharged during the reporting period, by nuclide, for all gases and particulates based on representative isotopic analysis. (AEC values are given in 10 CFR 20, Appendix B, Table 2.)

Solid Waste

- i. The total amount of solid waste packaged (in cubic feet).
- ii. The total activity involved (in curies).
- iii. The dates of shipment and disposition (if shipped off-site).
- g. A summary of radiation exposures received by facility personnel and visitors, including pertinent details of significant exposures.
- h. A summary of the radiation and contamination surveys performed within the facility and significant results.
- i. A description of environmental surveys performed outside the facility.

6.8 Retention of Records

Records and logs of the following items, as a minimum, shall be kept in a manner convenient for review and shall be retained as detailed below. In addition, any additional federal requirement in regards to record retention shall be met.

- a. Records to be retained for a period of at least five (5) years:
  - i. Normal plant operation and maintenance.
  - ii. Principal maintenance activities.
  - iii. Reportable events.
  - iv. Equipment and components surveillance activities.
  - v. Experiments performed with the reactor.
  - vi. Changes to Operating Procedures
  - vii. Audit summaries
  - viii. RSC and RSAC meeting minutes
  
- b. Records to be retained for the life of the facility:
  - i. Gaseous and liquid radioactive waste released to the environs.
  - ii. Results of off-site environmental monitoring surveys.
  - iii. Radiation exposures for all PULSTAR personnel.
  - iv. Results of facility radiation and contamination surveys.
  - v. Fuel inventories and transfers.
  - vi. Drawings of the reactor facility.
  
- c. Records to be retained for at least one training cycle:
  - i. Records of retraining and requalification of certified operating personnel shall be maintained at all times the individual is employed, or until the certification is renewed.

- ii. Attempts will be made to identify and limit the quantities of elements having very large thermal neutron absorption cross sections, in order to quantify reactivity effects.
  - iii. Explosive material<sup>(1)</sup>, shall not be allowed in the reactor. Experiments reviewed by the Radiation Safety Protection Committee in which the material is considered to be potentially explosive, either while contained, or if it leaks from the container, shall be designed to maintain seal integrity even if detonated, to prevent damage to the reactor core or to the control rods or instrumentation and to prevent any change in reactivity.
  - iv. Each experiment will be evaluated with respect to radiation-induced physical and/or chemical changes in the irradiated material, such as decomposition effects in polymers.
  - v. Experiments involving flammable<sup>(1)</sup> or highly toxic materials<sup>(1)</sup> require specific procedures for handling and shall be limited in quantity as approved by the Radiation Safety Protection Committee. No cryogenic liquids<sup>(1)</sup> will be allowed within the biological shield of the PULSTAR Reactor.
- f. ~~g.~~ Credible failure of any experiment shall not result in releases or exposures in excess of the annual limits established in 10 CFR 20.

<sup>(1)</sup>Defined as follows (reference - "Handbook of Laboratory Safety" - Chemical Rubber Company, 4<sup>th</sup> Ed., 1995, unless otherwise noted):

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- Explosive: Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion with substantially simultaneous release of gas and heat, the resultant pressure being capable of destructive effects. The term includes, but is not limited to, dynamite, black powder, pellet powder, initiating explosives, detonators,

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analysis or technical support, and at least two years of supervisory experience. A B.S. degree in Nuclear Engineering or Physics may substitute for one year of the reactor analysis and or technical support experience.

LEVEL 3 - Reactor Operations Manager: The Reactor Operations Manager, who shall be qualified as a Senior Reactor Operator, shall be responsible for assuring that operations are conducted in a safe manner and within the limits prescribed by the facility license, all applicable Nuclear Regulatory Commission regulations, and the provisions of the Radiation Safety Protection Committee. The Reactor Operations Manager reports directly to the Associate Director of the Nuclear Reactor Program.

LEVEL 4 - Operating Staff: This level includes the positions of Chief Reactor Operator, Chief of Reactor Maintenance, and the remaining Senior and Reactor operators. Personnel at this level report to the Reactor Operations Manager (for PULSTAR Reactor related matters).

Reactor Health Physicist: The Reactor Health Physicist is responsible for assuring the safety of reactor operations from the standpoint of radiation protection. The Reactor Health Physicist reports directly to the Nuclear Engineering Department Head and shall function independent of the campus Radiation Safety Division Protection Office as shown in Figure 6.1-1. He shall possess relevant practical experience in the application of health physics principles.

In all instances, responsibilities of one level may be assumed by designated alternates or by higher levels, conditional upon the appropriate qualifications.

#### 6.1.2 Minimum Staffing

The minimum staffing when the reactor is not secured shall be:

- a. A certified reactor operator (either Senior Operator or Operator) in the Control Room.
- b. A Reactor Operator Assistant (ROA), capable of being at the reactor facility within five minutes upon request of the reactor operator on duty.
- c. A Senior Reactor Operator. This individual may be referred to as the "Designated Senior Reactor Operator (DSRO)" and shall be readily on call, meaning:
  - i. Has been specifically designated and the designation known to the reactor operator on duty.
  - ii. Keeps the reactor operator on duty informed of where he may be rapidly contacted and the phone number.

## 6.2 Review and Audit

### 6.2.1 Radiation Safety Protection Committee and Reactor Safety and Audit Committee

The Radiation Safety Protection Committee (RSC RPC) has the primary responsibility to ensure that the use of radioactive materials and radiation producing devices, including the nuclear reactor, is conducted in the safest possible manner with the minimum effect on members of the University community and the general public. The RSC RPC exercises oversight over the University Radiation Safety Protection Program and performs final review of the actions of the Reactor Safety and Audit Committee (RSAC).

RSAC has the primary responsibility to assist the RSC RPC in ensuring that the reactor is operated in compliance with the facility license and all applicable regulations. RSAC performs an annual audit of the operations and performance of the reactor program.

### 6.2.2 RSC RPC and RSAC Composition and Qualifications

- a. RSC RPC shall consist of at least five seven voting members from the general faculty who are actively engaged in teaching/research involving radioactive materials or radiation emitting devices. Additionally, two members from the Nuclear Engineering Department/Nuclear Reactor Program will be permanent members. Non-faculty members who are knowledgeable in nuclear science or radiation safety fields may also be voting members. Requirements for membership and appointments to this committee are made by the University through the office of the Vice Chancellor for Finance and Business and the Provost.

~~At least five of these faculty members are appointed to three year staggered terms by the University. Their terms shall be staggered so that no more than three of these five members may be replaced each year. These members shall be selected from faculty who are actively engaged in teaching and/or research involving the use of radiation or who manifest a high degree of expertise in the areas of nuclear science and related fields. One voting member is appointed by the Faculty Senate, whose term shall not exceed three years, and another voting member is appointed from the Department of Nuclear Medicine. Less than a majority of the RPC members shall be from the line organization presented in Figure 6.1-1. Non-voting ex-officio members include the University Radiation Protection Officer and the Director of Environmental Health and Safety. Representatives from the Physical Plant Division, University Research Administration, and Nuclear Reactor Program may serve in a non-voting liaison capacity. The RPC shall prescribe which review items (detailed in 6.2.3) are to be delegated to RSAC.~~

- b. RSAC shall consist of at least five persons who have expertise in one or more of the component areas of nuclear reactor safety. These include Nuclear Engineering, Nuclear Physics, Health Physics, Electrical Engineering, Chemical Engineering, Material Engineering, Radiochemistry, and Nuclear Regulatory Affairs. At least three of the members are appointed from the general faculty by the University upon recommendation by the RPC. These faculty members shall be constituted as follows: Director of the Nuclear Reactor Program shall serve as a permanent member, one member from an appropriate discipline within the College of Engineering, and one member from the general faculty. Appointments are for three years. The remaining RSAC members are the Reactor Health Physicist and a member from the Radiation Safety Protection Division of the Environmental Health and Safety Center who serve as permanent members. An additional member may represent an outside nuclear related

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agency. At the discretion of RSAC, specialist from other universities and outside establishments may be invited to assist in its appraisals.

- c. A quorum shall consist of not less than a majority of the full RSC RPE or RSAC and shall include the chairman or his designated alternate. Members from the line organization shown in Figure 6.1-1 shall not form a quorum.

- d. RSC and RSAC shall meet at least four times per year, with intervals between meetings not to exceed six months. Both committees may also meet upon call of the Chair.
- ~~d. The RPC shall meet at least six times per year. While the RSAC shall meet at least four times per year, with intervals between meetings not to exceed six months. RSAC may also meet as specifically required by the audit function or upon call of the Chairman.~~

### 6.2.3 RSC-RPC/RSAC Review and Approval Function

The following items shall be reviewed and approved by the RSC ~~RPC~~ or by referral to RSAC, as needed:

- a. Determinations that proposed changes in equipment, systems, test, experiments, or procedures which have safety significance do not involve an unreviewed safety question.
- b. All new procedures and major revisions thereto having safety significance, proposed changes in reactor facility equipment, or systems having safety significance.
- c. All new experiments or classes of experiments that could affect reactivity or result in the release of radioactivity.
- d. Proposed changes to the Technical Specifications or facility license.
- e. Violations of technical specifications or license. Violations of internal procedures or instructions having safety significance.
- f. Operating abnormalities having safety significance.
- g. Reportable Events (as per technical specification definition 1.22).
- h. Audit reports.

RSC ~~RPC~~ summaries and meeting minutes shall be provided to the Chancellor, Provost, Vice Chancellor for Research, Vice Chancellor for Business and Finance, Faculty Senate, and University Archives.

A summary of RSAC meeting minutes, reports, and audit recommendations approved by RSAC shall be submitted to Dean of the College of Engineering, Head of the Nuclear Engineering Department, Director of the Nuclear Reactor Program, Associate Director of the Nuclear Reactor Program, the RSC ~~RPC~~, Director of Environmental Health and Safety, and the RSAC prior to the next scheduled RSAC meeting. Recommendations of the annual audit made by RSAC are forwarded to the RSC ~~RPC~~ for concurrence before being implemented.

#### 6.2.4 RSAC Audit Function

The audit function shall consist of selective, but comprehensive, examination of operating records, logs, and other documents. Discussions with cognizant personnel and observation of operations shall also be used as appropriate. The RSAC, under the authority of the RSC RPE, shall be responsible for this audit function. This audit shall include:

- a. Facility operations for conformance to the technical specifications and license, annually, but at intervals not to exceed fifteen months.
- b. The retraining and requalification program for the operating staff, biennially, but at intervals not to exceed thirty months.
- c. The results of action taken to correct those deficiencies that may occur in the reactor facility equipment, systems, structures, or methods of operations that affect reactor safety, annually, but at intervals not to exceed fifteen months.
- d. The Emergency Plan and Emergency Procedures, biennially, but at intervals not to exceed thirty months.
- e. Radiation Protection.

Deficiencies uncovered that affect reactor safety shall be immediately reported to the Head of the Nuclear Engineering Department, Director of the Nuclear Reactor Program and the Associate Director of the Nuclear Reactor Program, and the RSC RPE.

### 6.3 Operating Procedures

#### 6.3.1 Written Procedures

Written procedures shall be prepared, reviewed and approved prior to initiating any of the following:

- a. Startup, operation and shutdown of the reactor.
- b. Fuel loading, unloading, and movement within the reactor.
- c. Maintenance of major components of systems that could have an affect on reactor safety.
- d. Surveillance checks, calibrations and inspections required by the technical specifications or those that may have an affect on reactor safety.
- e. Personnel radiation protection, consistent with applicable regulations and that include commitment and/or programs to maintain exposures and releases as low as reasonably achievable (ALARA).
- f. Administrative controls for operations and maintenance and for the conduct of irradiations and experiments that could affect reactor safety or core reactivity.
- ~~g. Implementation of the Emergency Plan and Security Plan.~~

Substantive changes to the above procedures shall be made effective only after documented review by the ~~RSC RPE~~ (or RSAC as applicable) and approval by the Associate Director of the Nuclear Reactor Program, or his designated alternate.

Minor modifications to the original procedures which do not change their original intent may be made by the Reactor Operations Manager, but the modifications shall be approved by the Associate Director of the Nuclear Reactor Program within 14 days.

Temporary deviations from procedures may be made by the Senior Reactor Operator (on duty as required by specification 6.1.2 c.) or Reactor Operations Manager, in order to deal with special or unusual circumstances or conditions. Such deviations shall be documented and reported to the Associate Director of the Nuclear Reactor Program, or his designated alternate.

#### 6.3.2 Emergency Plan and Implementing Procedures

- a. The Emergency Plan is approved by the Associate Director of the Nuclear Reactor Program and forwarded to the Nuclear Regulatory Commission.
- b. The implementing procedures for the Emergency Plan are updated and approved by the Associate Director of the Nuclear Reactor Program.

Note: Because of new sub-sections added to section 6.3, pages were incremented by 1, starting with page 53 to the end of the document.

6.3.3 Physical Security Plan and Implementing Procedures

- a. The Physical Security Plan is approved by the Associate Director of the Nuclear Reactor Program and forwarded to the Nuclear Regulatory Commission. This document, pursuant to 10 CFR 2.790, is to be withheld from public disclosure.
  
- b. The implementing procedures for the Physical Security Plan are updated and approved by the Associate Director of the Nuclear Reactor Program.

#### 6.4 Review of Experiments

##### 6.4.1 New (untried) Experiments

All new experiments or class of experiments, referred to as "untried" experiments, shall be reviewed and approved by the Associate Director of the Nuclear Reactor Program, Reactor Health Physicist, and the Radiation Safety Protection Committee (or RSAC as applicable) prior to initiation of the experiment.

The review of new experiments shall be based on the limitations prescribed by Technical Specifications 3.7 and 3.8 and other Nuclear Regulatory Commission regulations, as applicable. If the Radiation Safety Protection Committee, the Associate Director of the Nuclear Reactor Program, and the Reactor Health Physicist jointly agree that the experiment can be safely performed within the limitations of the technical specifications and other applicable Nuclear Regulatory Commission regulations, then an approved PULSTAR Project Number can be issued by the RSC RPE for the experiment.

##### 6.4.2 Tried Experiments

All proposed experiments are reviewed by the Reactor Operations Manager and the Reactor Health Physicist (or their designated alternates). Either of these individuals may deem that the proposed experiment is not adequately covered by the documentation/analysis associated with an existing approved PULSTAR Project and therefore constitutes an untried experiment that will require the approval process detailed under Technical Specification 6.4.1. If the Reactor Operations Manager and the Reactor Health Physicist concur that the experiment is a tried experiment, then the request is approved and the experiment can be scheduled within the limitations of the reactor operating schedule.

Substantive changes to previously approved experiments shall be made only after review and approval by the Associate Director of the Nuclear Reactor Program, Reactor Health Physicist, and the Radiation Safety Protection Committee (or RSAC as applicable).

6.5 Action to be Taken in Case of Safety Limit Violation

In the event a Safety Limit is violated:

- a. The reactor shall be shut down and reactor operations shall not be resumed until authorized by the Nuclear Regulatory Commission.
- b. The Safety Limit violation shall be promptly reported to the Associate Director of the Nuclear Reactor Program, or his designated alternate.
- c. The Safety Limit violation shall be reported to the Nuclear Regulatory Commission in accordance with specification 6.7.1.
- d. A Safety Limit violation report shall be prepared that describes the following:
  - i. Circumstances leading to the violation including, when known, the cause and contributing factors.
  - ii. Effect of violation upon reactor facility components, systems, or structures and on the health and safety of facility personnel and the public.
  - iii. Corrective action to be taken to prevent recurrence.

The report shall be reviewed by the Radiation ~~Safety Protection~~ Committee and any follow-up report shall be submitted to the Nuclear Regulatory Commission when authorization is sought to resume operation.

6.6 Action to be Taken for Reportable Events (other than SL Violation)

In case of a Reportable Event (other than violation of a Safety Limit), as defined by section 1.22 of these specifications, the following action shall be taken:

- a. Reactor conditions shall be returned to normal or the reactor shall be shutdown. If it is necessary to shutdown the reactor to correct the occurrence, operations shall not be resumed unless authorized by the Associate Director of the Nuclear Reactor Program, or his designated alternate.
- b. The occurrence shall be reported to the Associate Director of the Nuclear Reactor Program, and to the Nuclear Regulatory Commission in accordance with specification 6.7.1
- c. The occurrence shall be reviewed by the Radiation Safety Protection Committee at their next scheduled meeting.

## 6.8 Retention of Records

Records and logs of the following items, as a minimum, shall be kept in a manner convenient for review and shall be retained as detailed below. In addition, any additional federal requirement in regards to record retention shall be met.

- a. Records to be retained for a period of at least five (5) years:
  - i. Normal plant operation and maintenance.
  - ii. Principal maintenance activities.
  - iii. Reportable events.
  - iv. Equipment and components surveillance activities.
  - v. Experiments performed with the reactor.
  - vi. Changes to Operating Procedures
  - vii. Audit summaries
  - viii. RSC RPC and RSAC meeting minutes
- b. Records to be retained for the life of the facility:
  - i. Gaseous and liquid radioactive waste released to the environs.
  - ii. Results of off-site environmental monitoring surveys.
  - iii. Radiation exposures for all PULSTAR personnel.
  - iv. Results of facility radiation and contamination surveys.
  - v. Fuel inventories and transfers.
  - vi. Drawings of the reactor facility.
- c. Records to be retained for at least one training cycle:
  - i. Records of retraining and requalification of certified operating personnel shall be maintained at all times the individual is employed, or until the certification is renewed.