BY ORDER OF THE SECRETARY OF THE AIR FORCE

AIR FORCE INSTRUCTION 91-109

11 MARCH 1994

Safety

AIR FORCE NUCLEAR REACTOR PROGRAM

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

OPR: HQ AFSA/SENA
(Maj Richard M. DeSimone)
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Certified by: HQ USAF/SE
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This instruction implements AFPD 91-1, *Nuclear Weapons and Systems Surety*. It sets up the Air Force nuclear reactor program. It does not apply to the Air Force Reserve and Air National Guard. Send major command (MAJCOM) supplements to the Air Force Safety Agency (HQ AFSA/SENA, 9700 Avenue G, Kirtland AFB NM 87117-5671) for coordination and HQ USAF/SE, 1400 Air Force Pentagon, Washington DC20330-1400 for approval before publication.

SUMMARY OF REVISIONS

This revision aligns the instruction with AFPD 91-1. It incorporates material previously in AFR 122-14. It includes numerous administrative changes to improve readability.

Section A—General Information

1. Nuclear Reactor Systems. The Air Force Nuclear Reactor Program ensures the safety and security of reactor systems consistent with operational requirements. The program applies to all phases of a system's life--from design to decommissioning. This instruction does not apply to reactor systems licensed or granted permits by the Nuclear Regulatory Commission (NRC) or the Department of Energy (DOE).

2. System Standards. Air Force Nuclear Reactor System Standards provide positive measures that:

- Maintain radiation exposures to the public, the environment, and operating personnel as low as reasonably achievable (ALARA).
- Minimize the probability of a nuclear reactor system mishap.
- Minimize the consequences of a nuclear reactor system mishap.
- Ensure adequate security of nuclear reactor systems.

Section B—Responsibilities

3. Assistant Secretary of the Air Force (Acquisition) (SAF/AQ). SAF/AQ requests, through the Assistant to the Secretary of Defense (Atomic Energy), DOE concurrence to acquire and operate a reactor system under section 91b, Atomic Energy Act of 1954.

4. Air Force Chief of Safety (HQ USAF/SE). HQ USAF/SE oversees reactor system design and evaluation criteria and coordinates reactor system policy within HQ USAF and with other government agencies.

5. Air Force Safety Agency (HQ AFSA). HQ AFSA/CC manages the Air Force Nuclear Reactor Program. HQ AFSA/SEN:

- Develops design and evaluation safety criteria for reactor systems based on the four Nuclear Reactor System Standards.
- Conducts studies and supporting activities.
- Issues system permits.
- Performs quality assurance program reviews.
- Conducts reactor system audits.
- Approves reactor system documents and changes.
- Certifies senior reactor operators (SRO), reactor operators (RO), and reactor console operators (RCO), collectively referred to as certified operators.
- Approves tests and experiments not addressed in existing nuclear reactor documents.

6. Air Force Surgeon General (HQ USAF/SG). HQ USAF/SG:

- Provides policy and guidance on occupational and public health.
- Provides policy and guidance on the medical aspects of programs to train and certify personnel.
- Participates in reactor studies.
- Coordinates on all reactor study reports.

7. Judge Advocate General (HQ USAF/JA). HQ USAF/JA is the HQ USAF point of contact for reactor system legal matters and coordinates on all reactor study reports.

8. Air Force Civil Engineer (HQ USAF/CE). HQ USAF/CE:

- Is the HQ USAF point of contact for reactor military construction projects, environmental protection criteria, and environmental assessments.
- Informs HQ USAF/SE and AFSA/CC (through HQ AFSA/SEN) of the status of the environmental impact analysis process for nuclear reactor systems.
- Coordinates on all reactor studies.
- Participates in reactor studies, as requested.

9. Air Force Chief of Security Police (HQ USAF/SP). Through the Air Force Security Police Agency, HQ USAF/SP:

- Oversees the physical security aspects of reactor systems.
- Develops physical security criteria for reactor systems based on the four Nuclear Reactor System Standards.
- Coordinates on all reactor study reports.
- Participates in reactor studies, as requested.

10. Major Command (MAJCOM). Each MAJCOM with a reactor system or program:

- Notifies HQ AFSA/SEN of plans to build a nuclear reactor system as early as possible in the development process and before applying for a reactor system construction permit.
- Asks SAF/AQ to obtain DOE concurrence.
- Applies for nuclear reactor system permits by sending the documents listed in table 1 to HQ AFSA/SEN.
- Sends reports and plans to HQ AFSA/SEN.
- Provides technical support and data to the organizations participating in reactor studies.
- Arranges and hosts study field trips and reviews, as requested.
- Implements a quality assurance program for designing, constructing, and decommissioning nuclear reactor system facilities and for major modifications that affect reactor system safety or security.
- Establishes a system safety program.
- Designates a responsible commander for each reactor system.
- Sends requests for modifications to HQ AFSA/SEN.
- Sends requests for conducting tests or experiments not addressed in existing reactor documents to HQ AFSA/SEN.

11. Responsible Commander:

- Exercises command authority over all functions pertaining to reactor operations and the staff agencies supporting those operations.
- Ensures the safe and secure operation of the reactor system.
- Implements a unit reactor program.
- Appoints a nuclear reactor safety manager.
- Emphasizes mishap prevention and identifies, investigates, reports, and corrects problems that affect the program.
- Ensures periodic reviews of local instructions, operating procedures, plans, and other directives that affect nuclear safety and security.
- Organizes a reactor system safety council.
- Provides physical security for the reactor system.
- Implements a fitness-for-duty program.

12. Facility Director. The facility director must be a certified SRO or approved by HQ AFSA/SEN. Acting for the responsible commander, the facility director:

- Manages a safe and efficient nuclear reactor program and ensures permit compliance.
- Trains operators.
- Implements a quality assurance program.

13. Nuclear Reactor Safety Manager (NRSM). The NRSM is the point of contact, independent of the reactor system staff, for safety matters and mishap prevention. As coordinator and independent advisor to the responsible commander and staff, the NRSM must be aggressively involved in overseeing nuclear operations. The NRSM identifies safety problems to the facility director and responsible functional manager for resolution and assists them. If a problem is significant or resolution does not appear to be timely and effective, the NRSM should request action by the responsible commander. The NRSM need not be an expert in all areas and may task appropriate experts to provide help, as needed. The NRSM:

- Performs an annual nuclear reactor system audit.
- Reviews corrective actions. ***Note: The NRSM is not responsible for deficiencies that are the responsibility of the facility director or functional managers and supervisors.***
- Helps prepare nuclear mishap reports.
- Reviews nuclear mishap reports from higher headquarters or other units and NRC licensee event reports for nonpower reactor systems.
- Sends pertinent mishap reports to Air Force reactor system facilities for crossfeed, training, and corrective action.
- Coordinates on locally developed checklists, instructions, operating procedures, and plans that affect nuclear reactor system safety.

14. Host-Base Responsibilities. At the host-base:

- The director of base medical services must provide medical evaluations to reactor operations personnel.
- The chief of security police ensures unit security documents and procedures meet nuclear reactor security requirements.

15. Operations Supervisor. The operations supervisor is responsible for reactor facility daily operations, technical specification compliance, and maintenance. The operations supervisor, who must be a certified SRO, ensures only trained and certified personnel conduct reactor activities.

16. Assigned Supervisors:

- Monitor the reliability of their subordinates and notify the facility director of potentially disqualifying information.
- Enforce compliance with the Air Force and unit reactor programs.
- Review the status of safety and security problems before each shift.
- Ensure only certified operators or trainees in the presence of a certified operator manipulate reactor system controls.

- Ensure personnel who can affect the reactivity of the reactor system while using experimental facilities are certified operators, are in the presence (direct supervision) of a certified operator, or are trained and approved by facility management.
- In conjunction with existing HAZMAT and other occupational programs, informs people of safety problems and encourage them to report any hazards or problems.

17. Assigned Individuals. Personnel assigned to certified duties are the most important part of the reactor program. They must be technically competent, understand the nuclear safety and security aspects of their jobs, be positively motivated and reliable, and be willing to monitor their own reliability. Everyone must:

- Report reactor safety hazards and security problems to supervisors.
- Report any other problems (e.g., medical, personal) that could reduce effectiveness and create a safety hazard.
- Perform tasks using approved procedures and directives.
- Inform the supervisor when a coworker's reliability is suspect.

Section C—Reactor Permits

18. Permit Types:

- Construction permit to build the system.
- Load and test permit to receive fuel, initialize core loading, and characterize and test the system.
- Operating permit for routine reactor system use.
- Decommissioning permit to decommission the system.
- Special permits to cover other operations.

19. Application Procedures. The responsible commander must apply for permits. Send reactor permit applications (signed original and 30 copies of supporting documents) to HQ AFSA/SEN. Include:

- Responsible commander's name and title.
- Type of permit application.
- Planned facility uses.
- Time period for the permit.
- Documents in table 1.

20. Permit Approval. HQ AFSA/SEN issues permits after Air Staff approval of the appropriate study report (see section D).

21. Permit Suspension. HQ AFSA/SEN or the facility's operational chain of command may suspend permits if the operating agency does not maintain the permit requirements or if public safety is at risk. The MAJCOM must immediately notify HQ AFSA/SEN of the suspension, which remains in effect pending HQ AFSA/SEN review. Only HQ AFSA/SEN can remove suspensions.

22. Permit Amendments. Only HQ AFSA/SEN can approve amendments.

Section D—Nuclear Reactor Studies

23. Study Purpose. Reactor studies evaluate whether Air Force reactor systems meet the Air Force Nuclear Reactor System Standards and the system design and evaluation criteria. Study participants must ensure facility operations and programs meet the commitments in the required facility documentation. HQ AFSA/SEN appoints an executive officer for the study, designates organizations to participate, and funds voting-member travel. Studies must cover the applicable areas in **Attachment 1**.

24. Formal Report:

- HQ AFSA/SEN documents conclusions and recommendations.
- The study participants sign the report for their organizations.
- HQ USAF/SEC consolidates the Air Staff position and sends it to HQ AFSA/SEN along with guidance.
- HQ AFSA/SEN publishes and distributes the report.

25. Initial Nuclear Reactor Study. This study evaluates the system early in development to determine if the design provides adequate reactor safety and security. The study is usually conducted when the design concept is firm so deficiencies can be corrected without undue cost.

26. Preoperational Nuclear Reactor Study. This study evaluates the organization's readiness to conduct initial reactor operations and determines if construction and staffing provide adequate safety and security.

27. Operational Nuclear Reactor Study. This study examines the system's design safety features, facility technical specifications, and procedures to ensure the system meets the Air Force Nuclear Reactor System Standards and evaluates its readiness for continuing operations.

28. Special Nuclear Reactor Study. As determined by HQ AFSA/SEN, these studies can be used to evaluate:

- Potentially unsafe conditions revealed during operational experience.
- Modifications or retrofits that affect reactor safety or security.
- Tests that affect nuclear reactor safety or security.
- Significant changes or modifications in the operational concept that affect reactor safety or security.
- Any other condition that could affect reactor safety or security.

29. Decommissioning Nuclear Reactor Study. This study evaluates the MAJCOM's ability to decommission the reactor system. The MAJCOM cannot begin decommissioning activities until after the study nor defer the study beyond 1 year after reactor operations cease.

30. Nuclear Reactor Study Findings. HQ AFSA/SEN recommends action agencies and suspense dates for each finding. The action agency must report the status of corrective actions for a finding to HQ

AFSA/SEN by the 10th of each month until HQ AFSA/SEN closes the finding. Only HQ AFSA/SEN can close findings.

Section E—Required Nuclear Reactor System Documentation

31. Required Documentation. Table 1 lists the documents required for each nuclear reactor study.

32. Safety Analysis Reports. The following reports must comply with NRC Regulatory Guide 1.70, *Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants*:

- **Preliminary Safety Analysis Report.** Contains information about the proposed system in relation to the development program.
- **Updated Safety Analysis Report.** Contains the proposed operational concept and information about the nuclear reactor system.
- **Facility Safety Analysis Reports.** Contains a description of the reactor system and planned operations.
- **Special Safety Analysis Report.** Contains a description of the reactor system and the proposed modification, procedural change, or test.

33. Technical Specifications. These specifications, derived from the Safety Analysis Report, include:

- Safety limitations and limiting safety system settings.
- Limiting conditions for operation.
- Surveillance requirements.
- Design features.
- Administrative controls.

34. Training Plan. Outlines the operations personnel training program. Facility documentation approved by HQ AFSA/SEN specifies technical qualifications for certified operators.

35. Requalification Plan. Outlines the requalification program for certified operators.

36. Physical Security Plan. Provides measures for resource protection and plans to counter threats to the reactor system.

37. Emergency Plan. Contains facility-unique emergency procedures.

38. Decommissioning Plan. Identifies status and operating history, radioactive material inventory, planned decommissioning program, radiological and nonradiological safety analyses, and organization and control.

39. Environmental Radiation Surveillance Plan. Outlines the collection and analysis of air, water, and soil samples in the area of interest. During the pre- and post- operational periods, vegetation and animal samples are also included.

Section F—Safety Agency Reviews and Audits

40. Quality Assurance Program Review (QAPR). The QAPR is a series of reviews that assess MAJCOM quality assurance programs. HQ AFSA/SEN conducts the QAPR during design, construction, decommissioning, and major modifications. The review covers quality assurance records and procedures affecting design, fabrication, construction, equipment installation, and test and checkout. The requirements are separate from contract-mandated inspections. The facility director must notify HQ AFSA/SEN (by letter) before beginning any major modification that affects reactor safety or security. HQ AFSA/SEN determines if a QAPR is needed.

41. Facility Audits. Audits determine if the facility is operating within its operating permit. HQ AFSA/SEN continuously monitors operational reactor systems and audits each area in **Attachment 1** at least once every 2 years. A report documents the findings, observations, and commendable items found during the audit and provides an assessment of the reviewed area. The report includes an estimated completion date for all actions. The audited unit must correct each finding as quickly as possible and provide monthly status reports to HQ AFSA/SEN by the 10th of each month until all findings are closed. Only HQ AFSA/SEN can close findings.

Section G—Unit Nuclear Reactor Program

42. Nuclear Reactor System Operating Reports, RCS: HAF-SE(A)9208. The facility director must send HQ AFSA/SEN an initial reactor startup report and annual reactor system operating reports (due by 30 June). Each annual report summarizes reactor system use, corrective maintenance, unscheduled shutdowns, reportable occurrences, and changes and tests.

43. Environmental Radiation Surveillance Reports, RCS: HAF-SE(A)9209. The facility director must send:

43.1. Quarterly reports to the host-base bioenvironmental engineer and environmental protection office that include results of area monitoring, sample analyses, and other significant data (e.g., releases into the environment exceeding allowable levels).

43.2. Annual reports of summarized data to HQ AFSA/SEN (due by 30 June).

44. Nuclear Reactor Safety Council. The responsible commander establishes the council to ensure coordination among organizations involved in reactor system construction, operation, and decommissioning. The council may be combined with other safety councils or committees. These guidelines apply:

- The responsible commander or vice commander should chair the council. Do not delegate this responsibility below directorate level.
- Prepare a written charter for the council, including operating procedures and voting rules.
- Have a recorder present.
- The facility director, operations supervisor, facility health physicist, NRSM, and the base radiation safety officer must be present.
- Representatives from the security police, medical services, civil engineering, safety, disaster preparedness, bioenvironmental engineering, and staff judge advocate's office should attend.

- The council meets at least semi-annually.
- Participants advise the chair on matters affecting reactor system safety, security, and reliability.
- The responsible commander maintains minutes documenting attendance and action items with suspense date, tracks action items until completed, and sends a copy of the minutes to HQ AFSA/SEN.

45. Fitness-for-Duty Program. The program provides reasonable assurance that personnel are reliable, not under the influence of any substance, and are not mentally or physically impaired in a way that could adversely affect their performance. The program includes adequate measures to identify individuals who are not fit to perform duties affecting the safety or security of the reactor. Each responsible commander must implement the program for certified operators and trainees at facilities with a load and test or operating permit.

46. Personnel Training. Training maintains the technical and professional competence of reactor operations personnel. Supervisors must ensure the required training is given and documented.

47. Facility Maintenance. Supervisors must ensure maintenance is done and documented to maintain the quality of reactor operations. Documentation must specify those maintenance tasks that are reactor related and those tasks that require over-the-shoulder SRO supervision. Reactor-related maintenance requires preapproval by the on-duty SRO and must be performed or supervised by an RO or SRO.

48. Annual Nuclear Reactor System Audit. The NRSM must perform an annual audit of the reactor program. Audit each area listed in **Attachment 1**. Audit areas in one effort or space the audit of the areas throughout a 12-month period. Document an annual audit in a report. If done separately, document each audit area as it is completed. ***Note: The annual audit may be combined with other safety inspections, audits, or reviews.***

49. Quality Assurance Program. Quality assurance prevents or reduces any impact on public health and safety as a result of the facility's operation. This is particularly important for facility modifications. Supervisors must ensure changes do not decrease the margin of safety of the original design and document the changes. The quality assurance program must be consistent with nuclear industry standards.

Section H—Operator Requirements

50. Operator Qualifications. Facility documentation approved by HQ AFSA/SEN specifies technical qualifications for certified operators.

51. Medical Examinations. Before being certified, an operator must have a medical examination. An examination is necessary if a significant change in medical status occurs. The facility director must coordinate with the base aerospace medicine council to establish medical examination criteria for certified operators using guidance in the American National Standard ANSI/ANS 15.4. Operators must have the physical and mental health needed to properly exercise their duties under normal and credible abnormal conditions. HQ AFSA/SEN requires copies of waivers given to certified operators including detailed statements of any limitations associated with the waiver. Include the limitations in the operator certification letter.

52. Medical Restrictions. Restrictions are for conditions that cannot be corrected within a year (e.g., use of corrective lenses while operating a reactor system). The facility director must notify HQ AFSA/SEN of the need for a restriction.

Section I—Operator Training Program

53. Candidate Training. The facility director:

- Establishes a training program to provide candidates with the knowledge and skills needed to safely operate and maintain the reactor system and ensure its security.
- Develops the training program according to the model in AFI 36-2201, *Developing Military Training Programs*, (formerly AFM 50-2) and covers the training topics in **Table 2.** as a minimum.
- Includes any other topics applicable for each operator position and reviews the training plan every 2 years.
- Makes the training program commensurate with the level of responsibility in paragraph **54.**
- Considers a candidate's previous training and experience.

54. Required Abilities:

- **Reactor Console Operator (RCO).** Must be able to operate the controls and monitor the instrumentation of the nuclear reactor system and perform other required tasks during normal, abnormal, and emergency operations.
- **Reactor Operator (RO).** Has RCO abilities and the ability to perform reactor-related maintenance tasks.
- **Senior Reactor Operator (SRO).** Has RO abilities, is able to direct the activities of RCOs and ROs, and understands administrative controls.

55. Requalification Program. The facility director must establish an ongoing requalification program for certified operators to ensure competence, address topics not reinforced by direct or constant use, and improve weak performance areas. The program evaluates and improves each worker's knowledge and proficiency in doing certified duties. The facility director may integrate the requalification plan with the facility training plan. Individuals must requalify every 2 years from the date of certification. The facility director may request an extension of up to 90 calendar days for extenuating circumstances. Failure to requalify causes decertification. Review the plan every 2 years. The plan must contain:

- Course content (the training topics in **Table 2.** as a minimum).
- Descriptions of tests and passing criteria. Requalification tests may be administered before training. A passing grade on the test allows credit for that specific topic.
- A schedule of training that completes each major topic in 2 years.

56. Recurring Training Requirements. Certified operators must:

- Annually review the contents of abnormal and emergency procedures.
- Receive training on changes to facility documentation, including procedures, before performing certified duties affected by the changes.

- Be retrained promptly if any evaluation indicates a deficiency in a critical area.

57. Training Documentation. The facility director maintains training and certification documents according to AFI 37-138, *Records Disposition--Responsibilities and Procedures,* (formerly AFR 12-50, volume 1), including:

- Current training and requalification programs.
- Documents used in certification and requalification including operating procedures and training and reference materials.
- Training and certification records, including copies of completed training, current medical certification, the certification letter issued by HQ AFSA/SEN, and decertification records.

Section J—Operator Certification Process

58. Applications and Document Reviews. After ensuring the applicant is qualified, the facility director sends certification applications to HQ AFSA/SEN (by letter) at least 120 calendar days before the desired certification date. The director also provides copies of the current operational procedures (normal and emergency), current operational data and formulas, and suggested test questions (optional). Before the test, HQ AFSA/SEN will review the medical evaluations and training records pertaining to the applicants. Do not mail the records to HQ AFSA/SEN, the review will take place at the facility.

59. Certification Tests. HQ AFSA/SEN administers written and performance tests. The written test covers the categories in **Table 2.** and requires a passing score of at least 70 percent in all applicable categories. The performance test evaluates applicable individual operational and maintenance skills and performance. The examiner questions the candidate during the performance test to evaluate knowledge and ability to communicate. A certified SRO supervises performance testing. Candidates failing either test may retake it after remedial training. The facility director sends another application for certification detailing the additional training the candidate received. Candidates failing in more than two categories retake the entire test.

60. Official Certification. HQ AFSA/SEN issues the proper certification letter after an applicant successfully completes the certification process. Certification is valid for 6 years from the date of issue or until decertification whichever comes first.

Section K—Operator Proficiency Requirements

61. Minimum Reactivity Manipulations. Each quarter, certified operators must perform at least two significant reactivity manipulations, as defined by the facility director. An SRO must supervise certified operators that have not met this requirement while they are performing operations until they meet the requirements.

62. Absence From Certified Functions. A certified operator who has not actively performed certified functions for 4 months must demonstrate satisfactory knowledge and proficiency to the facility director or operations supervisor before returning to certified duties.

63. Suspension From Certified Duties. A suspended operator cannot perform any certified duties until all corrective conditions are met. The facility director or responsible commander will initiate the suspension based on a condition that can be corrected or eliminated. A suspension should not exceed 120 calendar days and the facility director must notify HQ AFSA/SEN if the condition cannot be corrected within that time. Operator suspensions are based on but not limited to:

- Mental or physical conditions that could affect the individual's ability to reliably perform certified duties.
- Poor judgment or behavior that could lead to an unsafe condition.
- Performance indicating a need for additional training.
- Charges involving a criminal act and further legal actions expected.

64. Operator Decertification. The facility director, responsible commander, MAJCOM, and HQ AFSA/SEN can decertify an operator based on medical disqualification, lack of proficiency, or any reason that could seriously affect reactor system safety or security. Decertification is not punitive and is not grounds for administrative or disciplinary action, but authorities may use the information leading to decertification for appropriate disciplinary or administrative actions. The decertification authority must notify the facility director, responsible commander, MAJCOM, or HQ AFSA/SEN as applicable. The facility director must notify the decertified individual verbally and in writing.

65. Duty-Hour Limitations. Limit shifts to 12 hours with at least 12 hours of rest between shifts. The facility director or the operations supervisor may approve waivers to these limitations on a case-by-case basis. Use of waivers should not exceed two times a month.

Table 1. Support Documents for Nuclear Reactor Study Permits.

RULE	A If the study is	B the MAJCOM sends HQ AFSA/SEN	C resulting in
1	an Initial Nuclear Reactor Study	an application for a construction permit to include: Preliminary Safety Analysis Report Preliminary Decommissioning Plan Preliminary Physical Security Plan Preliminary Emergency Plan Approved Environmental Assessment or Environmental Impact Statement Environmental Radiation Surveillance Plan	a published report and construction permit, if approved.
2	a Preoperational Nuclear Reactor Study	an application for a load and test permit to include: Updated Safety Analysis Report Updated Decommissioning Plan Updated Physical Security Plan Updated Emergency Plan Preliminary Technical Specifications Preliminary Training Plan Preliminary Requalification Plan	a published report and load and test permit, if approved.

RULE	A If the study is	B the MAJCOM sends HQ AFSA/SEN	C resulting in
3	an Operational Nuclear Reactor Study	an application for an operating permit to include: Facility Safety Analysis report Facility Decommissioning Plan Facility Physical Security Plan Facility Emergency Plan Facility Technical Specifications Facility Training Plan Facility Requalification Plan	a published report and operating permit, if approved.
4	a Special Nuclear Reactor Study	an application for a special permit to include (as required by HQ AFSA/SEN): Special Safety Analysis Report Appropriate Supporting Documents	a published report and special permit, if approved.
5	a Decommissioning Nuclear Reactor Study	an application for a decommissioning permit to include: Final Decommissioning Plan	a published report and decommissioning permit, if approved.

Table 2. Major Training Categories.

RULE	A Training category	B will include training on these topics:
1	Theory and Principles of Operation	nuclear, radiation, and reactor theories; principles of reactor operation; theory of thermodynamics; heat transfer; and fluid flow.
2	Facility Design and Operating Characteristics	safety and emergency systems; facility design features, operating characteristics, and safety analyses; nuclear safety-related utilities; and experiment and test facilities.
3	Facility Instrumentation and Control Systems	nuclear and process instrumentation, control systems, and experimental instrumentation and controls.
4	Normal, Abnormal, and Emergency Procedures	normal, abnormal, and emergency procedures and administrative controls.
5	Radiological Control and Safety	special nuclear material and radioactive materials handling, safe practices, and radiation protection and instruments.
6	Administration	administrative controls, rules, applicable instruction, and permits.
7	Technical Specifications	technical specifications.
8	Fuel Handling (excluding RCOs)	procedures and criticality controls, rules, and limitations.
9	Maintenance Tasks (excluding RCOs)--performance test only	tasks required to maintain the facility.
10	Security	security procedures, requirements, and applicable instructions.

JAMES L. COLE JR., Brig General, USAF
Chief of Safety

Attachment 1

NUCLEAR REACTOR AUDITS AND STUDIES

A1.1. Unit Nuclear Reactor Program:

- Ensure the unit program complies with this instruction.
- Evaluate management of programs at wing and subordinate levels.
- Review all nuclear safety-related aspects of facility operations.
- Verify functional managers are ensuring individuals complete initial reactor system safety training before working with reactor systems.
- Review mishap and deficiency reporting according to AFI 91-204, *Investigating and Reporting US Air Force Mishaps* (formerly AFR 127-4).
- Review facility annual reports.
- Confirm compliance with previous audits.
- Evaluate the operating unit's program for conducting internal reviews and audits and its implementation procedures.
- Review the nuclear reactor safety council minutes.
- Ensure compliance with the technical specifications and Facility Safety Analysis Report.
- Confirm installation support (including safety, medical, radiation protection, security, fire protection, and disaster preparedness)is adequate.

A1.2. Administrative Requirements:

- Determine if the staff's size and its technical qualifications are adequate.
- Evaluate the fitness-for-duty program.
- Verify the professionalism of unit and facility staffs.
- Review the occupational health and safety program.
- Evaluate external base support provided by activities outside the control of the nuclear reactor staff (including safety, medical, security, radiation protection, fire protection, disaster preparedness, and electronic calibration).
- Evaluate the availability and accuracy of required technical orders, instructions, and manuals; Air Force permits and amendments; and safety analysis reports and technical specifications.
- Review the currency and adequacy of documentation (such as unit plans, operating orders, and instructions) in reactor system safety, security, accident and incident response, and emergency evacuation.

A1.3. Training and Requalification:

- Evaluate the training and requalification programs.
- Review procedures for selecting and training personnel.

A1.4. Facility Construction:

- Verify all major modifications to nuclear safety-related systems were subjected to a quality assurance program review.
- Ensure all nuclear safety-related systems function as intended and are being tested and operated under established procedures and documents submitted.
- Ensure the facility and all nuclear safety-related systems are maintained properly.
- Review the currency of as-built drawings.

A1.5. Radiation Protection:

- Evaluate the reactor facility radiation protection program to ensure personnel occupational exposure to radiation is within federal guidelines and is as low as reasonably achievable (ALARA).
- Review the management policy and organizational structure for implementing the radiation protection program.
- Evaluate the radiation detection and monitoring systems.
- Evaluate policies, methods, frequencies, and procedures.
- Examine personnel exposure records and processing of personnel monitoring systems.
- Confirm compliance with the technical specifications and Safety Analysis Report.
- Evaluate the facility's ability to control, collect, handle, document, process, store, and release radioactive materials and to dispose of liquid, gaseous, and solid wastes that may contain radioactive material.
- Review records of radioactivity releases into the environment beyond the facility operations boundary.

A1.6. Reactor Operations:

- Observe facility operations, including representative reactor operations and checklists.
- Review all nuclear safety-related aspects of facility operations, including the ALARA program.
- Review the staff's compliance with operating plans, procedures, and standards.
- Confirm administrative and operating procedures for routine operations and maintenance, as well as abnormal and emergency activities, provides for safe execution.
- Ensure the staff complies with instructions, plans, procedures, technical specifications, and the Facility Safety Analysis Report.
- Evaluate reactor instrumentation and control system operability.
- Review documentation of facility operations, maintenance, and surveillance activities.
- Review documentation of abnormal occurrences, malfunctions, and unscheduled scrams and the corrective actions taken.
- Evaluate experiment review, approval, and control procedures.
- Examine facility modifications to ensure nuclear safety and security concerns are addressed adequately.

A1.7. Emergency Response:

- Review emergency plans and procedures for the facility, staff, and emergency support organizations and personnel.
- Verify compliance with the instructions, plans, and technical specifications of the facility.
- Examine emergency response equipment.
- Review for adequacy and compliance the procedures for identifying, training, making formal appointment, and retraining emergency personnel from within the facility staff and from outside emergency support organizations.
- Observe an emergency exercise.

A1.8. Facility Security:

- Review physical security plans and procedures.
- Ensure facility security systems and requirements are fully operational and comply with AFI 31-209, *Air Force Resource Protection Program* (formerly AFR 125-37).
- Evaluate badge, lock, and key control systems.
- Observe a security exercise.