

**SUBJECT: PERSONNEL SELECTION, QUALIFICATION, AND TRAINING
REQUIREMENTS FOR DOE NUCLEAR FACILITIES**

1. PURPOSE. To establish selection, qualification, and training requirements for management and operating (M&O) contractor personnel involved in the operation, maintenance, and technical support of Department of Energy and National Nuclear Security Administration Category A and B reactors and non-reactor nuclear facilities.
2. CANCELLATION. DOE 5480.20, PERSONNEL SELECTION, QUALIFICATION, TRAINING, AND STAFFING REQUIREMENTS AT DOE REACTOR AND NON-REACTOR NUCLEAR FACILITIES, of 2-20-91.
3. APPLICABILITY.
 - a. DOE Elements. This Order is applicable to all Departmental Elements, including the NNSA, which are responsible for operable Category A and B reactors and non-reactor facilities. The Director, Naval Nuclear Propulsion Program, is exempt from this Order.
 - b. Contractors. Attachment 1, sets requirements that are to be applied to the universe of contractors awarded DOE management and operating contracts involving operable Category A and B reactors and non-reactor nuclear facilities.
4. AUTHORITY/BACKGROUND. After the Three Mile Island nuclear accident, the Nuclear Regulatory Commission (NRC) updated its minimum requirements for the training of reactor operators and senior reactor operators in Title 10 Code of Federal Regulations Part 55 (10 CFR 55). NRC also endorsed parts of ANSI/ANS 3.1-1981, *American National Standard for Selection, Qualification and Training of Personnel for Nuclear Power Plants*, and ANSI N18.1-1971, *Selection and Training of Nuclear Power Plant Personnel*, for the selection, qualification, and training of nuclear power plant personnel. In a similar manner, this Order was developed to update and consolidate DOE training requirements formerly contained in DOE 5480.5, SAFETY OF NUCLEAR FACILITIES, and DOE 5480.6, SAFETY OF DOE-OWNED NUCLEAR REACTORS. In addition, training issues identified by the National Academy of Sciences and other reviewers have been addressed. This Order encompasses those prescriptive requirements (education and experience, requalification, etc.) Contained in accepted industry standards here available, e.g., ANS N18.1-1971, ANS 3.1-1981, ANS 3.1-1987, ANS 3.1-1993, ANS 15.4-1988, and 10 CFR 55, and incorporates lessons learned with its use.

Vertical line denotes change.

5. POLICY AND OBJECTIVES. DOE objectives are to ensure the development and implementation of contractor-administered training programs that provide consistent and effective training for personnel at DOE nuclear facilities. This Order contains minimum requirements that must be included in training and qualification programs. The requirements are based on DOE, NRC, and related industry standards, and are applicable to all operable DOE nuclear facilities. Because the operation of Department of Energy reactor and non-reactor nuclear facilities involves certain risks to employees, the public, and the environment, well trained and qualified operating organization personnel are of extreme importance. A vital element in ensuring a well trained and qualified work force is the implementation of a systematic approach to training (SAT). This approach has proven effective in the commercial nuclear power industry and in other major industries; therefore, the Department requires that training programs for personnel in the operating organization at DOE nuclear facilities are established using a systematic approach to training. Experience has also shown that the better operating nuclear facilities have well-defined, effectively administered policies and procedures to control the activities associated with personnel training. This Order requires the establishment and implementation of certain training-related procedures. Implementation of the requirements of this Order will meet 10 CFR 830.120, *Criteria 2 - Personnel Training and Qualification*.
6. REQUIREMENTS.
- a. This order contains chapters that delineate general and specific requirements that apply to M&O contractor operating organization personnel. Chapter I contains requirements that have broad applicability for training and qualification of personnel at all operable nuclear facilities. Chapters II, III, and IV contain requirements for personnel at DOE Category A production, test, and research reactors, Category B reactors, and non-reactor nuclear facilities, respectively.
 - b. Evaluations of training and qualification programs shall be conducted using DOE-STD-1070-94.
7. RESPONSIBILITIES.
- a. Cognizant Secretarial Officer/Deputy Administrator, NNSA or designee shall perform the following functions for reactor and non-reactor nuclear facilities under their program responsibility:
 - (1) Assume line management responsibility and accountability for nuclear facility personnel qualification programs;
 - (2) Ensure that resources are provided for developing, implementing, and maintaining nuclear facility personnel training and qualification programs;
 - (3) Perform reviews to confirm implementation of this Order using DOE-STD-1070-94;

- (4) Assure that Cognizant Secretarial Office personnel responsible for training are proficient in personnel training processes and requirements, and that they have diverse expertise so that important areas related to nuclear and occupational safety are covered; and
- (5) Approve assessments for full-scope or part-task simulators at Category A test and research reactor facilities.

b. Assistant Secretary for Environment, Safety and Health:

- (1) As DOE's independent element generally responsible for nuclear facility personnel selection, qualification, and training requirements, in areas not assigned by law to the NNSA shall:
 - (a) Provide formal Departmental interpretations of the requirements of this Order.
 - (b) Develop, promulgate, and maintain training requirements, standards, and guidance materials, and conduct workshops as necessary, for implementing the requirements of this Order;
 - (c) Monitor reports (safety analysis reports, appraisal and inspections reports, training plans, etc.) Relative to nuclear facility personnel qualification activities to assess implementation of this Order and to identify needed improvements;
 - (d) Develop Department-wide training requirements for general employee/worker safety training which are consistent with the requirements promulgated by the Occupational Safety and Health Administration, the Nuclear Regulatory Commission, and the Environmental Protection Agency; and
 - (e) Assure that EH personnel responsible for training are proficient in personnel training processes and requirements, and that they have diverse expertise so that important areas related to nuclear, radiological, environmental, and occupational safety are covered.
- (2) In addition, as the independent element responsible for environment, safety, and health oversight of line management of the Department, shall:
 - (a) In coordination with the Cognizant Secretarial Officer and Operations Office, perform independent reviews of nuclear facility personnel training and qualification programs using DOE-STD-1070-94, as appropriate, and provide results of these reviews to cognizant Operations Office Managers and Secretarial Officers for resolution; and

(b) Monitor and audit activities of the Cognizant Secretarial Officer/Deputy Administrator, NNSA and the Operations Office Manager/Field Manager for NNSA Operations to assure the requirements of this Order are consistently applied.

c. Operations Office Manager/Field Manager for NNSA Operations or designee shall:

- (1) Identify and submit resource requests to the Cognizant Secretarial Officer to provide for adequate implementation of personnel qualification programs;
- (2) Perform periodic systematic evaluations of training and qualification programs using DOE-STD-1070-94 and provide day-to-day oversight of nuclear facility personnel training and qualification activities;
- (3) Review and approve each Training Implementation Matrix for nuclear facilities;
- (4) Assure that Operations Office staffing includes an adequate number of persons having expertise in the area of personnel training;
- (5) Assure that DOE contractors to whom this Order is applicable, implement the requirements of this Order;
- (6) Review the certification and recertification of shift supervisors, senior reactor operators, reactor operators, and fissionable material handlers at Category A reactors and high-hazard non-reactor nuclear facilities. Review may vary from observations to ensure that examinations adequately sample a candidate's knowledge and are properly conducted, to and including actively participating as a co-evaluator in an examination to determine a candidate's suitability for certification. Review shall include:
 - (a) Periodic attendance at certification oral examinations;
 - (b) Periodic and random review of individual training records;
 - (c) Periodic monitoring and evaluation of annual oral examinations/walkthroughs;
 - (d) Periodic spot checks of oral examinations; initial and continuing training classes, performance of practical factors, operational evaluations, and other training program materials; and
 - (e) Periodic review of certification records.

- (7) Approve contractor procedures which are established to grant exceptions to specific training or qualification requirements for an individual;
- (8) Approve, on a case by case basis, contractor requests for certification extensions; and
- (9) Approve contractor assessments of the need for a simulator at Category A test and research reactors.

8. IMPLEMENTATION.

- a. A Training Implementation Matrix shall be required and must be approved by the cognizant Operations Office for all new DOE reactor and non-reactor nuclear facilities prior to operations. The operating contractor shall meet the requirement of this Order to the extent possible prior to operation. The matrix shall be based on the status of existing compliance and shall include the time-frame for incremental implementation and full implementation of the requirements that are not being met at the time the facility begins to operate.
- b. Contractors with an approved Training Implementation Matrix previously submitted in accordance with the 2-20-91 issuance of this Order shall be required to submit (as necessary) either an addendum or page changes to the Training Implementation Matrix to reflect the changes made as a result of the review of this Order. Changes shall be submitted to the cognizant Operations Office for approval within 90 days from the issue date of this Order.

| 9. ASSISTANCE. Office of Nuclear and Facility Safety Policy (301) 903-3465.

10. EFFECTIVE DATE. Upon issue.

11. REFERENCES AND DEFINITIONS. See Attachment 2.

BY ORDER OF THE SECRETARY OF ENERGY:



FRANCIS S. BLAKE
Deputy Secretary

Vertical line denotes change.

CONTRACTOR REQUIREMENTS DOCUMENT

DOE 5480.20A, PERSONNEL SELECTION, QUALIFICATION, AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES, of 11-15-94, requires that the following requirements be applied to contractors awarded DOE procurement management and operating contracts for operable DOE nuclear facilities. Management and operating contractors shall:

1. Implement the requirements of DOE 5480.20A as they apply to the facility and the position;
- | 2. Prepare and submit a Training Implementation Matrix to the Operations Office Manager/Field
| Manager for NNSA Operations for review and approval;
3. Prepare and submit procedures which establish the requirements for granting exceptions to
| specific training or qualification requirements for an individual to the Operations Office
| Manager/Field Manager for NNSA Operations for review and approval;
4. Provide written requests for certification extensions to the Operations Office Manager for
approval;
- | 5. Prepare and submit an assessment of the need for a simulator to the Operations Office
| Manager/Field Manager for NNSA Operations for review and approval (Category A test and
research reactors only); and
6. Perform periodic systematic evaluations of training and qualification programs.

REFERENCES AND DEFINITIONS

1. REFERENCES.

- a. Title 10 Code of Federal Regulations, Part 830.120, Quality Assurance Requirements, which establishes DOE's quality assurance program.
- b. Title 10 Code of Federal Regulations, Part 835, Occupational Radiation Protection, which establishes DOE's radiation protection standards and program requirements for occupational radiation protection of workers at its facilities.
- c. DOE 1324.2A, RECORDS DISPOSITION, of 9-13-88, which contains procedures for the retention and disposition of records.
- d. DOE 5480.23, NUCLEAR SAFETY ANALYSIS REPORTS, of 4-10-92, which establishes requirements for the development of safety analyses that establish and evaluate the adequacy of the safety bases of nuclear facilities.
- e. DOE 5480.31, STARTUP AND RESTART OF NUCLEAR FACILITIES, of 9-15-93, which contains detailed requirements regarding starting up nuclear facilities following extended shutdowns.
- f. DOE/EH-0256T, Radiological Control Manual, of 4-94, which establishes requirements for the content of radiation protection training programs.
- g. DOE-STD-1070-94, Guidelines for Evaluation of Nuclear Facility Training Programs, of 6-94, which establishes a consistent set of objectives and criteria for organizations and entities who evaluate training and qualification programs at DOE nuclear facilities.
- h. DOE-STD-1060-93, Guide to Good Practices for Continuing Training Programs, of 2-92, which contains guidance on development and implementation of a continuing training program.
- i. DOE/EP-0095, Guidelines for Job and Task Analysis for DOE Nuclear Facilities, of 6-83, which contains guidance on methodology, procedures, content, and use of job and task analysis.
- j. DOE-TSL-(current edition), DOE Technical Standards List, which provides the current list of approved training-related Guides to Good Practices.
- k. NUCLEAR REGULATORY COMMISSION (NRC) REGULATORY GUIDE 1.134, REV.2, Medical Evaluation of Nuclear Power Plant Personnel Requiring Operator Licenses, of 4-87, which contains medical certification guidance for operators at commercial nuclear power plants.
- l. NUCLEAR REGULATORY COMMISSION (NRC) REGULATORY GUIDE 1.149, REV.1, Nuclear Power Plant Simulation Facilities for Use in Operator Licensing Examinations, of 4-87, which contains guidance for simulator training at commercial nuclear power plants.
- m. American National Standard, ANSI/ANS 3.4-1983, Medical Certification and

Monitoring of Personnel Requiring Operator Licenses for Nuclear power Plants, which contains standards for medical examinations.

- n. American National Standard, ANSI/ANS 3.5-1985, Nuclear Power Plant Simulators for Use in Operator Training, which contains minimum simulator performance and configuration criteria necessary for effective training.
- o. American National Standard, ANSI/ANS 8.20-1991, Nuclear Criticality Safety Training, which contains the training outline, procedures, and responsibilities for providing appropriate nuclear criticality safety training for employees associated with fissile material operations outside reactors.
- p. American National Standard, ANSI/ANS 15.4-1988, Selection and Training of Personnel for Research Reactors, which contains the minimum standards for the selection and training of personnel at research reactors.
- q. Nuclear Information Records Management Association (NIRMA) Guidelines for Management of Nuclear Related Training Records, TG17-1993, which addresses and recommends methods and practices for the management of nuclear related training records.

2. DEFINITIONS.

- a. Category A Reactor Facilities means those production, test, and research reactors designated by DOE based on power level (e.g., design thermal power rating of 20 megawatts steady state and higher), potential fission product inventory, and experimental capability.
- b. Category B Reactor Facilities means those test and research reactors designated by DOE based on power level (e.g., design thermal power rating of less than 20 megawatts steady state), potential fission product inventory, and experimental capability.
- c. Certification is the process by which contractor nuclear facility management provides written endorsement of the satisfactory achievement of qualification of a person for a position.
- d. Controls means, when used with respect to nuclear reactors, apparatus and mechanisms that, when manipulated, directly affect the reactivity or power level of a reactor. When used with respect to any other nuclear facility, "controls" means apparatus and mechanisms that, when manipulated could affect the chemical, physical, metallurgical, or nuclear process of the nuclear facility in such a manner as to affect the protection of health and safety.
- e. Education is the successful completion of the requirements established by an accredited educational institution.
- f. Engineered Safety Features means systems, components, or structures that prevent and/or mitigate the consequences of potential accidents described in the FSAR including the bounding design basis accident.

- g. Exception is a release from specific requirements of this Order. Exception also refers to release of an individual from portions of a training program through prior education, experience, training, and/or testing.
- h. Fissionable Materials means a nuclide capable of sustaining a neutron-induced fission chain reaction (e.g., uranium-233, uranium-235, plutonium-238, plutonium-239, plutonium-241, neptunium-237, americium-241, and curium-244).
- i. Fissionable Materials Handler is a person certified by contractor facility management to manipulate or handle significant quantities of fissionable materials, or manipulate the controls of equipment used to produce, process, transfer, store, or package significant quantities of such materials.
- j. Full-Scope Simulator is a simulator incorporating detailed modeling of systems of the reference facility with which the operator interfaces in the control room environment. The control room operating consoles are included. Such a simulator demonstrates expected facility response to normal and abnormal conditions.
- k. Graded Approach means a process by which the level of analysis, documentation, and actions necessary to comply with a requirement are commensurate with: (1) the relative importance to safety, safeguards, and security; (2) the magnitude of any hazard involved; (3) the life cycle stage of a facility; (4) the programmatic mission of a facility; (5) the particular characteristics of a facility; and (6) any other relevant factor.
- l. Hazard Categories. The consequences of unmitigated releases of radioactive and/or hazardous material are evaluated as required by DOE 5480.23 and classified by the following hazard categories:
- Category 1. The hazard analysis shows the potential for significant offsite consequences.
- Category 2. The hazard analysis shows the potential for significant onsite consequences.
- Category 3. The hazard analysis shows the potential for only significant localized consequences.
- m. Job Analysis means a systematic method used in obtaining a detailed listing of the tasks of a specific job.
- n. Medical Examination means an examination performed by a licensed medical physician or a physician's assistant to determine the physical condition and general health of a person for duty. If the examination is conducted by a physician's assistant, the results of the examination are subject to the review and approval of a licensed physician.
- o. Non-Reactor Nuclear Facility means those activities or operations that

involve radioactive and/or fissionable materials in such form and quantity that a nuclear hazard potentially exists to the employees or the general public. Incidental use and generating of radioactive materials in a facility operation (e.g., check and calibration sources, use of radioactive sources in research and experimental and analytical laboratory activities, electron microscopes, and X-ray machines) would not ordinarily require the facility to be included in this definition. Transportation of radioactive materials, accelerators and reactors and their operations are not included. Included are activities or operations that: (1) Produce, process, or store radioactive liquid or solid waste, fissionable materials, or tritium; (2) Conduct separations operations; (3) Conduct irradiated materials inspection, fuel fabrication, decontamination, or recovery operations; (4) Conduct fuel enrichment operations; (5) Perform environmental remediation or waste management activities involving radioactive materials; or (6) Design, manufacture, or assemble items for use with radioactive materials and/or fissionable materials in such form or quantity that a nuclear hazard potentially exists.

p. Nuclear Experience when used in reference to:

- (1) Category A and B reactors is experience acquired at commercial, production, training, test, military, or research reactors and includes experience acquired in reactor facility startup activities or operation. Experience in design, construction, maintenance, or related technical services that is job-related may also be considered. Appropriate research, or teaching, or both may be includable as nuclear experience.
- (2) Non-Reactor Nuclear Facilities is experience acquired at any facility in which radioactive materials are routinely handled, stored, processed, or utilized.

q. Nuclear Facility means reactor and non-reactor nuclear facilities.

r. Operable means the state of being operated or has the potential for being operated to fulfill the mission it was designed for. A facility that cannot be operated on a day-to-day basis because of refueling, extensive modifications, or technical problems is still considered to be operable. A facility that has been officially placed in a standby or shutdown condition, or in an environmental remediation status, but in which personnel manipulate or handle fissionable materials, radioactive materials, or tritium in such form and quantity that a nuclear hazard potentially exists to the employees or the general public, or manipulate the controls of equipment used to produce, process, transfer, or store such materials, is also considered operable.

s. Operating Organization is the onsite contractor organization responsible for operation, maintenance, and technical support services related to operations. This organization may include offsite personnel who provide operational support.

- t. Operational Evaluation is a documented evaluation of an individual's knowledge and skills. The operational evaluation is a facility walkthrough that may include system and/or component operation, or simulation of operations, during which the candidate is observed and questioned regarding procedures, safety implications, and Technical Safety Requirements.
- u. Participation is taking an active role in the duties and responsibilities relative to the function for which the candidate/trainee is being considered. Simple observation is not considered participation.
- v. Power Plant Experience is experience acquired in the testing, operation, or maintenance of power generating facilities. Experience in design and construction may be considered applicable power plant experience and should be evaluated on a case-by-case basis.
- w. Reactor Operator means a person certified by contractor nuclear facility management to operate (manipulate the controls of) a DOE-owned reactor.
- x. Safety Analysis means a documented process: (1) to provide systematic identification of hazards within a given DOE operation; (2) to describe and analyze the adequacy of measures taken to eliminate, control, or mitigate identified hazards; and (3) to analyze and evaluate potential accidents and their associated risks.
- y. Senior Reactor Operator means a person certified by contractor nuclear facility management to operate and direct the operation of a DOE-owned reactor.
- z. Shall, Should, and May means: shall is used to denote a requirement; should is used to denote a recommendation; and may is used to denote permission, neither a requirement nor a recommendation.
- aa. Shift Supervisor is a certified person in the operating organization designated by contractor facility management to direct operations-related activities of personnel at a DOE-owned reactor or non-reactor nuclear facility. Substitute titles may be utilized for positions of equivalent functions.
- bb. Shift Technical Advisor (STA) is a person who has been assigned to provide on-shift advice and counsel to shift operating personnel to help determine cause and mitigation of facility accidents.
- cc. Significant Quantity of Fissionable Materials. The minimum mass of fissionable material for which control of at least one parameter is required to ensure subcriticality under all normal and credible abnormal conditions.
- dd. Task is a well-defined unit of work having an identifiable beginning and end which is a measurable component of the duties and responsibilities of a specific job.
- ee. Task Analysis is the systematic process of examining a task to identify

skills, knowledge, and/or abilities required for successful task performance.

- ff. Technical Safety Requirement means those requirements that define the conditions, safe boundaries, and the management or administrative controls necessary to ensure the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials or from radiation exposures due to inadvertent criticality. A TSR consists of safety limits, operating limits, surveillance requirements, administrative controls, use and application instructions, and the basis thereof. TSRs were formerly known as Operational Safety Requirements for non-reactor nuclear facilities and Technical Specifications for reactor facilities.
- gg. Training is instruction designed to develop or improve job performance.
- hh. Training Implementation Matrix is a matrix prepared by the operating organization which defines and describes the application of the selection, qualification, and training requirements of this Order. This Matrix includes any exceptions taken for requirements which are not implemented.
- ii. Training Program is a planned, organized sequence of activities designed to prepare individuals to perform their jobs, to meet a specific position or classification need, and to maintain or improve their performance on the job.

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CHAPTER IGENERAL REQUIREMENTS

1. PURPOSE. This Chapter establishes general training program requirements for personnel involved in the operation, maintenance, and technical support of all Department of Energy nuclear facilities.
2. TRAINING ORGANIZATION REQUIREMENTS. The operating contractor shall establish one or more organizations to be responsible for the training of operating organization personnel. This organization(s) shall be held accountable for providing facility line management with the support necessary to ensure that personnel in the operating organization are qualified to safely and effectively meet job requirements. In some cases (e.g. Category B reactors, low-hazard (category 3) non-reactor nuclear facilities, or less complex, small facilities) this function may be integrated into the operating organization and may not necessarily be officially designated as a training organization. The responsibilities, qualifications, and authority of training organization personnel shall be documented, and managerial responsibilities and authority clearly defined. This organization may include subcontracted personnel who conduct training activities. At sites where a central training organization is used, this organization may be separate from the facility operating organization for support in areas of regulatory training. For example, central training organizations that provide support to line operating organizations may conduct training for the operating organization in regulatory compliance issues (e.g., OSHA training, Radiation Worker training, supervisory/management training, etc.) that have site-wide application, and which have content that is defined from other sources.
3. SUBCONTRACTOR PERSONNEL QUALIFICATION REQUIREMENTS. Subcontractor personnel shall meet the qualification requirements for the job function to be performed. In addition, the operating organization shall ensure that subcontractor and temporary personnel who perform specialized activities (e.g., radiation protection, maintenance, in-service inspection, radiography, and welding) are qualified to perform their assigned tasks. Personnel shall be considered adequately qualified with proper documentation of at least one of the following:
 - a. The satisfactory result of an audit of subcontractor records which relate to qualification of the subcontractor personnel being considered for assignment by the operating organization, or;
 - b. The operating organization's previous verification (within 2 years) of the ability of the subcontractor employee to perform assigned tasks safely and efficiently, or;
 - c. Successful completion by the subcontractor employee of those segments of the operating organization's qualification program which are considered pertinent to accomplishment of the task to be performed.

For subcontractor personnel who do not meet the requirements, work activities

on engineered safety features as identified in the facility Safety Analysis Report shall be supervised by a person who meets the qualification criteria established by the operating organization for conduct of the activities.

4. PERSONNEL SELECTION REQUIREMENTS.

- a. The operating contractor shall establish a process for selection and assignment of personnel into the operating organization. This process should consider factors such as background, experience, and education and should be based on the ability of the person to meet job performance requirements. Selection of operating organization personnel may involve a selection test.
- b. If an individual does not meet the experience requirements of this Order, consideration may be given to the collective experience of the operating organization. Individuals who do not meet the experience requirements for a position may be assigned to that position provided the overall operating organization is considered balanced and strong and that DOE approval is obtained on a case-by-case basis.

5. QUALIFICATION PROCESS REQUIREMENTS. Qualification is defined in terms of education, experience, training, examination, and any special requirements necessary for performance of assigned responsibilities. The requirements in this Order are based on industry standards and are intended to provide reasonable assurance that personnel at DOE nuclear facilities possess qualifications to operate and maintain the facility safely and reliably under all conditions.

- a. Operating organizations shall define qualification requirements for personnel in each functional level based on the criteria contained in this Order. The relative importance of managerial and technical competence should be considered by management in establishing these requirements. Specific knowledge and skills differ for each level in the organization. At the higher functional level, managerial competence is the dominant need, whereas technical competence is the dominant need at other functional levels.
- b. Even though applied broadly to personnel in the operating organization, the term qualification has a different application for different positions. For example, managers and technical staff personnel may be considered qualified by virtue of meeting the entry-level requirements associated with the position and by completing applicable position-specific training (see paragraph 7h and 7i). A comprehensive examination need not be administered to determine their qualification. Continuing training and professional development programs should be established to meet the needs of the individual and the position. Chapter I, paragraph 7d(1) contains requirements that shall be included in the continuing training program to the extent to which they apply to the position. Satisfactory performance of their assigned duties and assessment of individual performance such as that which is typically included in personal performance appraisals may be used to document continued

satisfactory performance.

- c. Technician and maintenance personnel qualification shall include demonstrated performance capabilities (performance demonstrations) to ascertain their ability to adequately perform assigned tasks. Written examinations should also be administered to personnel in these positions. However, a comprehensive final examination need not be administered to ascertain formal qualification of technicians and maintenance personnel (with the exception of radiological control technicians, who shall comply with the requirements of the *DOE Radiological Control Manual*). Participation in continuing training programs is required to maintain and improve their abilities to continue to function safely in the operating organization. The requirements that are described in Chapter I, paragraph 7d, shall be implemented to the extent to which they apply to the position. Their continued satisfactory performance of assigned duties and their satisfactory participation in the continuing training program (classroom, OJT, laboratory, etc.) serves as sufficient evidence of maintenance of their qualification.
 - d. Qualification of operators and their immediate supervisors shall include examinations (written, oral, operational evaluations, performance demonstrations) as applicable to the position. Written examinations and performance demonstrations shall be administered to qualified operators and supervisors. Written and oral examinations and operational evaluations shall be administered to certified operators and supervisors. Initial qualification/certification for a position shall include a comprehensive examination to ascertain the person's suitability to perform assigned duties. Participation in the continuing training program described in Chapter I, paragraph 7d shall be required following initial qualification to the extent to which it applies to the position. Upon completion of the continuing training program requalification may be achieved by either administering a comprehensive requalification examination, including any operational evaluations or performance demonstrations that may be specified, or by administering periodic examinations (e.g., quarterly) during the requalification cycle. Whether a comprehensive examination or periodic examinations are administered, after completing the continuing training program, the operating organization shall indicate by signature that the person has successfully completed the requalification program and is formally requalified.
 - e. Qualification may be granted only after assuring that all requirements (including training and examinations as required) and other specified requirements (e.g., medical examination) have been satisfactorily completed.
 - f. Qualification of operators and their immediate supervisors in the operating organization is valid for a period not to exceed two years unless revoked for cause (e.g., medical disqualification, performance deficiencies).
6. CERTIFICATION REQUIREMENTS. Certification is the process by which contractor

nuclear facility management endorses and documents, in writing, the satisfactory achievement of qualification of a person for a position. Certification follows the completion of the qualification program for those positions identified as requiring certification. The notable difference between certification and qualification is that certification requires official contractor management endorsement of an individual's qualification to ensure senior management involvement in the qualification of key operations positions (i. e., operators and supervisors). Other significant differences between qualification and certification are the requirements associated with continuing training, examination, and reexamination for recertification.

- a. The program leading to certification shall be governed by written procedures that include requirements for documented assessment of the person's qualifications through examinations and operational evaluations.
 - b. Certification may be granted only after all qualification requirements (including written and oral examinations and operational evaluations) and other specified requirements (e.g., medical examination) have been satisfactorily completed, and management has assured that the person is capable of safely performing all functions of the position. Satisfactory completion of qualifications which result in certification shall be verified by a person or group other than the candidate's immediate supervisor or the person/group that provided the training. Certification shall be valid for a period not to exceed two years unless revoked for cause (e.g., medical disqualification, performance deficiencies, or failure to maintain proficiency).
 - c. Reactor operators and senior reactor operators at Category A and B reactors, and fissionable material handlers and fissionable material handler supervisors at non-reactor nuclear facilities shall be certified. For all other operators and their immediate supervisors, the operating organization shall identify in the Training Implementation Matrix any additional positions that will be certified (e.g., tritium facility operators, enrichment facility operators, tank farm operators, and their immediate supervisors).
7. TRAINING REQUIREMENTS. Training to support qualification and certification programs shall be based on a systematic approach to training. A graded approach shall be used to establish the systematic approach to training for operations personnel, maintenance personnel, technicians, and the technical staff. For example, the methods used to develop training programs and materials for personnel at category 3 (low) hazard nuclear facilities do not need to be as detailed or formally developed and implemented as some of the training programs and materials for the category 1 and 2 (higher-hazard) nuclear facilities because the nuclear safety-related risk to the work force, the environment, and the public is significantly less.
- a. General. Training programs shall consist of a combination of classroom-type and on-the-job training, and include simulator and laboratory training as it applies to the position. Classroom-type training may include lectures, seminars, computer-based training, and

structured self-study activities.

- (1) A Training Implementation Matrix which defines and describes the application of the selection, qualification, certification) and training requirements of this Order shall be prepared by the contractor operating organization. The Matrix shall clearly define the organization, planning, and administration of the qualification program and set forth the responsibility, authority, and methods for conducting training. Suitable justification for exceptions shall be included in the Matrix for any requirement not implemented. At some sites with several facilities, a combined Training Implementation Matrix may be submitted.
 - (a) Personnel who are appointed to positions in the operating organization subsequent to approval of the Training Implementation Matrix required by DOE 5480.20 of 2-20-91 shall meet the education and experience requirements of this Order. This excludes personnel who held positions prior to the approval of the Training Implementation Matrix from meeting the education and experience requirements stated for these positions.
 - (b) The Training Implementation Matrix should identify whether future persons selected for these positions will meet the education and experience requirements or include a request for an exception from the requirements for all future appointees if the requirement is deemed inappropriate on the basis of the hazard involved, the complexity of the operation, or the risk involved. This relief from the education and experience requirements does not, however, exclude these personnel from the training requirements identified in this Order for their job positions. Participation is required in job-specific training and qualification/certification programs and subsequent continuing training programs.
- (2) The training and qualification program for nuclear facilities should be developed on the basis of the hazards involved and risk associated with the operation of the facility or activity. Accordingly, the level of detail of and content of the Training Implementation Matrix and content of the training programs should reflect the training and qualification needs of these facilities to assure personnel are qualified to carry out their assigned responsibilities (i.e., a graded approach should be applied).
- (3) Qualification and certification programs shall be reviewed by contractor facility management and shall be kept up to date to reflect changes to the facility, Safety Analysis Reports, Technical Safety Requirements, procedures, regulations, and applicable industry operating experience. The concept of training personnel as a team, stressing team communications and interaction, shall be

used where job functions require team solutions and activities. For example, many facility normal and abnormal operations require interaction and coordination of duties among the operating personnel. In cases such as these, team training is necessary.

- (4) This Order establishes personnel selection, qualification, and training requirements for operable nuclear facilities. There are other training requirements (e.g., other DOE orders and regulations such as those of the Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), Department of Transportation (DOT), etc.) that may be applicable and need to be implemented. Implementation of such training requirements need not conform to the requirements, methods, and standards established by this Order.

b. Training Process. Initial and continuing training programs shall be established to ensure that operating organization personnel are qualified to perform job requirements. This shall be achieved by using a systematic approach to training. The basic elements of a systematic approach to training include the following:

- (1) A systematic analysis of the jobs to be performed.

Analysis typically involves the conduct of job analysis, needs analysis, or both; job analysis to determine tasks for training, and needs analysis to distinguish between actual and desired performance and to propose workable solutions. The analysis should include both normal and emergency duties. Program goals are then established and the scope of training program content is defined.

A graded approach should be used when analyzing jobs. For example, experience with the conduct of job and task analysis has shown that detailed methods such as those described in industry task analysis procedures or in the *DOE Guidelines for Job and Task Analysis for Department of Energy Nuclear Facilities*, DOE/EP-0095, are rarely needed. Rather, using qualified trainers and subject matter experts, more simplified methods can produce equivalent results as effectively and more efficiently. One method that can be used to conduct a job analysis is the table-top job analysis method.

This is a method where a team of trainers, subject matter experts (e.g., qualified employees), and supervisors meet to identify duty areas involved in a specific job, tasks performed within each duty area, and tasks that should be included in the training program. The resulting task list typically ranges from the teens to approximately 250 tasks with the average being 125 - 150 for an operator or maintenance program. At non-reactor nuclear facilities where operator positions are sometimes more narrowly defined than a reactor operator job, the average is less. The verification and modification of task lists from similar facilities and jobs has also been found to be an effective method of job analysis.

Similarly, table-top methods can also be used to derive learning objectives from task lists. These methods are less time consuming, more cost effective, and are usually self-validating.

Because of varied complexity and scope of job functions, the degree of analysis (needs analysis, job analysis, task analysis) necessary to define training program content will vary. For example, a job and needs analysis may be appropriate for operations and maintenance personnel, whereas a less formal broad-based assessment of training needs is appropriate for technical staff personnel. Job analyses need not be conducted for technical staff personnel. Consensus-based content guides should be used to assist with the determination of technical staff training program content. This method may also be sufficient to determine training program content for operating organization positions at many category 3 hazard nuclear facilities.

- (2) Learning objectives derived from the analysis of the job that describe desired performance after training.

Learning objectives define the content of the training program. They are derived from task statements and represent the knowledge and skills necessary to perform the job. The objectives are organized into instructional units and sequenced to aid in the learning process. The objectives form the "blueprint" which guides the development of all training materials, tests, and strategies. Objectives are determined using one or more content analysis techniques. The most common techniques include verification analysis, document analysis, templating, detailed task analysis, or group brainstorming. In most cases the learning objectives, which address the knowledge and skills necessary to perform the task, can be developed directly from the task list and do not require additional analysis. A graded approach should be used to select the most effective technique for determining the learning objectives. For example, experience has shown that detailed task analysis is not necessary when good operating procedures exist or if improper performance of the task is of low consequence. Group brainstorming or a joint review of the procedure by a trainer and a subject matter expert (SME) can produce acceptable results.

- (3) Training design, development, and implementation based on the learning objectives.

Materials (e.g., lesson plans and OJT guides, training aids, and student materials) are developed to conduct training. The materials should reflect good instructional design and incorporate methods and activities that maximize knowledge and skill retention. Development of additional learning objectives, and in some cases, rewording of objectives also occurs. A graded approach should be used to develop training materials. For example, the training materials used to guide discussions with technical staff trainees

could include a one-page outline of the lesson content that includes the key points and a student handout to distribute. The level of detail should take into account the job position and experience of the designated instructor. This approach may also be sufficient for much of the training that is conducted at category 3 hazard nuclear facilities. Training/Evaluation standards are also developed to provide guidance for on-the-job training. Additional activities include development of test items and examinations. Technical and instructional reviews of the products that are developed should be conducted. Recommendations resulting from these reviews should be incorporated as necessary to assure that program content is both technically and educationally sound.

Program implementation consists of activities related to the actual conduct of training, as well as resource allocation, planning, and scheduling. Implementation requires assigning instructors and support staff, scheduling training and facilities, and conducting training.

- (4) Evaluation of trainee mastery of the objectives during training.

Mastery of the learning objectives by the trainees should be evaluated periodically during the training. Evaluation methods include oral questioning, written examinations, performance of related tasks by the use of evaluation instruments (e.g., qualification standards, checklists, performance tests, job performance measures (JPM), or other similar methods). Evaluations should be content valid, administered consistently, controlled, and documented as appropriate to the level of assurance needed. Content valid examinations are examinations that accurately and consistently measure the associated learning objectives. A graded approach should be used during evaluation. For example, structured on-the-job familiarization can be used in lieu of formal on-the-job evaluation for managers, non-certified supervisors, and technical staff personnel. Much of the training for managers, non-certified supervisors, and technical staff personnel occurs in nontraditional settings such as discussions with individual managers. In addition, learning objectives for managers, non-certified supervisors, and technical staff personnel may not be readily adaptable to prescribed standards or quantitative testing. In such instances, qualitative evaluations are acceptable. For example, trainee mastery could be assessed from responses during discussions, behavior during role-playing, or material developed during training exercises. Qualitative evaluations may also be used to assess trainee mastery of learning at category 3 hazard nuclear facilities.

- (5) Evaluation and revision of the training based on the performance of trained personnel in the job setting.

Evaluation provides the critical feedback loop to ensure the

training is up to date and reflects the requirements of the job. Specifically, training programs are evaluated for program and lesson content adequacy, test adequacy, presentation adequacy, documentation adequacy, and post-training job performance. In addition, the operating performance of job incumbents should be monitored to determine individual strengths and weaknesses. The feedback received from the evaluation process is used to modify and improve program content and delivery. Program content should be periodically monitored and revisions should be made (as appropriate) to include changes in areas such as policies and/or procedures, system or component design, job requirements, regulatory requirements, and industry guidelines or commitments. Adjustments should also be made as a result of reviews of operating experience information such as Occurrence Reports, inspection reports, information notices, and bulletins. Feedback obtained from instructors, students, and supervisors is also reviewed for its potential impact on future training programs. The results are translated into action items or recommendations which are factored into program content.

- c. Initial Training Requirements. An initial training program shall be established for operating organization personnel at operable nuclear facilities to develop or enhance their knowledge and skills to perform job assignments. These programs should be structured commensurate with specific position needs. Examinations (written, oral, operational evaluations, performance demonstrations) on material included in the training programs shall be administered and documented as appropriate. Personnel who are in-training shall not independently make decisions or take actions that could affect facility safety, nor shall personnel who are in-training be placed in such positions. However, they may independently perform specific tasks or job assignments for which they are qualified.
- d. Continuing Training Requirements. Continuing training programs shall be established to maintain and enhance the knowledge and skills of operating organization personnel who perform functions associated with engineered safety features as identified in the facility Safety Analysis Report. The guidance in DOE-STD-1060-93, *Guide to Good Practices for Continuing Training*, should be used to develop continuing training programs that improve the knowledge and skills of operating organization personnel.
 - (1) These programs shall be structured commensurate with specific position needs, and shall be administered on a cycle not to exceed two years. Continuing training shall include, at a minimum, training in significant facility system and component changes, applicable procedure changes, applicable industry operating experience, selected fundamentals with emphasis on seldom used knowledge and skills necessary to assure safety, and other training as needed to correct identified performance problems.
 - (2) Periodic examinations (written, oral, operational evaluations

performance demonstrations, as applicable to the position) shall be administered and documented throughout the cycle on material included in the operator (operators and their immediate supervisors) training programs. Periodic examinations (written and/or performance demonstrations) of other members of the operating organization (i.e., maintenance personnel, technicians, technical staff) is also appropriate in some areas during the continuing training program.

- (3) Continuing training programs for certified operations personnel shall consist of preplanned classroom-type training, on-the-job training, and operational evaluations on a regular and continuing basis. Continuing training programs for certified operators and certified supervisors shall include, at a minimum, the following as related to job performance:
- (a) Training and examination covering abnormal facility procedures and emergencies shall be required at least annually for certified operators and certified supervisors;
 - (b) Drills conducted in the facility or on a simulator to enable personnel and operating teams to maintain their ability to respond to abnormal or accident situations. Training drills conducted in the facility shall not lead to or have the potential for safety concerns;
 - (c) Instruction in the use of facility systems to control or mitigate accidents. Such training shall include both classroom-type training and training conducted in the facility; and
 - (d) Training, as applicable to the position, in the following subjects where examinations and experience (industry and facility-specific) or other evidence indicates additional emphasis in scope and depth of coverage is needed:
 - 1 Theory and principles of facility operation;
 - 2 General and specific facility operating characteristics;
 - 3 Facility instrumentation and control;
 - 4 Facility protection systems;
 - 5 Engineered Safety Features;
 - 6 Normal, abnormal, and emergency procedures;
 - 7 Radiation control and safety; and

8 Technical Safety Requirements.

- (4) Personnel who are responsible for developing and delivering training may be excused from continuing training for the area of primary administrative responsibility. For example, an individual who prepares, administers, and grades a written examination need not take the examination.
- e. General Employee Training (GET) Requirements. All persons employed either full- or part-time in DOE nuclear facilities shall be trained commensurate with their job duties
- (1) GET programs shall include training on the following areas as they relate to individual jobs:
 - (a) General description of facilities;
 - (b) Job related policies, procedures, and instructions;
 - (c) Radiological health and safety program;
 - 1 Training program content shall be in accordance with DOE/EH-0256T, *Radiological Control Manual*, Chapter 6, Training and Qualification.
 - (d) Facility emergency plans;
 - (e) Industrial safety/hygiene program;
 - (f) Fire protection program;
 - (g) Security program;
 - (h) Quality assurance program; and
 - (i) Criticality safety.
 - 1 Training program content shall be in accordance with ANSI/ANS 8.20 - 1991, *Criticality Safety Training*.
 - (2) Visitors, contracted personnel, and temporary personnel shall be under continuous escort while at the facility unless they have been trained in appropriate areas from the above list to the extent necessary to ensure safe execution of their duties. For example, short-term visitors should be given instruction in items (a), (c), (d), (e), and (g), while contracted and temporarily assigned personnel may need training in additional topics as related to their assignments.
 - (3) For persons requiring long-term (i.e., more than 1-2 weeks) access, understanding of the information provided by the GET program shall

be evaluated by administering a written examination. The examination should cover areas selected for training and should be of sufficient difficulty to ensure the person has adequate knowledge to work independently at the facility. Persons who do not pass this examination shall not be permitted access without a continuous escort.

- (4) Changes in GET areas identified in paragraph 7e(1) shall be included in continuing training programs for all facility personnel. Periodic examinations should be administered on areas of the GET program that are included in the continuing training program.
- f. Probabilistic Risk Assessment (PRA) Training Requirements. At those nuclear facilities for which a PRA has been performed, initial and continuing training programs for operations and technical staff personnel shall include training on the principal results of the PRA. This training shall address the following:
- (1) The importance of facility systems in preventing damage or severe accidents;
 - (2) Locations of all significant amounts of radioactive and other hazardous materials, and measures to prevent its release; and
 - (3) The importance of maintaining operational limits and conditions, and the consequences of violating those limits.
- g. Technician and Maintenance Personnel Training Requirements. Technicians are principally involved in calibration, inspection, troubleshooting, testing, maintenance, and radiation protection activities at the facility. Examples include laboratory technicians, instrument technicians, and radiological control technicians. Maintenance personnel perform maintenance and repair on mechanical and electrical equipment.
- (1) All technicians and maintenance personnel shall be qualified to perform the tasks associated with their specialty, or work under the direct supervision of personnel qualified to perform the activity or task.
 - (2) Training on engineered safety features as identified in the facility Safety Analysis Report shall be conducted for personnel who perform work on those systems/components. Included in this category are systems having a direct impact on the safe operation of the facility. Examples of engineered safety feature systems are emergency core cooling systems, instrumentation systems that provide protective functions, emergency electrical power distribution systems, and other systems whose failure could have an adverse affect to the environment or the health and safety of the public. System training shall, at a minimum, include the following elements:

- (a) Purpose of the system;
 - (b) General description of the system including major components, relationship to other systems, and all safety implications associated with working on the system; and
 - (c) Related industry and facility-specific experience.
- (3) Training program content for radiological control technicians (RCT) shall be in accordance with the requirements contained in 10 CFR 835, *Occupational Radiation Protection*, and DOE/EH-0256T, *DOE Radiological Control Manual*. RCT training program elements (i.e., selection, training process, continuing training, qualification) shall be in accordance with the requirements of this Order.
- h. Technical Staff Training Requirements. Technical staff personnel are typically involved in surveillance, testing, analyzing facility data, planning modifications, program review, and technical problem resolution in their area of expertise (e.g., electrical, mechanical, instrumentation and control, chemistry, radiation protection, safety, quality assurance, facility engineering).
- (1) The contractor shall develop a list of specific technical staff positions that have a direct impact on employee, facility, or public safety.
 - (2) Training shall be provided to entry-level technical staff personnel who provide technical support to the operating organization. Training in the following facility-specific subject areas shall be included as appropriate to the position:
 - (a) Facility organization;
 - (b) Facility fundamentals;
 - 1 Heat transfer, fluid flow, and thermodynamics
 - 2 Electrical science
 - 3 Nuclear physics
 - 4 Chemistry/chemistry controls
 - 5 Process controls
 - (c) Facility systems, components, and operations;
 - (d) Simulator training;
 - (e) Environment, Safety, and Health Orders;

- (f) Codes and standards overview;
- (g) Facility document system;
- (h) Safety Analysis Reports and Technical Safety Requirements;
- (i) Nuclear criticality control;
- (j) Material, maintenance, and modification control;
- (k) ALARA and radwaste reduction program; and
- (l) Quality Assurance/Quality Control practices.

i. Management and Supervisory Training Requirements. The topics listed in paragraph 7h shall be considered for applicability when developing manager and supervisor training programs. If training related to those topics is applicable to the position, that training shall be included in addition to the topics listed below, as appropriate to their job responsibilities. Supervisory skills and management training need not be subject to examination as part of initial training, nor is it necessary to include training on these topics in the continuing training program. It may, however, be appropriate to include additional topics such as these as part of the ongoing professional development program for managers and supervisors.

(1) Supervisory Skills Training. The supervisory skills training program shall include the following (or equivalent):

- (a) Leadership;
- (b) Interpersonal communication;
- (c) Responsibilities and authority;
- (d) Motivation of personnel;
- (e) Problem analysis and decision making;
- (f) Fitness for duty procedures; and
- (g) Administrative policies and procedures.

(2) Management Training. The management training program should include:

- (a) Supervisory skills training;
- (b) Quality assurance and quality control;
- (c) Facility security and emergency plans;

- (d) Purchasing;
- (e) Material storage;
- (f) Facility modifications (configuration control);
- (g) Nuclear, industrial, and radiation safety;
- (h) Environmental issues; and
- (i) Budgeting.

8. OPERATOR AND SUPERVISOR EXAMINATION REQUIREMENTS. Comprehensive written and oral examinations and operational evaluations shall be prepared and administered to demonstrate that certified operator and certified supervisor candidates possess the required knowledge and skills. Comprehensive written examinations and individual performance demonstrations shall be administered to ascertain the qualification of other operator and supervisor candidates that include duties that are important to engineered safety features as identified in the Safety Analysis Report. For Category A reactor facility certified personnel, the oral examination shall be separate from the operational evaluation. Operational evaluations and oral examinations may be combined for Category B reactor and non-reactor nuclear facility certified personnel. These examinations shall contain a representative sampling of the knowledge and skills identified in and derived from the learning objectives resulting from the systematic analysis of the position. Examinations should include questions from sources such as Safety Analysis Reports, Technical Safety Requirements, system description manuals, operating procedures, Occurrence Reports, and other applicable sources.
- a. Written procedures that establish requirements for examinations shall be developed and implemented. These procedures shall address, at a minimum, examination/evaluation development, approval, security, administration, remediation, and maintenance of examination question banks.
 - b. Oral examinations may be conducted as a one-on-one walkthrough or by an oral board or committee consisting of personnel identified by contractor facility management. The oral examination content shall be tailored to evaluate the candidate's operational knowledge (initial/continuing training program subjects) and organizational awareness (e.g., operating philosophy, use of procedures, shift and relief turnovers, verification of system/equipment status) to determine how the individual will function in an operating environment.
9. OPERATOR AND SUPERVISOR REEXAMINATION REQUIREMENTS. Reexamination for certified and qualified operators and supervisors shall include subjects in which the person is expected to be knowledgeable and emphasize those subjects covered by the continuing training program. The contractor shall administer comprehensive biennial examinations, or administer periodic (e.g., quarterly) examinations throughout the continuing training cycle. Written examinations and performance demonstrations shall be administered to qualified operators and

supervisors. Written and oral examinations and operational evaluations shall be administered to certified operators and supervisors.

For Category A reactor facility certified personnel, the oral examination shall be separate from the operational evaluation. Operational evaluations and oral examinations may be combined for Category B reactor and non-reactor nuclear facility certified personnel. Written examinations for certified operators and certified supervisors shall include a representative sampling of the topics specified in Chapters II, III, and IV to the extent applicable to the position and the facility. Operational evaluations shall require certified operators and certified supervisors to demonstrate an understanding of and the ability to perform a representative sampling of the control manipulations specified in Chapters II, III, and IV to the extent applicable to the position and the facility.

10. REQUALIFICATION REQUIREMENTS. Operators and their immediate supervisors shall not be allowed to continue to function in qualified or certified positions if they have not completed all of the requalification or recertification program elements within the two year continuing training cycle. The program elements consist of the continuing training program and the associated reexaminations. If a qualified or certified operator or supervisor fails a requalification or recertification examination, or shows serious job performance deficiencies which indicate that he or she may perform in an unsafe manner, the person shall be removed from activities requiring qualification or certification.
- a. Qualification or certification may be regained after completing remedial training designed to correct the deficiency(s) and satisfactorily completing a reexamination. In addition, recertification shall be based on the following:
- (1) A review of individual operating performance during the past certification period by either line management, by a committee, or by a person designated by management; and
 - (2) A current medical examination as required by Chapter II paragraph 3, Chapter III paragraph 3, or Chapter IV paragraph 3.
- b. When a certified operator or certified supervisor has been absent from certification duties for greater than 3 months, but less than 12 months, selected retraining (including written and oral examinations and operational evaluations, as deemed necessary) shall be given prior to reassignment to certification duties. The certification base date remains the same as it was before the absence. However, if the absence is greater than 12 months, comprehensive written and oral examinations and operational evaluations (as required of initial candidates) shall be given to determine weak areas. Retraining and reexamination shall be required in areas of weakness, and upon successful completion, a new certification date may be established.
11. EXCEPTIONS TO TRAINING REQUIREMENTS. The initial training programs that are described in this Order were developed for persons assumed to have the

entry-level knowledge and skills required of the position for which they are to fill, on the basis of meeting the education and experience requirements contained in this Order. Some candidates may already possess the knowledge and skills necessary for certain of their job requirements, and may be excepted from certain areas of training programs on the basis of prior education, experience, training, and/or testing. Testing (i.e., performance demonstrations, written examinations, oral examinations) is the preferred method for excepting persons from specific areas of training. In all cases, the requisite examinations (as described in paragraph 8) to establish qualification/certification shall be completed.

- a. The operating organization shall establish an administrative procedure that describes the methods used to administer and document exceptions to initial training program requirements. The name of the person and the specific subject for which the exception is requested, along with justification for the exception, shall be included as part of the documentation. In all cases, the operating organization shall ensure that sufficient facility-specific instruction is provided to enable the candidate to perform job requirements. The operating organization shall submit the procedure for granting exceptions to the Operations Office Manager for approval.
- b. Personnel placed in the training program who have satisfactorily completed training programs comparable in content and in performance standards may be released (excepted) from portions of training on an individual case basis. Exception from training should be based on a review of previous training records (i.e., transcripts), personal interviews, and on examinations that are based on the objectives states for the training program.
- c. Exceptions from qualification or certification requirements may be approved by contractor management after approval of the exception procedure by the Operations Office Manager/Field Manager for NNSA Operations.
- d. Persons who believe that they have knowledge or skills equivalent to that which is addressed by the training may challenge the requirement to attend individual portions of the training program. In situations such as these, examinations (written or performance) may be administered by the operating contractor. If challenge examinations are administered, they shall be sufficiently comprehensive to adequately test the learning objective(s) that are stated in the training program. The use of challenge tests is not considered taking an exception to the training and, as such, challenge tests are excluded from the requirements for exceptions contained in preceding portions of this section. Accordingly, they do not need to be approved on a case-by-case basis.

12. EXTENSION REQUIREMENTS. An extension of qualification or certification may be granted to persons on a case-by-case basis in order to support operational and schedular commitments.

- a. The operating organization shall establish an administrative procedure for granting extensions to qualification or certification. At a minimum, the documentation to support the extension should include:

Vertical line denotes change.

- (1) Responsibility for approval of the extension;
 - (2) Length of the extension; and
 - (3) Explanation of the circumstances that prevented the person from completing the requirements.
- b. Extensions of certification of operators and supervisors may be approved only by the Operations Office Manager/Field Manager for NNSA Operations. Extensions of qualification of operators and supervisors may be approved by contractor facility management.
13. ALTERNATIVES TO EDUCATION AND EXPERIENCE REQUIREMENTS. The purpose of establishing education and experience requirements is to help ensure that personnel have the ability to perform their job safely and reliably. Education and experience requirements of this Order are consistent with nuclear industry standards for similar positions. As a result of the considerable variation in the operations of DOE nuclear facilities, it is reasonable to consider and allow substitutions and alternatives to the education and experience requirements contained herein. Work experience may be substituted for education and education and training may be substituted for experience in specific cases. Using alternatives to education and experience requirements is intended to allow individuals who do not meet the literal education and experience requirements of this Order, but who are otherwise qualified or capable, to fill positions in the operating organization.
- a. Alternatives to Education. Educational requirements are described as either baccalaureate *or* associate degree, or high school diploma. In each case, the type of degree/diploma required is a function of the person's responsibilities. Persons who do not possess the formal educational requirements specified shall not be automatically eliminated where other factors provide sufficient assurance of their abilities to fulfill the duties of a specific position. These factors shall be evaluated on a case-by-case basis and approved and documented by the operating organization. The following are examples that may be considered in making the evaluation of an acceptable alternative to the educational requirements:
- (1) General Education Development (GED) test for a high school diploma;
 - (2) Professional engineers license or completion of Engineer in Training (ET) examination for a baccalaureate or associate degree requirement;
 - (3) Completion of technical portions of an engineering, engineering technology, or related science program may substitute for the baccalaureate or associate degree. Successful completion shall be determined by a transcript or other certification by an accredited

institution. For example, completion of 80 semester credit hours may be substituted for the baccalaureate requirement and 43 semester credit hours for the associate degree. The courses shall be in appropriate technical subjects relevant to the position to be filled; and

- (4) Related experience may substitute for education at the rate of six semester credit hours for each year of experience up to a maximum of 60 credit hours.

b. Alternatives to Experience. Experience in design, construction, and operational training may be considered applicable nuclear experience and should be evaluated on a case-by-case basis.

- (1) Where course work is related to job assignments, post-secondary education may be substituted. Formal education shall not be allowed to substitute for more than 50 percent of the experience requirement unless otherwise stated in Chapters II, III, or IV.
- (2) Job-related training in the position sought may qualify as equivalent to nuclear experience on a one-for-one basis for up to a maximum of two years.

14. DOE STANDARDS. DOE training-related guides to good practices have been developed to assist in meeting the requirements of this Order. Typically, good practices are developed from DOE operating contractor and commercial industry programs and collective experience, and are synthesized into a good practice standard by the Department, with DOE and DOE contractor review. In general, good practices define one method of meeting the requirements of this Order in specific areas. It is recognized that other programs or methods may be as good or better. Operating contractors are encouraged to selectively use good practices in developing or improving programs applicable to their facilities. Good practices can be used in whole or in part, as furnished or modified, to meet the specific needs of the facility involved. For the current list of training-related guides to good practices, see the *DOE Technical Standards List*.

15. RECORD REQUIREMENTS. Contractors shall develop and implement administrative procedures that specify requirements for the maintenance of training, qualification, and certification records for operating organization personnel. The guidance in the *Nuclear Information and Records Management Association Guidelines for Management of Nuclear Related Training Records*, TG-17 should be used to help standardize identification, handling, and storage of training records.

- a. Qualification and certification of personnel shall be documented in an easily auditable format. Individual record documentation shall include the following at a minimum:
 - (1) Education, experience, and employment history and most recent health evaluation summary (e.g., similar to NRC Form 396);

- (2) Training programs completed and qualification/certification achieved;
 - (3) Latest completed checklists, graded written examinations (with answers corrected as necessary or examination keys), simulator examinations (where applicable), and operational evaluations used for certification (this requires controlling access to training records to maintain examination security). The record should include an evaluation of knowledge and performance during operational evaluations;
 - (4) Lists of questions asked and the examiner's overall evaluation of the responses on oral examinations;
 - (5) Correspondence relating to exceptions to training requirements and extensions of qualification/certification;
 - (6) Records of qualification for one-time-only special tests or operations; and
 - (7) Attendance records for required training courses or sessions.
- b. A historical record that documents initial qualification or certification, and applicable information from the above list that verifies the most recent qualification or certification shall be retained in individual records. Superseded information should be handled in accordance with DOE 1324.2A, RECORDS DISPOSITION.

CHAPTER 11

CATEGORY A REACTOR PERSONNEL

1. PURPOSE. This Chapter provides specific requirements in addition to the general requirements of Chapter I for personnel at DOE Category A reactor facilities.
2. ENTRY-LEVEL REQUIREMENTS. Entry-level requirements for operating organization personnel are intended to provide reasonable assurance that these personnel have, or can acquire, the knowledge and skills to operate and maintain the reactor and related support systems in a safe and reliable manner under all conditions. Attachment 11-1 summarizes the education and experience requirements for positions in this Chapter.
 - a. Managers. The term "Manager" refers to a person whose assigned responsibilities include ensuring that a plant or facility is safely and reliably operated, and that supporting operational and administrative activities are properly controlled. Managers are responsible for nuclear safety, operational efficiency and reliability, control of onsite emergencies, and any other activities necessary to safeguard the health and safety of the workforce, the general public, and the environment-Operational responsibilities include prioritizing and assessing facility activities including modifications, and overseeing the operating organization. Administrative responsibilities include maintenance of a qualified staff, budgets, maintaining employee performance, administering disciplinary actions consistent with company policies, public information, and coordination with corporate offices. This functional level typically includes the Plant/Facility Manager or Director, the Operations Manager, the Maintenance Manager, the Training Manager, and the Technical Manager. Prior to assuming the duties of the assigned position, persons at the manager level shall meet the following requirements:
 - (1) Plant Manager.
 - (a) Education: Baccalaureate in engineering or related science
 - (b) Experience:

Nuclear	6 years
Supervisory or Management	4 years
Onsite	6 months
 - (c) Special Requirements:
 - 1 Three years of the required nuclear experience may be power plant experience; and
 - 2 The Plant Manager shall hold, or have held, a senior reactor operator certification for a similar Category A

reactor plant (or equivalent) or have been certified at an appropriate simulator. Plant Managers who have an assistant holding a senior reactor operator certification need not meet this special requirement.

(2) Operations Manager.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	4 years
Onsite	6 months
- (c) Special Requirements:
 - 1 One year of the required nuclear experience may be power plant experience; and
 - 2 The Operations Manager shall hold a senior reactor operator certification at the time of appointment to the position.

(3) Maintenance Manager.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	4 years
Onsite	6 months
- (c) Special Requirements:
 - 1 Two years of the required nuclear experience may be power plant experience; and
 - 2 The Maintenance Manager shall be familiar with nondestructive testing and have an understanding of electrical, pressure vessel, and piping codes and standards.

(4) Technical Manager.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	4 years
Onsite	6 months
- (c) Special Requirements:
 - 1 One year of the required nuclear experience may be

power plant experience.

(5) Training Manager.

- (a) Education: Baccalaureate including courses in education and technical subjects
- (b) Experience:

Job related	4 years
which shall include,	
Nuclear	2 years
- (c) Special Requirements:
 - 1 The Training Manager shall have training in educational techniques if not included in baccalaureate course material; and
 - 2 If the Training Manager does not hold, or has not held, a senior reactor operator certification, another person who holds a senior reactor operator certification shall be responsible to the Training Manager for the content and conduct of the certified operator training program.

b. Supervisors. This functional level consists of those individuals who are responsible for the quantity and quality of work and who direct the actions of operators, technicians, or maintenance personnel. Their duties include ensuring that work is performed in compliance with procedures, policies, and industrial safety practices. Prior to assuming the duties of the assigned position, supervisors shall meet the following requirements:

(1) Shift Supervisors.

- (a) Education: High School Diploma
- (b) Experience:

Nuclear	4 years
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- (c) Special Requirements:
 - 1 Two years of the required nuclear experience may be power plant experience; and
 - 2 The shift supervisor shall hold and maintain senior reactor operator certification.

(2) Senior Reactor Operators.

- (a) Education: High School Diploma

- (b) Experience:

Power Plant	4 years
Nuclear	2 years
Onsite	6 months

(c) Special Requirements:

- 1 Two years of the power plant experience may be fulfilled by academic or related technical training on a one-for-one time basis;
- 2 If the candidate for senior reactor operator does not possess a baccalaureate in engineering or equivalent, the candidate shall have one year experience as a certified reactor operator at the reactor for which certification is sought;
- 3 Candidates for senior reactor operator with a baccalaureate in engineering or equivalent shall participate in reactor plant operations at power levels of at least 20 percent for at least six weeks, while assigned in the control room as a reactor operator candidate; and
- 4 Candidates for senior reactor operator with a baccalaureate in engineering or equivalent shall perform all control manipulations that a reactor operator candidate would perform.

(3) Qualified Supervisors.

- (a) Education: High School Diploma

- (b) Experience:

Job related	4 years
Nuclear	1 year
Onsite	3 months

c. Technical Staff. Personnel in these positions are responsible for supervision and performance of technical support functions for the operating organization. Personnel involved in surveillance, testing, analyzing facility data, planning modifications, program review, and technical problem resolution in their area of expertise are also included. They have expertise in mechanical, electrical, instrumentation and control, chemistry, radiation protection, safety, quality assurance/independent assessment, or reactor engineering. Unless otherwise stated, the basic education requirement is a baccalaureate in engineering or related science and the experience requirement is 2 years job-related, of which 1 year shall be nuclear experience. The education and experience requirements listed below apply to supervisory positions or positions with authority to make independent decisions or to review

and concur, and not to entry-level positions.

(1) Reactor Engineering.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience: 4 years
 Job related
 which shall include, 2 years
 Nuclear 6 months
 Onsite
- (c) Special Requirement: Nuclear experience shall be in areas such as reactor physics, core measurements, core heat transfer, and core physics testing programs.

(2) Instrumentation and Control.

- (a) Education: Associate Degree in engineering or related science
- (b) Experience: 2 years
 Job related
 which shall include, 1 year
 Nuclear 6 months
 Onsite

(3) Chemistry and Radiochemistry.

- (a) Education: Baccalaureate in chemistry or related science
- (t) Experience: 2 years
 Job related
 which shall include, 1 year
 Nuclear 6 months
 Onsite
- (c) Special Requirement: one year of nuclear experience shall be in radiochemistry.

(4) Radiation Protection.

- (a) Education: Baccalaureate in a science or engineering subject, including formal training in radiation protection.
- (b) Experience: 4 years
 Job related
 which shall include, 3 years
 Nuclear 6 months
 Onsite

- (c) Special Requirement: The three years nuclear experience shall be professional-level.

(5) Preoperational Testing Engineer.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	1 year
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- (c) Special Requirements:
 - 1 The required nuclear experience may be power plant experience; and
 - 2 These persons shall be knowledgeable of test program administration and the design and operational performance requirements of the system and equipment being tested and its interaction with other systems.

(6) Startup Testing Engineer.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	2 years
---------	---------
- (c) Special Requirements:
 - 1 One year of the required nuclear experience may be power plant experience; and
 - 2 This person shall be knowledgeable of test program administration, the system design and operational requirements, and expected plant operational characteristics during the test.

(7) Shift Technical Advisors.

- (a) Education: Baccalaureate in engineering or related science
- (b) Experience:

Nuclear	1 year
Onsite	6 months
- (c) Special Requirement: This person shall be knowledgeable of control room instruments and controls, and be assigned to advise the responsible shift supervisor concerning abnormal facility operating conditions.

d. Training Organization Personnel. Training organization personnel are

responsible for working with the line organization to identify and meet personnel and organization needs. Training organization personnel assist line organizations in determining training program content, developing training materials, scheduling training, and delivering training programs for the operating organization.

(1) Training Coordinators.

- (a) Education: High School Diploma
- (b) Experience:

Nuclear	2 years
Onsite	6 months
- (c) Special Requirement: The required nuclear experience may be power plant experience.

(2) Training Instructors.

- (a) Education: High School Diploma
- (b) Experience: Consistent with the material being presented.
- (c) Special Requirements:
 - 1 Instructors who provide instruction on the reactor simulator to certified personnel shall hold, or have held, a senior reactor operator certification for a similar Category A reactor facility (or equivalent) or have been certified on the reactor simulator;
 - 2 Instructors who are responsible for instruction of subjects such as Technical Safety Requirements, reactor operating principles and characteristics, and control manipulations shall have received senior reactor operator (or equivalent) training; and
 - 3 Instructors shall have demonstrated knowledge of instructional techniques through training or experience and be qualified by the Training Manager (or equivalent) for the material being presented.

- e. Operators, Technicians, and Maintenance Personnel. Operators are responsible for the manipulation of facility controls or the operation of engineered safety features as identified in the Safety Analysis Report. Technicians and maintenance personnel are responsible for monitoring of instrumentation, conduct of radiation surveys, control of reactor plant chemistry, or for maintenance of facility equipment and systems, as related to the position. Examples include auxiliary operator, reactor operator, electronics technician, radiological control technician, laboratory technician, electrician, or mechanic. Persons in a training

status or in apprentice positions shall not be considered operators, technicians, or maintenance personnel, but may perform work in the specific tasks for which qualification has been achieved. Persons in a training status or in apprentice positions may perform tasks under the immediate supervision of a person qualified to perform that specific task.

(1) Qualified Auxiliary Operators.

- (a) Education: High School Diploma
- (b) Experience: Qualified auxiliary operators whose actions could affect the quality of engineered safety features shall have 1 year of nuclear experience.
- (c) Special Requirement: The required nuclear experience may be power plant experience.

(2) Reactor Operators.

- (a) Education: High School Diploma
- (b) Experience: Nuclear 3 years
- (c) Special Requirements:
 - 1 Two years of the required nuclear experience may be power plant experience; and
 - 2 Six months of the required experience shall be experience as a qualified auxiliary operator at the reactor for which certification is sought.

(3) Technicians.

- (a) Education: High School Diploma
- (b) Experience: Job related experience 3 years

(4) Maintenance Personnel.

- (a) Education: Journeyman level
- (b) Experience: Related maintenance experience 3 years

3. MEDICAL EXAMINATION REQUIREMENTS. An initial medical examination shall be given to candidates and a reexamination shall be given at least every two years to certified operators and certified supervisors to verify health and physical

fitness to safely perform their assigned tasks. Certified operators and certified supervisors must also be cleared by medical examination prior to returning to work following any illness or injury which keeps the person from performing their duties for a period exceeding one month. Medical examination requirements shall be in accordance with ANSI/ANS 3.4-1983, *Medical Certification and Monitoring of Personnel Requiring Operator Licenses*. Medical examination requirements for other operating organization personnel shall be in accordance with operating contractor procedures.

4. ENGINEERING EXPERTISE ON SHIFT REQUIREMENTS. The operating organization shall ensure that the operating shift possesses adequate engineering and accident assessment expertise. This may be accomplished by designating a Shift Technical Advisor (STA) for each shift, or by combining the STA position with the shift supervisor or an on-shift senior reactor operator. If the combined approach is utilized, the designated STA shall meet the following qualifications:
 - a. Currently certified as a senior reactor operator; and
 - b. Successful completion of the STA training requirements in paragraph 6a, and one of the following educational requirements:
 - (1) Baccalaureate in engineering;
 - (2) Professional engineer's license;
 - (3) Baccalaureate in engineering technology including course work in the physical, mathematical, or engineering sciences; or
 - (4) Baccalaureate in a physical science including course work in the physical, mathematical, or engineering sciences.

5. SIMULATOR REQUIREMENTS. DOE production reactors shall have a full-scope simulator that meets the requirements contained in ANSI/ANS 3.5-1985, *Nuclear Power Plant Simulators for Use in Operator Training*, and Regulatory Guide Positions C.5 and C.6 contained in Nuclear Regulatory Commission Regulatory Guide 1.149, Revision 1, of April 1987, *Nuclear Power Plant Simulation Facilities for Use in Operator Licensing Examinations*, for reactor operator and senior reactor operator training.
 - a. If a full-scope simulator is to be utilized for more than one production reactor, the differences between the simulator and reactor shall be identified and documented by the operating organization and shall be approved by the Operations Office Manager/Field Manager for NNSA Operations. These differences should not be so significant that they

have an adverse impact on the ability of the simulator to meet the requirements and guidance of ANSI/ANS 3.5-1985.

- b. The need for a full-scope or part-task simulator for DOE Category A test and research reactors shall be based on an evaluation conducted by the operating organization. The evaluation shall consider whether adequate training may be achieved by actual facility maneuvers, drills, part-task simulators, or combinations of these. The evaluation shall also consider the ability to adequately provide in-facility training covering all operator actions where timely operator action must be taken to bring the reactor to, or maintain it in, a safe condition. The operating contractor should also evaluate the ability to provide adequate training in normal operations; anticipated transients, and accident conditions. The assessment (evaluation) of the need for a simulator (for other than production reactors) shall be approved by the Operations Office Manager/Field Manager for NNSA Operations and the Cognizant Secretarial Officer/Deputy Administrator, NNSA.

6. SPECIFIC TRAINING REQUIREMENTS. This section provides additional position-specific training requirements.

- a. Shift Technical Advisor (STA). STA training shall include:
- (1) Accidents analyzed in the facility Safety Analysis Report (SAR) and the consequences of these accidents;
 - (2) Thermodynamics/fluid flow, reactor physics, system engineering, nuclear instrumentation, process computer, and facility response;
 - (3) The duties, responsibilities, and authorities of the STA;
 - (4) Performance of control manipulations on the simulator (for those facilities having simulators), by actual facility maneuvers or drills, or combinations of these;
 - (5) Response to and analysis of facility transients and accidents; and
 - (6) The relationship of accident conditions to offsite consequences and protective action strategies.
- b. Fuel Handling Operations. All fuel handling operations shall be performed by or under the direct supervision of a person certified to perform the required functions. The requirements below are not necessary if fuel handling is performed by persons trained for such as part of reactor operator and senior reactor operator certification programs:

- (1) A specific training program shall be established to certify fuel handling operators and supervisors. The program shall include training for their assigned tasks; and
 - (2) The program for fuel handling operators and supervisors shall consist of initial and continuing training. Training and examination may be limited to that needed for fuel handling safety, the impact of fuel handling on safety, and actions to be taken during abnormal and emergency conditions.
- c. Control Manipulations. The operating contractor shall prepare a list of

control manipulations that is based on the analysis of the job. The list of control manipulations shall specify which manipulations are to be performed annually and which are to be performed biennially by reactor operators and senior reactor operators as part of the continuing training program. Reactor operator and senior reactor operator candidates shall perform a minimum of five significant reactivity manipulations (e.g., reactor startup, reactor shutdown, >10% change in reactor power) for initial certification. Additional control manipulations should be based on the analysis. Following initial certification, the senior reactor operator need only direct control manipulations to meet this requirement.

- d. Reactor Operator Written Examination Contents. Written examinations shall be administered to reactor operator candidates. These examinations shall contain a representative selection of questions on the knowledge and skills identified from learning objectives developed from the analysis of the job and from information in facility Safety Analysis Reports, Technical Safety Requirements, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources. The examination shall include a representative sampling from the following items, as appropriate to the position and to the facility:
- (1) Fundamentals of reactor theory, including fission process, neutron multiplication, source effects, control rod effects, criticality indications, reactivity coefficients, and poison effects;
 - (2) General design features of the core, including core structure, fuel elements, control rods, core instrumentation, and coolant flow;
 - (3) Mechanical components and design features of the primary system;
 - (4) Secondary coolant and auxiliary systems;
 - (5) Facility operating characteristics, and reasons for these characteristics, during steady state and transient conditions, including coolant chemistry, causes and effects of temperature, pressure and reactivity changes, effects of load changes (if applicable), and operating limitations;
 - (6) Reactivity control mechanisms and instrumentation, including design, components, and functions;
 - (7) Control and safety systems, including design, components, functions, instrumentation, signals, interlocks, failure modes, and automatic and manual features;
 - (8) Emergency systems, including components, capacity, and functions;
 - (9) Shielding, isolation, and containment/confinement design features, including access limitations;

- (10) Operating procedures, including administrative, normal, abnormal, and emergency;
 - (11) Radiation monitoring systems, including purpose, operation, alarms, and survey equipment;
 - (12) Radiological safety principles and procedures;
 - (13) Procedures and equipment available for handling and disposal of radioactive and other hazardous materials and effluent;
 - (14) Principles of heat transfer, thermodynamics and fluid mechanics; and
 - (15) Use of installed facility systems for the control and mitigation of an accident in which the core maybe severely damaged.
- e. Senior Reactor Operator Written Examination Contents. The senior reactor operator written examination shall be based on the sources discussed in paragraph 6d. The examination shall include a representative sampling from the following items, in addition to those required for reactor operators, as appropriate to the position and to the facility:
- (1) Conditions and limitations for facility operations;
 - (2) Operating limitations in the Technical Safety Requirements and their bases;
 - (3) Procedures required to obtain authority for design and operating changes in the facility;
 - (4) Radiation hazards that may arise during normal and abnormal situations, including maintenance activities and various contamination conditions;
 - (5) Assessment of facility conditions and selection of appropriate procedures during normal, abnormal, and emergency situations;
 - (6) Procedures and limitations for initial core loading, alterations in core configuration, control rod programming, and determination of various internal and external effects on core reactivity; and
 - (7) Fuel handling facilities and procedures.
- f. Operational Evaluations. The operational evaluations administered to reactor operator and senior reactor operator candidates are to be generally similar in scope. Operational evaluations shall include a facility walkthrough or a combination walkthrough and simulator examination (for those DOE facilities having simulators), and may include system and/or component operation. Operational evaluations, to the extent possible and consistent with the analysis of the job, shall

require the candidate to demonstrate an understanding of, and the ability to perform, the actions necessary to accomplish a representative sampling from the following items:

- (1) Perform prestartup procedures, including operation of controls associated with equipment which could affect reactivity;
- (2) Manipulate the console controls as required to operate the facility between shutdown and designated power levels;
- (3) Identify annunciators and condition-indicating signals and perform appropriate remedial actions;
- (4) Identify instrumentation systems and the significance of the instrument readings;
- (5) Observe and safely control the operating behavior characteristics of the facility;
- (6) Perform control manipulations to obtain desired operating results during normal, abnormal, and emergency situations;
- (7) Safely operate heat removal systems, including the primary coolant, emergency coolant, and decay heat removal systems and explain relationships between proper operation of these systems to the operation of the facility;
- (8) Safely operate auxiliary and emergency systems, including controls of facility equipment that could affect reactivity or release radioactive or other hazardous materials to the environment;
- (9) Demonstrate or describe the use and function of radiation monitoring systems, including fixed radiation monitors and alarms, portable survey instruments, and personnel monitoring equipment;
- (10) Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized, and the ability to perform other procedures to reduce excessive radiation levels and to guard against personnel exposure;
- (11) Demonstrate knowledge of the emergency plan, including, as appropriate, reactor operator or senior reactor operator responsibility to decide whether the plan should be executed and assigned duties under the plan;
- (12) Demonstrate knowledge and ability, as appropriate to the assigned position, to assume the responsibilities associated with safe operation of the facility; and
- (13) Demonstrate the ability to function within the control room team in such a way that procedures are adhered to and Technical Safety

Requirements are not violated.

g. Operating Crew/Shift Training.

- (1) Reactor Operators. Reactor operator candidates shall be assigned to an operating crew full-time for a minimum of 3 months shift training with no concurrent duties that are not related to the operation of the facility. During this period, under the observation and control of a certified reactor operator, the trainee shall manipulate the facility controls and perform the same duties as a certified reactor operator.
- (2) Senior Reactor Operator. Senior reactor operator candidates shall be assigned to an operating crew full-time for a minimum of 3 months shift training with no concurrent duties that are not related to the operation of the facility. During this period, under the observation and control of a certified senior reactor operator, the trainee shall supervise the manipulation of the facility controls and perform the same duties as a certified senior reactor operator.

7. OPERATOR PROFICIENCY REQUIREMENTS. Certified reactor operators and senior reactor operators shall actively perform job functions associated with their certification to maintain proficiency. Actively performing job functions associated with certification means that the certified individual has a position on the shift crew, and that the individual carries out and is responsible for the day-to-day duties of the certified position. If certified operators are absent from activities associated with the certified position for extended periods of time, their ability and readiness to perform at a high level of vigilance can reasonably be expected to decrease. The proficiency requirement is imposed to ensure that certified personnel continue to possess and practice the skills and abilities necessary to operate the systems and equipment for which they are responsible in a safe and reliable manner during both normal and abnormal facility operations and system transients.

- a. To maintain active status (proficiency), reactor operators and senior reactor operators shall perform certification duties on a minimum of:
 - (1) 5 eight-hour shifts per calendar quarter; or
 - (2) 3 twelve-hour shifts per calendar quarter; or
 - (3) 9 four-hour shifts per calendar quarter.
- b. If active status is not maintained, certification shall be suspended and the person shall not be assigned certification duties. Prior to resuming duties associated with certification, the operating contractor shall ensure that:
 - (1) Certification is otherwise current and valid; and

- (2) The reactor operator and senior reactor operator has performed certification duties under the direct supervision of a certified reactor operator or certified senior reactor operator, as appropriate to the position, for a minimum period of 24 hours and must include a complete tour of the facility and all required shift turnover procedures.
- c. If the reactor is not operated frequently enough to meet established requirements, the operating contractor shall ensure that certification is reinstated prior to reactor operation. Administering written and oral examinations and operational evaluations and conducting facility walkthroughs and/or simulated operations should be considered to ensure adequate operational knowledge (as determined by the duration of the reactor shutdown). A graded approach should be used to determine the extent of activities necessary to reinstate certification. DOE 5480.31, STARTUP AND RESTART OF NUCLEAR FACILITIES, contains detailed requirements for facility restart.

CATEGORY A REACTOR
MINIMUM EDUCATION AND EXPERIENCE

	EDUCATION		EXPERIENCE		SPECIAL REQMTS
	Degree or Diploma	Other	Job Related	Nuclear	RO/SRO CERT
MANAGERS					
Plant	BS		(1)	6 Yr (2)(3)	SRO(5)
Operations	BS			4 Yr (3)(8)	SRO(14)
Maintenance	BS	(9)		4 Yr (3)(7)	
Technical	BS			4 Yr (3)(8)	
Training	BS/BA		4 Yr	2 Yr	SRO(10)
SUPERVISORS					
Shift Supervisors	HS			4 Yr (7)	SRO
Senior Reactor Operators	HS		4 Yr	2 Yr (3)	SRO(11)
Qualified Supervisors	HS		4 Yr	1 Yr (4)	
TECHNICAL STAFF					
Reactor Engineering	BS		4 Yr	2 Yr (3)	
Instrumentation and Control	AS		2 Yr	1 Yr (3)	
Chemistry/Radiochemistry	BS		2 Yr	1 Yr (3)	
Radiation Protection	BS		4 Yr	3 Yr (3)	
Preoperational Testing Engineer	BS			1 Yr (8)	
Startup Testing Engineer	BS			2 Yr (8)	
Shift Technical Advisor	BS			1 Yr (3)	

	EDUCATION		EXPERIENCE		SPECIAL REQMS
	Degree or Diploma	Other	Job Related	Nuclear	RO/SRO CERT
TRAINING ORGANIZATION PERSONNEL					
Training Coordinators	HS			2 Yr (3)(7)	
Training Instructors	HS		(12)		(13)
OPERATORS, TECHNICIANS, AND MAINTENANCE PERSONNEL					
Auxiliary Operators	HS			1 Yr (8)	
Reactor Operators	HS			3 Yr (3)(7)	RO
Technicians	HS		3 Yr		
Maintenance Personnel	Journeyman		3 Yr		

- (1) Minimum of 4 years supervisory or management experience.
- (2) 3 years of nuclear experience may be power plant experience.
- (3) Minimum of 6 months onsite.
- (4) Minimum of 3 months onsite.
- (5) Hold, or have held, a senior reactor operator certification for similar Category A reactor plant (or equivalent) or have been certified at an appropriate simulator. Plant Managers who have an assistant holding an SRO certification need not meet this special requirement.
- (6) Hold, or have held, a senior reactor operator certification for similar Category A reactor plant (or equivalent)
- (7) 2 years of nuclear experience may be power plant experience.
- (8) 1 year nuclear experience may be power plant experience.
- (9) Shall be familiar with nondestructive testing and have an understanding of electrical, pressure vessel, and piping codes and standards.
- (10) If the Training Manager does not hold, or has not held, a senior reactor operator certification, another person who holds a senior reactor operator certification shall be responsible to the Training Manager for the content and

conduct of training for certified operators.

- (11) If the candidate for senior reactor operator does not possess a baccalaureate in engineering or equivalent, this person shall have 1 year experience as a reactor operator at the reactor for which certification is sought.
- (12) Experience shall be consistent with the material being presented.
- (13) Instructors who provide instruction on the reactor simulator to certified personnel shall hold, or have held, a senior reactor operator certification for a similar Category A reactor plant (or equivalent), or have been certified on the reactor facility simulator. Persons who are responsible for instruction of subjects such as Technical Safety Requirements, reactor operating principles and characteristics, and control manipulations shall have received senior reactor operator (or equivalent) training.
- (14) The Operations Manager shall hold a senior reactor operator certification at the time of appointment to the position.

CHAPTER IIICATEGORY B REACTOR PERSONNEL

1. PURPOSE. This Chapter provides specific requirements in addition to the general requirements of Chapter I for personnel at DOE Category B reactor facilities.
2. ENTRY-LEVEL REQUIREMENTS. Entry-level requirements for operating organization personnel are intended to provide reasonable assurance that these personnel have, or can acquire, the knowledge and skills to operate and maintain the reactor and related support systems in a safe and reliable manner under all conditions. Attachment III-1 summarizes the education and experience requirements for positions in this Chapter.
 - a. Managers. The term "Manager" refers to a person whose assigned responsibilities include ensuring that a plant or facility is safely and reliably operated, and that supporting operational and administrative activities are properly controlled. Managers are responsible for nuclear safety, operational efficiency and reliability, control of onsite emergencies, and any other activities necessary to safeguard the health and safety of the workforce, the general public, and the environment. Operational responsibilities include prioritizing and assessing facility activities including modifications, and overseeing the operating organization. Administrative responsibilities include maintenance of a qualified staff, budgets, maintaining employee performance, administering disciplinary actions consistent with company policies, public information, and coordination with corporate offices. This functional level typically includes the Plant/Facility Manager or Director, the Operations Manager, the Maintenance Manager, the Training Manager, and the Technical Manager. Prior to assuming the duties of the assigned position, persons at the manager level shall meet the following requirements:
 - (1) Education: Baccalaureate in engineering or related science
 - (2) Experience:
Nuclear 6 years
 - (3) Special Requirements:
 - (a) Education or experience that is job-related may be substituted for a degree on a case-by-case basis. The degree may fulfill 4 of the 6 years of nuclear experience required on a one-for-one time basis. Experience acquired at a nuclear power, test, research, or production reactor, or a critical facility counts on a one-for-one time basis;
 - (b) Managers shall receive facility-specific training based upon a comparison of the individual's background and abilities with the responsibilities and duties of the position; and

- (c) The Training Manager shall have a baccalaureate including courses in education and technical subjects (baccalaureate need not be in engineering or related science).
- b. Supervisors. This functional level consists of those individuals who are responsible for the quantity and quality of work performed and who direct the actions of operators, technicians, or maintenance personnel. Their duties include ensuring that work is performed in compliance with procedures, policies, and industrial safety practices. This functional level typically includes the reactor or shift supervisor and may be combined with the senior reactor operator position at smaller facilities. Prior to assuming the duties of the assigned position, supervisors shall meet the following requirements:
- (1) Education: High School Diploma
 - (2) Experience: Nuclear 3 years
 - (a) Experience acquired at nuclear power, test, research, or production reactors or a critical facility counts on a one-for-one time basis; and
 - (b) Full-time academic training (i.e., degree programs, trade schools, vocational programs, etc.) may be substituted on a one-for-one basis for 2 of the 3 years of required nuclear experience.
 - (3) Special Requirement: The reactor or shift supervisor shall be certified as a senior reactor operator.
- c. Operators. Operators are responsible for manipulating facility controls, monitoring facility parameters, and operating facility engineered safety features as identified in the Safety Analysis Report. At Category B reactor facilities this position includes the reactor operator and senior reactor operator.
- (1) Education: High School Diploma
- d. Technicians. Technicians are principally involved in calibration, inspection, troubleshooting, testing, maintenance, and radiation protection activities at the facility. Examples are laboratory technicians, instrument technicians, and radiological control technicians.
- (1) Experience: Job related 1 year
- e. Maintenance Personnel. Maintenance personnel typically perform maintenance and repair of electrical and mechanical equipment.

- (1) Experience:
Maintenance related 1 year

f. Technical Staff. Personnel in these positions are responsible for supervision and performance of technical support functions for the operating organization. Personnel involved in surveillance, testing, analyzing facility data, planning modifications, program review, and technical problem resolution in their area of expertise are also included. They have expertise in mechanical, electrical, instrumentation and control, chemistry, radiation protection, safety, quality assurance/independent assessment, or reactor engineering. For personnel assigned to equivalent positions, Category B reactor facilities should use the education and experience requirements contained in Chapter II, Category A Reactor Personnel, paragraph 2c. For positions for which there is no equivalent, the education and experience requirements are as listed below. The education and experience requirements listed below apply to supervisory positions or positions with authority to make independent decisions or to review and concur, and not to entry-level positions.

- (1) Education: Baccalaureate in engineering or related science

- (2) Experience:
Job related 2 years
Nuclear 1 year

g. Training Organization Personnel. Training organization personnel are responsible for working with the line organization to identify and meet personnel and organization needs. Training organization personnel assist line organizations in determining training program content, developing training materials, scheduling training, and delivering training programs for the operating organization.

- (1) Training Coordinators.

- (a) Education: High School Diploma

- (b) Experience:
Nuclear 2 years
Onsite 6 months

- (c) Special Requirement: Experience acquired at nuclear power, test, research, or production reactors or a critical facility counts on a one-for-one time basis.

- (2) Training Instructors.

- (a) Education: High School Diploma

- (b) Experience: Consistent with the material being presented.

(c) Special Requirements:

- 1 Instructors who are responsible for instruction on subjects such as Technical Safety Requirements, reactor operating principles and characteristics, and control manipulations shall have received senior reactor operator (or equivalent) training; and
- 2 Instructors shall have demonstrated knowledge of instructional techniques through training or experience and be qualified by the Training Manager (or equivalent) for the material being presented.

3. MEDICAL EXAMINATION REQUIREMENTS. An initial medical examination shall be given to candidates and a reexamination shall be given at least every two years to certified reactor operators and certified senior reactor operators to verify health and physical fitness to safely perform their assigned tasks. Certified operators and certified supervisors must also be cleared by medical examination prior to returning to work following any illness or injury which keeps the person from performing their duties for a period exceeding one month. Medical examinations shall be in accordance with requirements contained in ANSI/ANS 15.4-1988, *Selection and Training of Personnel for Research Reactors*. Medical examination requirements for other operating organization personnel shall be in accordance with operating contractor procedures.

4. SPECIFIC TRAINING REQUIREMENTS. The qualification program shall include classroom-type and on-the-job training to assure familiarity with all required aspects of reactor operation, including anticipated transients and accident conditions. Where construction precludes on-the-job training, practical experience at similar reactors, training on simulators, and other appropriate training is acceptable.

a. Reactor Operator and Senior Reactor Operator Training.

- (1) Training for reactor operators and senior reactor operators should take into account the previous experience, training, and level of responsibility of the candidate.
- (2) Senior reactor operator training shall be sufficiently comprehensive to develop the knowledge and skills commensurate with the position and cover areas which are fundamental to the candidate's job duties.
- (3) Initial and continuing training shall include the categories contained in paragraph 4d or 4e, and other categories and topics which are applicable to the facility and to the requirements of the job.

b. Fuel Handling Operations. All fuel handling operations shall be performed by or under the direct supervision of a person certified to perform the required functions. The requirements below are not necessary

if fuel handling is performed by persons trained for such as part of reactor operator and senior reactor operator certification programs.

- (1) A specific training program shall be established to certify fuel handling operators and supervisors. The program shall include training for their assigned tasks.
 - (2) The program for fuel handling operators and supervisors shall consist of initial and continuing training. Training and examination may be limited to that needed for fuel handling safety, the impact of fuel handling on safety, and actions to be taken during abnormal and emergency conditions.
- c. Control Manipulations. The operating contractor shall prepare a list of control manipulations that is based on an analysis of the job. The list of control manipulations shall specify which manipulations are to be performed annually and which are to be performed biennially by reactor operators and senior reactor operators as part of the continuing training program. Reactor operator and senior reactor operator candidates shall perform a minimum of five significant reactivity manipulations (e.g., reactor startup, reactor shutdown, >10% change in reactor power) for initial certification. Additional control manipulations should be based on the analysis. Following initial certification, the senior reactor operator need only direct control manipulations to meet this requirement.
- d. Reactor Operator Written Examination Contents. Written examinations shall be administered to reactor operator candidates. These examinations shall contain a representative selection of questions on the knowledge and skills identified from learning objectives developed from the analysis of the job and from information in Safety Analysis Reports, Technical Safety Requirements, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources. The examination shall include a representative sampling from the following items, as appropriate to the position and to the facility.
- (1) Facility design and operating characteristics, including features of facility design, design and operating characteristics and limitations, safety and emergency systems, experiment and test facilities, engineered safety features, and shielding;
 - (2) Principles of facility operation, including principles of reactor operation, radiological protection, effects of experiments, basic reactor theory, and heat transfer, fluid flow and thermodynamics, as necessary, for the specific design of the reactor;
 - (3) Instrumentation and control, including nuclear instruments, process instruments, control systems, radiation monitoring systems and survey equipment, experiment and test facility instrumentation, and manipulation of reactivity controls; and
 - (4) Procedures and Technical Safety Requirements including normal,

abnormal, emergency, radiological and hazardous materials control and administrative procedures, and operational limitations.

- e. Senior Reactor Operator Written Examination Contents. Written examinations shall also be administered to senior reactor operator candidates. These examinations shall be based on the sources discussed in paragraph 4d. The examination shall include a representative sampling from the following items, in addition to those required for reactor operators, as appropriate to the position and to the facility.
- (1) Radioactive materials handling, including special nuclear material (SNM) and radioactive materials hazards, handling, disposal, and safe practices; and
 - (2) Advanced theory and operation, including reactivity effects during experimental and maintenance activities, fuel handling, fuel burnup and reactivity worth, alterations in core configuration, Technical Safety Requirements bases, and administrative responsibilities associated with the facility and appropriate for the senior reactor operator's level of responsibility.
- f. Operational Evaluations. The operational evaluations administered to reactor operator and senior reactor operator candidates are to be generally similar in scope. To accommodate specialized modes of operation and differences in control, equipment, and operator knowledge and skill requirements, operational evaluations for Category B reactor personnel shall be similar, but need not be identical, to the operational evaluations for Category A reactor personnel. Significant deviations from the operational evaluations required of Category A reactor personnel shall be justified in writing and included in the Training Implementation Matrix.
5. OPERATOR PROFICIENCY REQUIREMENTS. Certified reactor operators and senior reactor operators shall actively perform job functions associated with their certification to maintain proficiency. Actively performing job functions associated with certification means that the certified individual has a position on the shift crew, and that the individual carries out and is responsible for the day-to-day duties of the certified position. If certified operators are absent from activities associated with the certified position for extended periods of time, their ability and readiness to perform at a high level of vigilance can reasonably be expected to decrease. The proficiency requirement is imposed to ensure that certified personnel continue to possess and practice the skills and abilities necessary to operate the systems and equipment for which they are responsible in a safe and reliable manner during both normal and abnormal facility operations and system transients.
- a. To maintain active status (proficiency), reactor operators and senior reactor operators shall perform certification duties for at least four hours per calendar quarter.
 - b. If active status is not maintained, certification shall be suspended and

the person shall not be assigned certification duties. Prior to resuming duties associated with certification, the operating contractor shall ensure that:

- (1) Certification is otherwise current and valid; and
 - (2) The reactor operator or senior reactor operator has performed certification duties under the direct supervision of a certified reactor operator or certified senior reactor operator, as appropriate to the position, for a minimum period of 6 hours.
- c. If the reactor is not operated frequently enough to meet established requirements, the operating contractor shall ensure that certification is reinstated prior to reactor operation. Administering written and oral examinations and operational evaluations and conducting facility walkthroughs and/or simulated operations should be considered to ensure adequate operational knowledge (as determined by the duration of the reactor shutdown). A graded approach should be used to determine the extent of activities necessary to reinstate certification. DOE 5480.31, STARTUP AND RESTART OF NUCLEAR FACILITIES, contains detailed requirements for facility restart.

CATEGORY B REACTORMINIMUM EDUCATION AND EXPERIENCE

	EDUCATION	EXPERIENCE		SPECIAL REQMTS
		Job Related	Nuclear	RO/SRO CERT
	Degree Diploma			
Managers	BS (1)		6 Yr (2, 3)	
Reactor Supervisors	HS		3 Yr (3)	SRO
Senior Reactor Operators	HS		3 Yr (3)	SRO
Reactor Operators	HS			RO
Technicians		1 Yr		
Maintenance Personnel		1 Yr		
Technical Staff	BS	2 Yr	1 Yr	
Training Coordinators	HS		2 Yr (3)	
Training Instructors	HS	(4)		(5)(6)

- (1) The Training Manager shall have a baccalaureate including courses in education and technical subjects (baccalaureate need not be in engineering or related science).
- (2) Education or experience that is job related may be substituted on a case-by-case basis. The degree may fulfill 4 of the 6 years of nuclear experience required on a one-for-one time basis.
- (3) Experience acquired at nuclear power, test, research, or production reactors or a critical facility counts on a one-for-one time basis.
- (4) Experience consistent with the material being presented.
- (5) Instructors who are responsible for instruction on subjects such as Technical Safety Requirements, reactor operating principles and characteristics, and control manipulations shall have received senior reactor operator (or equivalent) training.
- (6) Instructors shall have demonstrated knowledge of instructional techniques through training or experience and be qualified by the Training Manager (or equivalent) for the material being presented.

CHAPTER IVNON-REACTOR NUCLEAR FACILITY-PERSONNEL

1. Purpose. This Chapter provides specific requirements in addition to the general requirements of Chapter I for personnel at DOE non-reactor nuclear facilities.
2. ENTRY-LEVEL RETIREMENTS. Entry-level requirements for operating organization personnel are intended to provide reasonable assurance that these personnel have, or can acquire, the knowledge and skills to operate and maintain the facility in a safe and reliable manner under all conditions. The following paragraphs describe the positions typically involved in the operation of non-reactor nuclear facilities, and the education and experience requirements for each. Attachment IV-1 summarizes the education and experience requirements for positions in this Chapter.
 - a. Managers. The term "Manager" refers to a person whose assigned responsibilities include ensuring that a plant or facility is safely and reliably operated, and that supporting operational and administrative activities are properly controlled. Managers are responsible for nuclear safety, operational efficiency and reliability, control of onsite emergencies, and any other activities necessary to safeguard the health and safety of the workforce, the general public, and the environment. Operational responsibilities include prioritizing and assessing facility activities including modifications, and overseeing the operating organization. Administrative responsibilities include maintenance of a qualified staff, budgets, maintaining employee performance, administering disciplinary actions consistent with company policies, public information, and coordination with corporate offices. This functional level typically includes the Plant/Facility Manager or Director, the Operations Manager, the Maintenance Manager, the Training Manager, and the Technical Manager. Prior to assuming the duties of the assigned position, persons at the manager level shall meet the following requirements:
 - (1) Education: Baccalaureate in engineering or related science
 - (2) Experience: Nuclear 4 years
 - (3) Special Requirements:
 - (a) Education or experience that is job-related may be substituted for a degree on a case-by-case basis. The degree may fulfill 3 of the 4 years of nuclear experience required on a one-for-one time basis;
 - (b) Managers shall receive facility-specific training based upon a comparison of the individual's background and abilities with the responsibilities and duties of the position; and

- (c) The Training Manager shall have a baccalaureate including courses in education and technical subjects (baccalaureate need not be in engineering or related science).
- b. Supervisors. This functional level consists of those individuals who are responsible for the quantity and quality of work performed and who direct the actions of operators, technicians, or maintenance personnel. Their duties include ensuring that work is performed in compliance with procedures, policies, and industrial safety practices. Prior to assuming the duties of the assigned position, supervisors shall meet the following requirements:
- (1) Education: High School Diploma
 - (2) Experience: Nuclear 3 years
 - (3) Special Requirement: Full-time academic training (i.e., degree programs, trade schools, vocational programs, etc.) may be substituted on a one-for-one basis for 2 of the 3 years of required nuclear experience.
- c. Operators. Operators are persons responsible for performing operations associated with engineered safety features as identified in the Safety Analysis Report, operating support systems which could affect engineered safety features, or conducting activities with radioactive materials. Duties may include manipulating facility controls, monitoring parameters, and operating equipment in facility safety systems. Operators include fissionable material handlers, tritium facility operators, chemical process operators, waste tank operators, and enrichment facility operators.
- (1) Education: High School Diploma
- d. Technicians. Technicians are principally involved in calibration, inspection, troubleshooting, testing, maintenance, and radiation protection activities at the facility. Examples are laboratory technicians, instrument technicians, and radiological control technicians.
- (1) Experience: Job related 1 year
- e. Maintenance Personnel. Maintenance personnel are responsible for the maintenance and repair of mechanical and electrical equipment.
- (1) Experience: Maintenance related 1 year
- f. Technical Staff. Personnel in these positions are responsible for supervision and performance of technical support functions for the operating organization. Personnel involved in surveillance, testing,

analyzing facility data, planning modifications, program review, and technical problem resolution in their area of expertise are also included. They have expertise in mechanical, electrical, instrumentation and control, chemistry, radiation protection, safety, or quality assurance/independent assessment. For personnel assigned to equivalent positions, non-reactor nuclear facilities should use the education and experience requirements contained in Chapter II, Category A Reactor Personnel, paragraph 2c. For positions for which there is no equivalent, the education and experience requirements are as listed below. The education and experience requirements listed below apply to supervisory positions or positions with authority to make independent decisions or to review and concur, and not to entry-level positions.

(1) Education: Baccalaureate in engineering or related science

(2) Experience:

Job related	2 years
Nuclear	1 year

- g. Training Organization Personnel. Training organization personnel are responsible for working with the line organization to identify and meet personnel and organization needs. Training organization personnel assist line organizations in determining training program content, developing training materials, scheduling training, and delivering training programs for the operating organization.

(1) Training Coordinators.

(a) Education: High School Diploma

(b) Experience:

Nuclear	2 years
Onsite	6 months

(2) Training Instructors.

(a) Education: High School Diploma

(b) Experience: Consistent with the material being presented.

(c) Special Requirements:

- 1 Instructors who are responsible for instruction on subjects such as Technical Safety Requirements shall have received training on facility operating characteristics and principles, and operating limits (Safety Limits, Limiting Control Settings, and Limiting Conditions for Operation) and their bases; and
- 2 Instructors shall have demonstrated knowledge of instructional techniques through training or

experience and be qualified by the Training Manager (or equivalent) for the material being presented.

3. MEDICAL EXAMINATION REQUIREMENTS. Operating contractor management shall determine the physical demands imposed upon operating organization personnel by the job tasks that are required to perform both routine and emergency functions. An initial medical examination shall be given to candidates and a reexamination shall be given at least every two years to certified operators, fissionable material handlers, and certified supervisors to verify health and physical fitness to safely perform their assigned tasks. Certified operators, fissionable material handlers, and certified supervisors must also be cleared by medical examination prior to returning to work following any illness or injury which keeps the individual from performing his or her duties for a period exceeding one month. Medical examination requirements for other operating organization personnel shall be in accordance with operating contractor procedures.
4. SPECIFIC TRAINING REQUIREMENTS. The depth and scope of training and qualification programs for operating organization personnel at non-reactor nuclear facilities shall be commensurate with the hazard level and complexity of the operations (i.e., a graded approach should be used to develop and implement the training programs). This section provides specific training requirements for operators, fissionable material handlers, and supervisors.
 - a. Operators. Operator training shall be sufficiently comprehensive to cover areas which are fundamental to the candidate's assigned tasks to ensure that personnel are capable of safely performing their job duties. The training program shall include the following:
 - (1) A core of subjects such as industrial safety, instrumentation and control, basic physics, chemistry, industry operating experience, and major facility systems, as applicable to the position and the facility.
 - (2) On-the-job and classroom-type training to ensure that personnel are familiar with all aspects of their positions. Such training shall include but not be limited to:
 - (a) Normal and emergency procedures;
 - (b) Administrative procedures;
 - (c) Radiation control practices;
 - (d) Location and functions of pertinent safety systems and equipment;
 - (e) Procedures for making changes or alterations in operations and operating procedures; and
 - (f) Technical Safety Requirements.

- b. Fissionable Material Handlers. Fissionable material handler candidates shall be trained in the following subject areas in addition to that required in paragraph 4a above to the extent applicable to the position:
- (1) Instrumentation and control, including types of instruments and control systems, principles of operation, and consequences of malfunctions;
 - (2) Facility operating characteristics, including principal features, operating parameters, and operating limits of the facility (to include auxiliary systems); and
 - (3) Principles of nuclear facility operation, including the processes involved and technical terminology for the chemical, physical, and metallurgical reactions and criticality safety principles, controls, and specifications.
- c. Supervisors. The supervisor training program shall include the categories and on-the-job training specified for operators and fissionable material handlers to the extent to which they are applicable. This training shall be of increased depth to reflect the added responsibility of the supervisor position.
- d. Certified Operator Written Examination Contents. Written examinations shall be administered to certified operator candidates (fissionable material handlers and other positions that have been designated as certified, e.g., tritium facility operators, chemical process operators, waste tank operators, and enrichment facility operators). These examinations shall contain a representative selection of questions on the knowledge and skills identified from learning objectives developed from the analysis of the job and from information in Safety Analysis Reports, Technical Safety Requirements, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources. The examination shall include a representative sampling from the following items, in addition to the items listed in paragraph 4a, as appropriate to the position and to the facility.
- (1) Facility control and safety systems, including design, principles of operation, components, functions, instrumentation, signals, interlocks, failure modes, and automatic and manual features;
 - (2) Nuclear facility operating characteristics, and reasons for these operating characteristics, including causes and effects of temperature and pressure changes, and operating limitations;
 - (3) Principles of facility operation, including the process involved and technical terminology for the chemical, physical, and metallurgical reactions;
 - (4) Emergency systems, including components, functions, and limitations.

- (5) Criticality safety principles, controls, and specifications.
 - (6) Radiation monitoring systems, including purpose, operation, alarms, and survey equipment alarms; and
 - (7) Radioactive and hazardous materials and effluent, including procedures, equipment, handling, and disposal.
- e. Certified Supervisor Written Examination Contents. Written examinations shall be administered to certified supervisor candidates. These examinations shall be based on the sources discussed in paragraph 4d. The examination shall include a representative sampling from the following items, in addition to those required for certified operators, as appropriate to the position and to the facility.
- (1) Design, control, and operating limitations for the nuclear facility, including instrumentation characteristics and adjustment, nuclear facility operation, and nuclear facility console control mechanisms;
 - (2) Radiation hazards that may arise during the performance of experiments;
 - (3) Nuclear and radiation theory, including details of the fission process, neutron multiplication, source effects, and neutron poison effects;
 - (4) Procedures and limitations involved in initial equipment loading, alterations in fissionable material configuration, and determination of various internal and external effects on criticality safety;
 - (5) Procedures, equipment, and facilities available for handling and disposing of radioactive materials and effluent;
 - (6) Functions, assignments, and responsibilities of the maintenance and technical support organizations as related to nuclear facility safety; and
 - (7) Applicable portions of the facility Safety Analysis Report.
- f. Operational Evaluations. The operational evaluations administered to certified operator, fissionable material handler, and certified supervisor candidates shall be generally similar in scope. The evaluation shall contain questions and operational exercises and shall include a facility walkthrough, and may include system and/or component operation. Operational evaluations, to the extent applicable to the facility, shall require the candidate to demonstrate an understanding of, and the ability to perform the actions necessary to accomplish a representative sampling from the following items:
- (1) Perform prestartup procedures, including operating of controls

- associated with equipment which could affect criticality safety;
- (2) Manipulate the controls as required to control the nuclear process between system or component shutdown and normal process operation;
 - (3) Identify annunciators and condition-indicating signals and perform appropriate remedial actions;
 - (4) Identify instrumentation systems and the significance of associated instrument readings;
 - (5) Observe and safely control the operating behavior characteristics of the facility;
 - (6) Perform control manipulations to obtain desired operating results during normal, abnormal, and emergency situations;
 - (7) Safely operate auxiliary and emergency systems, including controls of facility equipment that could affect criticality safety or release radioactive or other hazardous material to the environment;
 - (8) Demonstrate or describe the use and function of radiation monitoring systems, including fixed radiation monitors and alarms, portable survey instruments, and personnel monitoring systems;
 - (9) Demonstrate knowledge of significant radiation hazards, including permissible levels in excess of those authorized and ability to perform other procedures to reduce excessive radiation levels and to guard against personnel exposure;
 - (10) Demonstrate knowledge of the emergency plan, including, as appropriate, nuclear facility operator or supervisor responsibility to decide whether the plan should be executed and assigned duties under the plan;
 - (11) Demonstrate knowledge and ability, as appropriate to the assigned position, to assume the responsibilities associated with safe operation; and
 - (12) Demonstrate the ability to function within the facility or the control room as a team, as applicable to the facility and to the position, in such a way that procedures are adhered to and Technical Safety Requirements are not violated.
- g. Control Manipulations. The operating contractor shall prepare a list of control manipulations that is based on an analysis of the job. Certified operator, fissionable material handler, and certified supervisor candidates shall perform control manipulations for initial certification and on a biennial basis as part of the continuing training program after certification is achieved. Certified supervisors need only supervise or direct the performance of control manipulations to

satisfy this requirement. Supervision of the performance of control manipulations is consistent with the normal responsibilities of supervisors. However, there may also be situations in which the nuclear facility could require that a certified supervisor actually perform the control manipulation as part of initial certification if the operation requires in-depth knowledge of the supervisor to ensure that the operation is performed safely and correctly.

5. OPERATOR, FISSIONABLE MATERIALS HANDLER, AND SUPERVISOR PROFICIENCY REQUIREMENTS. Certified operators, fissionable material handlers, and certified supervisors shall actively perform job functions associated with their certification to maintain proficiency. Actively performing job functions associated with certification means that the certified individual has a position on the shift crew, and that the individual carries out and is responsible for the day-to-day duties of the certified position. If certified operators, fissionable material handlers, or certified supervisors are absent from activities associated with the certified position for extended periods of time, their ability and readiness to perform at a high level of vigilance can reasonably be expected to decrease. The proficiency requirement is imposed to ensure that certified personnel continue to possess and practice the skills and abilities necessary to operate the systems and equipment for which they are responsible in a safe and reliable manner during both normal and abnormal facility operations and system transients.
- a. The operating organization shall establish procedures which define requirements and frequency (e.g., 8 hours per month) necessary to maintain an active status.
 - b. If active status (proficiency) is not maintained, certification shall be suspended. Prior to resuming duties associated with certification, the operating contractor shall ensure that:
 - (1) Certification is otherwise current and valid; and
 - (2) The certified operator, fissionable material handler, or certified supervisor has performed certification duties under the direct supervision of a certified person, as appropriate to the position, for a specific period of time (e.g., 6 hours.)
 - c. If the nuclear facility is not operated frequently enough to meet established requirements, the operating contractor shall ensure that certification is reinstated prior to facility operation. Administering written and oral examinations and operational evaluations and conducting facility walkthroughs, cold operations, and/or simulated operations should be considered to ensure adequate operational knowledge (as determined by the duration of the facility shutdown). A graded approach should be used to determine the extent of activities necessary to reinstate certification. DOE 5480.31, STARTUP AND RESTART OF NUCLEAR FACILITIES, contains detailed requirements for facility restart.

NON-REACTOR NUCLEAR FACILITY
MINIMUM EDUCATION AND EXPERIENCE

	EDUCATION	EXPERIENCE	
	Degree	Job Related	Nuclear Facility
Managers	BS (1)		4 Yr (2)
Supervisors	HS		3 Yr
Operators	HS		
Technicians		1 Yr	
Maintenance Personnel		1 Yr	
Technical Staff	BS	2 Yr	1 Yr
Training Coordinators	HS		2 Yr
Training Instructors	HS	(3)	(4)(5)

- (1) The Training Manager shall have a baccalaureate including courses in education and technical subjects (baccalaureate need not be in engineering or related science).
- (2) Education or experience that is job related may be substituted on a case-by-case basis. The degree may fulfill 3 of the 4 years of nuclear experience required on a one-for-one time basis.
- (3) Experience consistent with the material being presented.
- (4) Instructors who are responsible for instruction on subjects such as Technical Safety Requirements shall have received training on facility operating characteristics and principles, and operating limits (Safety Limits, Limiting Control Settings, and Limiting Conditions for Operation) and their bases.
- (5) Instructors shall have demonstrated knowledge of instructional techniques through training or experience and be qualified by the Training Manager (or equivalent) for the material being presented.

**SUBJECT: PERSONNEL SELECTION, QUALIFICATION, AND TRAINING
REQUIREMENTS FOR DOE NUCLEAR FACILITIES**

1. PURPOSE. To transmit revised pages to DOE 5480.20A, PERSONNEL SELECTION, QUALIFICATION, AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES, dated 11-15-94.
2. EXPLANATION OF CHANGE. The directive is being revised to reflect implementation of the National Nuclear Security Administration.
3. FILING INSTRUCTIONS.

a.	<u>Remove Pages</u>	<u>Dated</u>	<u>Insert Pages</u>	<u>Dated</u>
	1, 2, 3, 4, and 5	11-15-94	1, 2, 3, 4, and 5	7-12-01
	Att. 1, pgs. 1 and 2	11-15-94	Att. 1, pgs. 1 and 2	7-12-01
	Chap. I, pgs. 17 and 18	11-15-94	Chap. I, pgs. 17 and 18	7-12-01
	Chap. II, pg. 9	11-15-94	Chap. II, pg. 9	7-12-01
	Chap. II, pg. 10	11-15-94	Chap. II, pgs. 10 and 10a	7-12-01

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- b. After filing the attached pages, this transmittal may be discarded.

BY ORDER OF THE SECRETARY OF ENERGY:



FRANCIS S. BLAKE
Deputy Secretary