U.S. Department of Energy
Washington, DC

ORDER

DRAFT
DOE O 426.2A

Approved: xx-xx-201x

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

1. PURPOSE.

   a. This Order establishes selection, training, qualification, and certification requirements for contractor personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support of Hazard Category 1, 2, and 3 nuclear facilities. The "Systematic Approach to Training" described in the Contractor Requirements Document (CRD) of this Order is designed to ensure that these personnel have the requisite knowledge, skills, and abilities to properly perform work in accordance with the safety basis.

   b. This Order updates and consolidates DOE's training requirements to be consistent with applicable aspects of ANSI/ANS 3.1-2014, *Selection, Qualification and Training of Personnel for Nuclear Power Plants,* ANSI/ANS 15.4-2016, *Selection and Training of Personnel for Research Reactors,* and 10 CFR Part 55, *Operators' Licenses.*

   c. Implementation of the requirements of this Order constitutes an acceptable method of complying with 10 CFR § 830.122, Criterion 2 – *Management/Personnel Training and Qualification.*

2. CANCELLATIONS.

   a. This revision cancels DOE O 426.2, *Personnel Selection, Training, Qualification and Certification Requirements for DOE Nuclear Facilities* (2010).

   b. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual or regulatory obligation to comply with the directive. CRDs that have been incorporated into a contract remain in effect throughout the term of the contract unless and until the contract or regulatory commitment is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.

3. APPLICABILITY.

   a. This Order applies to all departmental elements, including the National Nuclear Security Administration (NNSA), responsible for operation of Hazard Category 1, 2, and 3 nuclear facilities, except as provided in subsection b of this section. The Administrator of NNSA must assure that NNSA employees and contractors meet their

responsibilities under this directive. Nothing in this directive interferes with the NNSA Administrator's authority under section 3212(d) of Public Law 106-65, *National Defense Authorization Act*, to establish Administration-specific policies, unless disapproved by the Secretary.

b. This Order does not apply to:

- The Bonneville Power Administration.
- DOE nuclear facilities below Hazard Category 3 (radiological).
- Activities that exclusively involve transportation of or offering for transportation of hazardous materials (including radioactive materials), substances and wastes. [Note: Training requirements related to transportation of hazardous materials, substances and wastes are provided in DOE O 460.1C, *Packaging and Transportation Safety*, or successor directive. The methods and procedures established in this Order may provide acceptable approaches for addressing the requirements of DOE O 460.1C.]

c. The CRD for this Order (Attachment 1) must be inserted in all contracts for Hazard Category 1, 2, or 3 DOE nuclear facilities.

d. Equivalencies and exemptions to this Order are processed in accordance with DOE O 251.1C, *Departmental Directives Program*. Central Technical Authority concurrence is required for both exemptions and equivalencies to this Order for nuclear facilities.

4. REQUIREMENTS.

a. A selection, training, qualification and certification program (hereafter "training program"), as described in this Order, must be implemented at new and existing Hazard Category 1, 2, and 3 nuclear facilities.

b. Heads of DOE field organizations and NNSA field element managers must evaluate and approve:

- Implementation documentation, which includes the contractor's Training Implementation Matrix, or succeeding training program plan or description, and
- The contractor's procedures for releasing an individual from portions of a training program through prior education, experience, training, and/or qualification/ certification.

c. Heads of field organizations and NNSA field element managers must conduct oversight of the implementation of (1) requirements of the CRD for this Order and (2) the overall effectiveness of the nuclear facility training program according to the requirements of DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*. At a minimum, this oversight must include:

- Evaluation of the implementation documentation.

- Ensuring that the contractor has evaluated all applicable criteria of the program within three years using DOE-STD-1070-94, *Criteria for Evaluation of Nuclear Facility Training Programs*.
- Independent evaluation at least every three years of program performance using the criteria of DOE-STD-1070-94. The basis for selecting the scope of this evaluation should be documented.

d. Training records are subject to a number of legal requirements to prevent unauthorized access or disclosure and must be properly identified and protected as Official Use Only information within the Department. These requirements are addressed in other DOE directives and rules such as DOE O 206.1, *Department of Energy Privacy Program*; DOE O 471.3, Chg.1, *Identifying and Protecting Official Use Only Information*; and DOE M 471.3-1, Chg.1, *Manual for Identifying and Protecting Official Use Only Information*.

5. RESPONSIBILITIES.

a. Program Secretarial Officers/Deputy Administrator, NNSA.

(1) Exercise line management responsibility and accountability for nuclear facility training programs.

(2) Ensure that resources are provided for developing, implementing, and maintaining nuclear facility personnel training and qualification programs.

(3) Ensure that DOE and NNSA personnel responsible for training are proficient in personnel training processes and requirements and have diverse expertise in all important areas related to nuclear and occupational safety.

(4) Approve assessments for full-scope or part-task simulators at Category A reactor facilities.

(5) Provide contracting officers necessary information and direction for procurements requiring application of the CRD of this Order.

b. Associate Undersecretary for Environment, Health, Safety and Security.

(1) Develop and coordinate proposed new or revised policy, directives, requirements, guidance, and technical standards related to this Order and CRD.

(2) Interpret or clarify provisions of this Order and CRD and provide advice and assistance on policy implementation.

(3) Provide input to the CTAs regarding interpretation of DOE safety policy as applied to this Order.

(4) Provide comments on requests for exemptions and equivalencies from the requirements of this Order.

c. Director, Office of Enterprise Assessment.

Plan and conduct assessments to determine compliance with the requirements of this Order, in accordance with DOE O 227.1A, *Independent Oversight Program* using DOE-STD-1070-94.

d. DOE Heads of Field Organizations and NNSA Field Element Managers.

(1) Develop Field Office staffing plans to include an adequate number of persons having expertise in the area of personnel training to enable execution of Field Office responsibilities. Identify and submit resource requests to the Program Secretarial Officers to provide for adequate implementation of personnel selection, training, qualification, and certification programs.

(2) Evaluate and approve implementation documentation, which includes the contractor Training Implementation Matrix (TIM) or succeeding training program plan or description (TPP).

(3) Evaluate and approve the contractor procedures that are established to release an individual from portions of a training program through prior education, experience, training, and/or qualification/certification.

(4) Conduct oversight of the implementation of the requirements of the CRD and the overall effectiveness of the nuclear facility training, qualification, and certification program according to the requirements of DOE O 226.1B. At a minimum, this oversight must include:

(a) Evaluation of the implementation documentation.

(b) Ensuring that the contractor has evaluated all applicable criteria of the program within three years using DOE-STD-1070-94.

Independently evaluate program performance at least every three years using criteria in DOE-STD-1070-94. The basis for selecting the scope of this evaluation must be documented.

(5) Review the certification and recertification of shift supervisors, senior reactor operators, reactor operators, and fissionable material handlers at Category A reactors. Review the certification and recertification of these positions at other nuclear facilities that are determined by the field element manager, based on facility hazards and operational complexity. The review must include:

- Periodic and random review of individual training records;
- Periodic monitoring and evaluation of oral examinations, walkthroughs, operational evaluations; and
- Periodic spot checks of initial and continuing training classes, performance of practical factors, and other training program materials

(6) Approve on a case-by-case basis, contractor requests for certification extensions.

(7) Approve, on a case-by-case basis, assignment of individuals who do not meet the experience requirements for a position.

(8) Approve contractor assessments of the need for a simulator at Hazard Category 1/ Category A test and research reactors.

e. Contracting Officers or Representatives.

(1) The contracting officer, after being notified, must incorporate the CRD of this Order into affected contracts via the laws, regulations, and DOE directives clause of the contracts.

(2) The contracting officer must assist originators of procurement requests to incorporate the requirements of the CRD in new contracts.

6. DEFINITIONS.

See Chapter III.

7. REFERENCES.
These references are supplied for information only, unless cited elsewhere in this Order. [R = Reaffirmed]

a. Public Laws

(1) Public Law 106-65, *National Defense Authorization Act*, 2000.

b. Code of Federal Regulations (C.F.R.)

(1) 10 C.F.R. Part 55, *Operators' Licenses.*

(2) 10 C.F.R. Part 830, *Nuclear Safety Management*.

(3) 10 C.F.R. Part 835, *Occupational Radiation Protection*.

(4) 10 C.F.R. Part 850, *Chronic Beryllium Disease Prevention Program.*

(5) 10 C.F.R. Part 851, *DOE Worker Safety and Health Program*.

c. DOE Manuals (M) and Orders (O)

(1) DOE M 471.3-1, Chg.1, *Manual for Identifying and Protecting Official Use Only Information*.

(2) DOE O 206.1, *Department of Energy Privacy Program.*

(3) DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*.

(4) DOE O 227.1A, *Independent Oversight Program.*

(5) DOE O 251.1C, *Departmental Directives Program.*

(6) DOE O 414.1D, *Quality Assurance*.

(7) DOE O 420.1C, Chg. 1, *Facility Safety*.

(8) DOE O 425.1D, Chg. 1, *Verification of Readiness to Startup or Restart Nuclear Facilities*.

(9) DOE O 440.1B, *Worker Protection Program for DOE (including the National Nuclear Security Administration)*.

(10) DOE O 460.1C, *Packaging and Transportation Safety*.

(11) DOE O 471.3, Chg.1, *Identifying and Protecting Official Use Only Information.*

d. DOE Handbooks (HDBK) and Technical Standards (STD)

(1) DOE-HDBK-1074-95, *Alternative Systematic Approaches to Training* (R: 2001).

(2) DOE-HDBK-1078-94, *Training Program Handbook: A Systematic Approach to Training* (R: 2014).

(3) DOE-HDBK-1211-2014, *Activity-Level Work Planning and Control Implementation.*

(4) DOE-STD-1070-94, *Criteria for Evaluation of Nuclear Facility Training Programs* (R: 2014).

(5) DOE-STD-1098-2008, *Radiological Control*, Chg. 1 (2009).

e. American National Standards Institute (ANSI) / American Nuclear Society (ANS)

(1) ANSI/ANS 3.1-2014, *Selection, Qualification, and Training of Personnel for Nuclear Power Plants*.

(2) ANSI/ANS 3.4-2013, *Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants*.

(3) ANSI/ANS 3.5-2009, *Nuclear Power Plant Simulators for Use in Operator. Training and Examination*.

(4) ANSI/ANS 8.1-2014, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors*.

(5) ANSI/ANS 8.15-2014, *Nuclear Criticality Control of Selected Actinide Elements.*

(6) ANSI/ANS 8.20-1991, *Nuclear Criticality Safety Training.* (Reaffirmed 2015).

(7) ANSI/ANS 15.4-2016, *Selection and Training of Personnel for Research Reactors*.

f. Nuclear Information and Records Management Association

(1) Nuclear Information and Records Management Association, *Management of Electronic Records*, TG-15-2011.

(2) Nuclear Information and Records Management Association, *Electronic Records Protection and Restoration*, TG-21-1998.

g. Nuclear Regulatory Commission

(1) Regulatory Guide 1.134, *Medical Evaluation of Licensed Personnel at Nuclear Power Plants*, Rev. 4 (2014).

(2) Regulatory Guide 1.149, *Nuclear Power Plant Simulation Facilities for Use in Operator Training, License Examinations, and Applicant Experience Requirements*, Rev. 4 (2011).

(3) Regulatory Guide 1.8, *Qualification and Training of Personnel for Nuclear Power Plants*, Rev. 3 (2000).

h. Other

Other training resources are available at the National Training Center Training Library (https://sites.ntc.doe.gov/partners/tr/SitePages/Home.aspx) and in DOE's Technical Standards archives. Examples of archived documents:

(1) *Good Practices for Continuing Training* (DOE-HDBK-1118-99).

(2) *Good Practices for the Development of Test Items* (DOE-HDBK-1204-97).

(3) *Good Practices for the Design, Development, and Implementation of Examinations* (DOE-HDBK-1205-97).

(4) *Good Practices for On-The-Job Training* (DOE-HDBK-1206-98).

8. CONTACT.

Questions concerning this Order should be addressed to the Office of Nuclear Facility Safety Programs at nuclearsafety@hq.doe.gov.

BY ORDER OF THE SECRETARY OF ENERGY:

ELIZABETH SHERWOOD-RANDALL
Deputy Secretary

CONTRACTOR REQUIREMENTS DOCUMENT
DOE O 426.2A, PERSONNEL SELECTION, QUALIFICATION, AND TRAINING REQUIREMENTS FOR DOE NUCLEAR FACILITIES

Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements.

- Chapter I of this CRD establishes general training program requirements for all personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support of all Hazard Category nuclear facilities.

- Chapter II of this CRD establishes additional training program requirements for all personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support of Hazard Category 2 and 3 nonreactor nuclear facilities. The requirements in these chapters for nonreactor nuclear facilities are mandatory for Hazard Category 2 nuclear facilities. A graded approach must be used when applying these requirements to Hazard Category 3 nuclear facilities.

- Chapter III of this CRD establishes additional training program requirements for all personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support of Hazard Category 1/Category A and Hazard Category 2/Category B reactor facilities. The requirements of Chapter II are not applicable to these facilities.

CHAPTER I. GENERAL TRAINING REQUIREMENTS

1. Training Organization

   The operating contractor must establish one or more organizations to be responsible for the training of all applicable personnel. This organization must be held accountable for providing the support necessary to ensure that personnel are qualified to safely and effectively meet job requirements. The responsibilities, qualifications, and authority of training organization personnel must be documented; managerial roles, responsibilities, authority, and accountability must be clearly defined.

2. Implementation Documentation

   The contractor must prepare implementation documentation that identifies which sections of this CRD are applicable to a particular facility. The documentation defines and describes the application of requirements for personnel selection, qualification, certification, and training requirements as stated in this CRD. The documentation must clearly define the organization, planning, and administration of the program and set forth the responsibility, authority, and methods for conducting training. Suitable justification must be included in the document for not implementing certain CRD provisions. At sites with several facilities, a combined training document may be submitted. The document and any revisions must be approved by DOE.

   Contractors having approved implementation documentation must revise the documents to reflect any changes made as a result of the implementation of this CRD. If no changes are needed, a memorandum to that effect may be submitted to DOE as an addendum. Changes must be submitted to DOE for approval within 90 days from the date of inclusion of this CRD in the contract.

3. Training Process

   (a) A training program must be established at a minimum for operations, maintenance, and technical staff, and any others with the potential to impact the safe operation of the facility using the systematic approach to training" (SAT) process. The basic elements of SAT are:

   - An analysis of the jobs to be performed;
   - Design of learning objectives derived from the analysis of the job that describe desired performance after training;
   - Development of lesson plans and other training materials;
   - Implementation of the developed training;
   - Evaluation of trainee mastery of the objectives during training; and
   - Evaluation and revision of the training based on the performance of trained personnel in the job setting;
   - Training should be continually assessed to determine both its near and long-term effectiveness.

Helpful guidance on the design and implementation of training programs is provided in DOE-HDBK-1078-94, *Training Program Handbook*: *A Systematic Approach to Training*, and DOE-HDBK-1074-95, *Alternative Systematic Approaches to Training*. Another resource is the National Training Center's Training Resources SharePoint site: https://sites.ntc.doe.gov/partners/tr/SitePages/ Home.aspx.

(b) The training program must be developed using a graded approach based on the hazards involved and risk associated with the operation of the facility or activity. Accordingly, the level of detail and content of the training program, and associated documents or procedures, must reflect the personnel selection, training and qualification that are required at these facilities.

(c) At least every three years, contractors must perform a systematic evaluation of training programs in accordance with DOE-STD-1070-94. The implementation documentation must be reviewed to ensure that it reflects current facility conditions and meets the requirements of this CRD.

(d) Changes to the facility, processes, Documented Safety Analysis (DSA), Technical Safety Requirements (TSRs), and administrative procedures must be reviewed to determine whether the existing training program remains adequate. If the training program is no longer adequate, the contractor must update the program and obtain DOE approval.

(e) The concept of training personnel as a team, stressing team communications and interaction, must be used where job functions require team solutions and activities.

(f) Training programs must consist of a combination of classroom-type, on-the-job training, 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.

(g) The contractor must ensure that personnel who are in the process of completing training on tasks and positions for which they are not yet fully qualified work under the direct supervision of someone who is qualified. However, they may independently perform specific tasks or job assignments for which they are qualified.

(h) During testing, troubleshooting, experiments, or other special operations, subject matter experts may be authorized to operate equipment with which they are familiar, provided they are directly supervised by a trained and qualified individual.

4. Personnel Selection

(a) Selection Process. The contractor must establish a process for selection and assignment of Functional Level personnel as shown in Chapters II and III (Tables 1, 2, and 3). This process must include factors such as background, experience, education, and medical examination (as applicable), and be based on the ability of the person to meet job performance requirements. Selection of personnel may involve a selection test.

(b) Education and Experience Requirements. Education and experience 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 nuclear facilities and related support systems in a safe and reliable manner under all conditions. Tables and supporting notes in Chapters II and III identify the minimum education and experience requirements for operating organization positions. Persons at the manager level must meet the requirements shown prior to assuming the duties of the assigned position. Except when noted otherwise, a baccalaureate degree is required to be in engineering or a related science.

(c) 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 should not be automatically eliminated where other factors provide sufficient assurance of their abilities to fulfill the duties of a specific position. These factors must be evaluated on a case-by-case basis and approved and documented by the contractor. The following may be considered in making the evaluation of an acceptable alternative to the educational requirements:

1. General Education Development test for a high school diploma.

2. Associate Science Degree.

   - Completion of technical portions of an engineering technology, or related science program may substitute for the associate degree requirement. Successful completion must be determined by a transcript or certification by an institution or program accredited by an accrediting organization recognized by the Council for Higher Education Accreditation or the United States Department of Education. Completion of 43 semester credit hours for the associate degree (in technical subjects related to the position); or

   - Two years' experience related to the applicable position may be substituted for one year of an associate degree (i.e., four years related experience is equivalent to an Associate Degree).

3. Baccalaureate Degree / Professional engineers license; or

   - Successful completion of Fundamentals of Engineering examination (formerly Engineer in Training examination); or

   - Successful completion of 80 semester credit hours of the technical portions of an engineering, engineering technology, or related science program may be substituted for the baccalaureate. The courses must be in appropriate technical subjects relevant to the position to be filled.

- Successful completion must be determined by a transcript or certification by an institution or program accredited by an accrediting organization recognized by the Council for Higher Education Accreditation or the United States Department of Education.
- Two years' experience related to the applicable position may be substituted for one year of a baccalaureate degree (i.e., eight years related experience is equivalent to a Baccalaureate Degree).

(d) Alternatives to Experience. Experience in design, construction, and operational training may be considered applicable nuclear experience and must be evaluated on a case-by-case basis and approved and documented by the contractor.

1. Where course work is related to job assignments, post-secondary education may be substituted. Formal education must not be allowed to substitute for more than 50 percent of the experience requirement unless otherwise stated in Chapter II or III.
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.

If an individual does not meet the experience requirements and cannot satisfy the alternatives to experience, he or she may be assigned to that position based on consideration of the collective experience and the strength and balance of the overall operating organization. In such cases, written justification must be provided to DOE for approval on a case-by-case basis.

5. General Employee Training

All persons requiring access to Hazard Category 1, 2, or 3 Nuclear Facilities must be trained on the topics in (A) below, as applicable, or be continuously escorted by a person so trained. The training may be given for site-wide access and/or for separate facilities, as long as access is controlled in the same fashion.

(a) General Employee Training programs must include training in the following areas as they relate to individual jobs:

1. General description of facility
2. Access-related policies (to include escort duties), procedures and instructions
3. Radiological hazards
4. Site/Facility emergency plans
5. Industrial hazards
6. Fire response protocol
7. Security requirements
8. Quality assurance program
9. Criticality safety

(b) Completion of access training must require satisfactory performance on an examination which may be written, computer, or web-based. The examination must be of sufficient scope and rigor to demonstrate that the person has adequate knowledge to independently access the facility.

(c) Changes to information provided in access training must be evaluated for potential revision to the training and for periodic refresher training.

6. Qualification and Certification

(a) Initial Qualification and Certification.
Qualification is defined in terms of education, experience, training, examination, and any special requirements necessary for performance of assigned responsibilities.

1. General

The program leading to qualification/certification must be governed by written procedures that include requirements for documented assessment of the person's qualifications. The contractor must define qualification requirements for personnel in each of the functional levels (Tables 1, 2, and 3) based on the criteria contained in this chapter and Chapter II or III as applicable. The contractor must keep an accurate and up-to-date record indicating that a person is qualified or certified and stating when the qualification/certification expires.

2. Subcontractor Personnel

Subcontractor personnel must meet the qualification requirements for the job function to be performed. In addition, the operating contractor must ensure that subcontractor and temporary personnel who perform specialized activities such as radiation protection are qualified to perform their assigned tasks. One of the following criteria must be satisfied to conclude that a subcontractor employee is qualified:

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.

b. The operating contractor's previous verification (within 2 years) of the ability of the subcontractor employee to perform assigned tasks safely and efficiently.

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 any of these criteria, work activities must be directly supervised by a person who meets the qualification criteria for conduct of the activities.

3. Operators and Operations Supervisors

a. Operator training must be sufficiently comprehensive to cover areas fundamental to the candidate's assigned tasks. The training program must include the following items, consistent with the job specific training requirements.

(1) A core of fundamental science and engineering subjects such as physics, chemistry, mathematics, instrumentation and control systems, and materials science.

(2) Classroom, simulator (as applicable), and on-the-job type training. Such training must cover:

(a) Facility systems (normal and emergency), including principles of operation, components, functions, instrumentation, signals, interlocks, failure modes, system interfaces, and automatic and manual features;

(b) Principles of facility operation, including the process involved and technical terminology for the chemical, physical, and metallurgical reactions;

(c) Normal, Abnormal, and Emergency procedures;

(d) Emergency systems, including components, functions, and limitations;

(e) Criticality safety principles, controls, and specifications;

(f) Radiation control practices;

(g) DSA; and

(h) Conduct of operations.

b. The supervisor training program must include the subject categories and on-the-job training specified for operators to the extent to which they are applicable. This training must be of increased depth to reflect the added knowledge and responsibility of the supervisor position.

c. Qualification of operators and operations supervisors (e.g., First Line Supervisors and Shift Operations Manager) must include the following:

(1) Final Comprehensive written examination, an oral examination, and an operational evaluation must be administered to certify operators and operations supervisors.

(2) The oral examination and operational evaluation may be combined for non-reactor nuclear facilities.

d. Qualification may be granted only after determining that all requirements have been met.

e. Qualification of operators and operations supervisors is valid for a period up to two years, but may be revoked earlier for cause, such as medical disqualification or performance deficiencies.

4. Technicians and Maintenance Personnel

   All technicians and maintenance personnel must 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.

   Technicians and maintenance personnel whose work involves engineered safety features must be provided training on the importance of safety significant and safety class structures, systems, and components.

   Technician and maintenance personnel qualification must include performance evaluations such as a Job Performance Measure. Written examinations should be administered to personnel in these positions as applicable. However, a comprehensive final examination need not be administered except for radiological control technicians.

   Training program content for radiological control technicians (RCT) must meet the requirements of 10 CFR Part 835, *Occupational Radiation Protection*, and DOE-STD-1098-2008, *Radiological Control*. RCT training program elements must be in accordance with the requirements of this CRD.

5. Operations/Engineering Managers and Technical Staff

   a. Operations and Engineering Managers

      For operations and engineering managers:

      (1) Training must be satisfactorily completed on applicable facility and process safety basis documents.

      (2) Training must be provided on facility processes and systems.

      (3) Training may be provided on additional topics listed in Section 6.A.5.b as relevant to the position.

   b. Technical Staff

      (1) Entry-level technical staff personnel who provide technical support to the operating organization must be trained in the following subject areas as applicable to the facility and to the position:

         (a) Facility fundamentals: systems, components, and operations;

         (b) Applicable DOE Orders and standards;

         (c) Applicable consensus codes and standards;

         (d) Safety basis documentation and the Unreviewed Safety Question (USQ) process;

         (e) Criticality safety program;

         (f) Radiological protection program; and

         (g) Quality assurance program.

         Continuing training and professional development programs must be established to meet the needs of the individual and the position.

6. Examinations

   a. Written Examinations

      (1) Examinations must contain a sampling of the knowledge identified in and derived from the learning objectives resulting from the SAT.

      (2) Examination questions must be derived from learning objectives and include questions from sources such as the DSA, TSRs, system description manuals, operating procedures, and other sources.

   b. Operational Evaluation

      The operational evaluation is a facility walkthrough that includes system and/or component operation. The evaluation may include a simulation of operations, during which the candidate is observed and questioned regarding procedures, safety implications, and TSRs. Operational evaluations must require the candidate to demonstrate the ability to perform some or all of the following actions:

      (1) Perform pre-startup procedures.

      (2) Operate controls that could affect reactivity or criticality safety;

      (3) Operate controls to control the facility in all operating modes;

      (4) Identify annunciators and condition-indicating signals and perform appropriate remedial actions;

      (5) Identify instrumentation systems and the significance of associated instrument readings;

      (6) Operate heat removal systems and explain relationships between proper operation of these systems to the operation of the facility;

      (7) Operate auxiliary and emergency systems, including controls that could affect criticality safety or confinement of radioactive and hazardous materials;

      (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 of personnel exposure;

   c. Oral Examinations (Certified Positions)

      (1) Oral examinations may be conducted as a one-on-one walkthrough (e.g., during the operational evaluation) or by an oral board or committee of facility managers.

      (2) The oral examination's content must be tailored to evaluate the candidate's operational knowledge and organizational awareness to determine how the individual will function in an operating environment. Organization awareness

includes operating philosophy, use of procedures, shift and relief turnovers, verification of system/equipment status.

7. Exceptions to Training

   a. The operating contractor must establish an administrative procedure for granting exceptions to initial training program requirements. The operating organization must submit the procedure to the DOE Head of Field Organization/Field Element Manager for NNSA Operations for approval.

   b. When an exception action has been initiated, documentation must include the name of the person, the specific subject for which the exception is requested, and the justification for the exception. The operating organization must ensure that sufficient facility-specific instruction is provided to enable the candidate to perform job requirements.

   c. Personnel placed in the training program who have satisfactorily completed equivalent training programs comparable in content and performance standards may be released from portions of training on an individual case basis. Exceptions from training should be based in part on a review of previous training records.

   d. Persons who believe that they have comparable knowledge or skills may challenge the requirement to attend training. Challenge examinations (written or performance) may be administered. These examinations must be sufficiently comprehensive to adequately test the learning objectives stated in the training. The use of challenge tests is not considered an exception to the training and as such, challenge tests do not need to be approved on a case-by-case basis.

8. Certification Process

   Certification is the process by which contractor management endorses and documents, in writing, the satisfactory achievement of qualification. Certification follows the completion of the qualification program for those positions identified as requiring certification. The notable differences between initial certification and qualification are:

   (1) requirements for an oral examination or board and

   (2) that certification requires official contractor management endorsement, outside of the individual's direct supervisor, of their qualification to ensure senior management involvement in the qualification of designated operations positions (i.e., operators and supervisors).

   a. Fissionable material handlers and fissionable material handler supervisors must be certified. For all other operators and their immediate supervisors, the contractor must identify in the implementation documentation any additional positions that will be certified based on facility hazards and operational complexity.

   b. The program leading to certification must be governed by written procedures that include requirements for documented assessment of the person's qualifications through examinations and operational evaluations.

c. Certification must not be granted until all qualification requirements and other specified requirements (e.g., medical examination) have been satisfactorily completed and management has confirmed that the person is capable of safely performing all functions of the position.

d. Satisfactory completion of qualifications for certification must be verified by a person other than the candidate's immediate supervisor.

e. Certification will be valid for a period not to exceed two years unless revoked for cause (e.g., medical disqualification).

9. Medical Examination

An initial medical examination must be given to certified operator and certified supervisor candidates to verify health and physical fitness to safely perform their assigned tasks. A reexamination must be given to certified operators and certified supervisors at least every two years. 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 for other operating contractor personnel must be in accordance with operating contractor procedures.

(b) Continuing Training

Continuing training programs must be established to maintain and enhance the knowledge and skills of operating contractor personnel who perform functions associated with engineered safety features as identified in the facility DSA. The guidance in DOE-HDBK-1118-99, *Guide to Good Practices for Continuing Training*, should be used to develop continuing training programs.

1. Certified/Qualified Operators and Operations Supervisors

a. Continuing training programs must be structured commensurate with specific position needs and must be administered on a cycle not to exceed two years.

b. Periodic examinations must be administered and documented throughout the cycle on material included in the program.

c. If the contractor chooses to give periodic requalification examinations (e.g., quarterly requalification exams) vice a comprehensive biennial requalification examination, the periodic requalification exams must include material from the continuing training cycle(s).

d. Continuing training must include, at a minimum, the following as related to job performance:

(1) Changes and lessons learned:

a. Significant facility system and component changes,

b. Applicable procedure changes,

c. Applicable industry operating experience,

d. Selected fundamentals with emphasis on seldom used knowledge and skills necessary to assure safety, and other training as needed to correct identified performance problems;

e. Any changes in the safety envelope of the facility including updates to the DSA and TSR

(2) Classroom and in-facility instruction in the use of facility systems to control or mitigate accidents;

(3) Refresher training on the initial qualification/certification topics identified in section 6.A.3.a.; and

(4) For certified operators and their supervisors, operational drills conducted in the facility or on a simulator must be provided at least biennially. (Note: facility evacuation drills are not considered operational drills.)

e. Personnel who are responsible for developing and delivering training may be excused from continuing training on the subjects they teach.

(c) Requalification/Recertification

Operators and Operations Supervisors must be requalified by completion of the continuing training program and requisite examinations. Operators and their supervisors must 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 contractor must indicate by signature that the person has successfully completed the requalification program and is formally requalified.

1. Requalification/Recertification Examinations

a. Requalification must include requisite examinations with the exception that the final written comprehensive examination may be achieved by either administering a comprehensive biennial requalification examination or by administering periodic examinations (e.g., quarterly) during the continuing training cycle, which would cover the breadth of topics included in a biennial exam.

If a requalification or recertification examination is failed, or personnel show serious job performance deficiencies, or if any required training element lapses, the person must be removed from activities for each qualification or certification area that requires the lapsed element. (However, see Section 3 below on extensions.)

Qualification or certification may be regained after completing remedial training designed to correct the deficiency and satisfactorily completing a reexamination, or completion of the needed training requirement. In addition, recertification must be based on: (i) review of an individual's operating performance during the past certification period by line management, and (ii) a current medical examination.

2. Absences

   a. When a qualified/certified operator or operations supervisor has been absent from duties for greater than 3 months, but less than 12 months, the individual must restore proficiency by complying with the requirements of Chapter II.3 or III.5, as applicable. The qualification or certification base date remains the same as it was before the absence.

   b. When a qualified or certified operator or operations supervisor has been absent for greater than 12 months, in addition to the above requirements the individual is required to complete all the requisite examinations applicable to the position.

      Upon completion of the above requirements, a new qualification or certification date may be established.

3. Extensions

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

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

      (1) Responsibility for approval of the extension;

      (2) Length of the extension (not to exceed 12 months); and

      (3) Explanation of the circumstances that prevented the person from completing the requirements.

   b. Extensions of certification of operators and operations supervisors must be approved by the DOE Head of Field Organization/NNSA Field Element Manager. Extensions of qualification of operators and operations supervisors may be approved by contractor facility management.

7. Management and Supervisory Skills Training

The topics listed in paragraph 6.A.5.b must be considered for applicability when developing manager and supervisor training programs. If training related to those topics is applicable to the position, that training must be included in addition to the topics listed below consistent with the SAT.

1. Supervisory Skills Training. The supervisory skills training program must include the following (or equivalent):
   a. Leadership;
   b. Interpersonal communication;
   c. Roles, responsibilities, authority, and accountability;
   d. Motivation of personnel;
   e. Problem analysis and decision making;
   f. Fitness for duty procedures;
   g. Administrative policies and procedures;
   h. Conduct of Operations;
   i. Conduct of Maintenance and the Work Control Process;
   j. Conduct of selection, training, qualification and certification of personnel; and
   k. Management of personnel performance issues.

2. Management Skills Training. The management training program must 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; and
   h. Environmental Compliance.

8. Records

Contractors must develop and implement administrative procedures to control and preserve training, qualification, and certification records. Qualification and certification of personnel must be documented in an easily auditable format. Guidance on meeting these requirements may be found in several documents published by the Nuclear Information and Records Management Association: TG-15, *Management of Electronic Records*, and TG-21, *Electronic Records Protection and Restoration*. . [Note: training records are subject to a number of legal requirements to prevent unauthorized access or disclosure and must be properly identified and protected as Official Use Only information within the Department. These requirements are addressed in other DOE directives and rules such as DOE O 206.1, *Department of Energy Privacy Program;* DOE O 471.3, Chg.1, *Identifying and Protecting Official Use Only Information*; and DOE M 471.3-1, Chg.1, *Manual for Identifying and Protecting Official Use Only Information*.)

Individual record documentation must include the following at a minimum:

a. Education, experience, and employment history and most recent health evaluation summary;

b. Training programs completed and qualification/certification achieved;

c. Latest completed checklists, graded written examinations (with answers corrected as necessary or examination keys), simulator examinations, and operational evaluations used for qualification/certification;

d. Lists of questions asked and the examiner's overall evaluation of the responses on oral examinations;

e. Correspondence relating to exceptions to training requirements and extensions of qualification/certification;

f. Records of qualification for one-time-only special tests or operations; and

g. Attendance records for required training courses or sessions.

CHAPTER II. NONREACTOR NUCLEAR FACILITIES

1. Purpose

The requirements in this CRD are intended to provide reasonable assurance that personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support at DOE Hazard Category 1, 2, and 3 nuclear facilities possess qualifications to operate and maintain the facility safely and reliably under all conditions. This chapter contains specific training requirements for nuclear facility operators, fissionable material handlers, and nuclear facility operations supervisors. The requirements of this chapter supplement those in Chapter I.

Table 1 below summarizes the training requirements for nonreactor nuclear facilities.

Table 1: Hazard Category 2 and 3 Nonreactor Nuclear Facilities
Personnel Education and Experience Requirements

Functional Level	EDUCATION	EXPERIENCE	
	Degree or Diploma	Job Related	Nuclear
Managers	Baccalaureate (1)	(6)	4 Yr (2)
Supervisors	HS		3 Yr (3)
Operators	HS		
Technicians	HS or Journeyman (7)	1 Yr	
Maintenance Personnel	HS or Journeyman (7)	1 Yr	
Technical Support Personnel	Baccalaureate	2 Yr	1 Yr
Instructional Technologist	HS (4)	1 Yr	
Training Instructors	HS (5)		

Notes:

1. The training manager must have a baccalaureate degree. The training manager must have courses in education or training that focus on instructional analysis, design, development, delivery and testing as well as evaluation of training programs if not included in the baccalaureate course material (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 on a one-for-one-time basis.
3. Full-time related academic training (e.g., degree programs, trade schools, vocational programs) may be substituted on a one-for-one basis for 2 of the 3 years' nuclear experience.
4. Instructional Technologist must have courses in education or training that focus on instructional analysis, design, development, implementation, and evaluation.
5. Training Instructors must have courses in classroom and on-the-job training techniques.
6. Managers must receive facility-specific training based upon a comparison of the individual's background and abilities with the responsibilities and duties of the position.
7. Personnel qualified on the date of this Order may be grandfathered from this education requirement.

2. Specific Requirements

(a) Certified Operators

Qualification programs must be developed using a SAT. Learning objectives developed from the analysis of the job should include information in the DSA, TSRs, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources.

Written examinations must be administered to certified operator candidates. These examinations must contain a representative selection of questions on the knowledge identified in the learning objectives.

(b) Certified Supervisors

Qualification programs must be developed using a SAT. Analysis of the job should generate learning objectives for certified supervisors similar to operators with increased emphasis on theory and basis for procedures. In addition, the following topics should be considered:

1. Procedures and limitations involved in initial equipment loading, alterations in fissionable material configuration, and determination of various internal and external effects on criticality safety;
2. Procedures, equipment, and facilities available for handling and disposing of radioactive materials and effluent;
3. Functions, assignments, and responsibilities of the maintenance and technical support organizations as related to nuclear facility safety; and
4. Applicable portions of the facility DSA.
5. Written examinations must be administered to certified supervisor candidates. These examinations must contain a selection of questions from the applicable learning objectives.

3. Proficiency

"Proficiency" in this CRD means that the individual has performed specified activities and served a required number of duty hours per quarter for his or her position. An individual normally maintains proficiency by having a position on a shift crew and being responsible for the day-to-day duties of that position. Personnel not assigned full time to operating shifts may remain proficient by participating in a defined number of shift hours or operating activities.

If proficiency has not been maintained, qualification/certification must be suspended and the person must not be assigned duties. Prior to reassigning an employee to duty following loss of active status, the contractor must evaluate and document the following factors:

- Continuing training topics missed (if any);
- Required reading applicable to the position;
- Changes in facility systems/processes;

- Performance of duties under the direct supervision of a person qualified in that position for a prescribed period; and
- Written and oral examinations and performance evaluations.

If the facility or specific activities are not operated frequently enough to meet established requirements, the contractor must ensure that qualification/certification is reinstated prior to operation. Based upon the duration of the shutdown or inactivity, and the risk and complexity of the planning operations, one or more of the following would be appropriate:

- Written and/or oral examination
- Operational evaluation
- Facility or tabletop walkthrough
- Simulated operations

CHAPTER III. REACTOR NUCLEAR FACILITIES

1. Purpose

The requirements in this CRD are intended to provide reasonable assurance that personnel who can impact the safety basis through their involvement in the operation, maintenance, and technical support at DOE Hazard Category 1, 2, and 3 nuclear facilities possess qualifications to operate and maintain the facility safely and reliably under all conditions. This chapter contains specific training requirements for positions unique to Hazard Category 1 and 2/Category A and B Reactor Nuclear Facilities, such as the specialized training and certification requirements for reactor operators. The requirements of this chapter supplement those in Chapter I.

2. Reactor Training Summary

Tables 2 and 3 below summarize the training requirements for two types of reactors.

Table 2: Hazard Category 1/Category A Reactor Facility Personnel Education and Experience Requirements

	EDUCATION		EXPERIENCE		SPECIAL RQMTS
	Degree/Diploma	Other	Job Related	Nuclear	RO/SRO Cert
Managers					
Plant/Facility Manager	Baccalaureate		(1)	6 Yr (2 3)	SRO(5)
Operations Manager	Baccalaureate		(15)	4 Yr (3)(6)	SRO(13)
Maintenance	Baccalaureate	(8)	(15)	4 Yr (3)(6)	
Technical Manager	Baccalaureate		(15)	4 Yr (3)(7)	
Supervisors					
Shift Supervisor	HS			4 Yr (6)	SRO
Senior Reactor Operator	HS		4 Yr	2 Yr (3)	SRO (10)
Qualified Supervisor	HS		4 Yr	1 Yr (4)	
Technical Support					
Technical Staff	Baccalaureate		2 Yr	1 Yr	
Shift Technical Advisor	Baccalaureate			1 Yr (3)	(18)
Training Organization					
Training Manager	Baccalaureate (17)		4 Yr (16)	2 Yr	SRO (9)
Instructional Technologist	Baccalaureate (14)		2 Yr	(3)	
Training Instructor	HS		2 Yr (11)		(12)
Operators, Technicians, & Maintenance					
Auxiliary Operator	HS			1 Yr (7,3)	
Reactor Operator	HS			3 Yr (3,6)	RO
Technician	HS		3 Yr		
Maintenance Personnel	HS		1 Yr		

Notes:

1. Minimum of 4 years of supervisory or management experience.
2. Three 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 Hazard Category 1/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 standard.
6. Two years of nuclear experience may be nuclear/non-nuclear power plant experience.
7. One year of nuclear experience may be power plant experience.
8. Must be familiar with nondestructive testing and have an understanding of electrical, pressure vessel, and piping codes and standards.
9. 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 must be responsible to the training manager for the content and conduct of training for certified operators.
10. The candidate for senior reactor operator must have:
    - 1 year of nuclear power plant experience as an active reactor operator of the same vendor and vintage; or
    - 1.5 years as an active reactor operator at a comparable (BWR/PWR) facility or a noncomparable commercial power reactor facility; or
    - 1.5 years as a manager, supervisor, or staff member responsible for the coordination and implementation of plant equipment controls, integrated operations procedures, operations, maintenance, radiological support, modifications, maintenance planning, work control, chemistry, or accredited training at the current or a comparable (BWR/PWR) facility; or
    - 1.5 years as a qualified nonlicensed operator; or
    - 2 years in a position equivalent to reactor operator position at a military power reactor (qualified to manipulate or direct the manipulation of control rods); or
    - 4 years as a senior operator level certified instructor at the current or a commercial power reactor facility of the same vendor and vintage; or
    - 6 years as a senior operator level certified instructor at a comparable (BWR/PWR) facility or a noncomparable commercial power reactor.
11. Experience must be consistent with the material being presented. Instructors must have demonstrated knowledge of instructional techniques through training or experience and be qualified by the training manager (or equivalent) for the material being presented.
12. Instructors who provide instruction on the reactor plant simulator to certified personnel must hold, or have held, a senior reactor operator certification for a similar Hazard Category 1/Category A reactor plant (or equivalent), or have been certified on the reactor plant simulator. Persons who are responsible for instruction of subjects such as TSRs, reactor operating principles and characteristics, and control manipulations must have received senior reactor operator (or equivalent) training.
13. The operations manager must hold a senior reactor operator certification at the time of appointment to the position.
14. Instructional Technologists should have a baccalaureate degree in Training or Education. The IT must have courses or related experience in education or training that focus on instructional analysis, design, development, implementation, and evaluation.
15. Minimum of 3 years of supervisory or management experience.
16. Minimum of 1 year of supervisory or management experience.
17. The training manager must have a baccalaureate degree. The training manager must have courses or related experience in education or training that focus on instructional analysis, design, development,

delivery and testing as well as evaluation of training programs if not included in the baccalaureate course material (baccalaureate need not be in engineering or related science).

18. This person must be knowledgeable of control room instruments and controls.

Table 3: Hazard Category 2/Category B Reactor Facility Personnel Education and Experience Requirements

	EDUCATION	EXPERIENCE		SPECIAL RQMTS
	Degree or Diploma	Job Related	Nuclear	RO/SRO Cert
Managers				
Plant/Facility Manager	Baccalaureate	(8)	6 Yr (2,3)	
Operations Manager	Baccalaureate		4 Yr (3)(6)	SRO(10)
Maintenance	Baccalaureate		4 Yr (3)(6)	
Technical Manager	Baccalaureate		4 Yr (3)(7)	
Supervisors				
Shift Supervisor	HS		3 Yr (3,9)	SRO
Senior Reactor Operator	HS		3 Yr (3)	
Training Organization				
Training Manager	Baccalaureate (17)	4 Yr	2 Yr	
Instructional Technologist	Baccalaureate (14)	2 Yr		
Training Instructor	HS	(5)		(6,7)
Other				
Technical Support Personnel	Baccalaureate	2 Yr	1 Yr	
Reactor Operator	HS			
Technician	HS	1 Yr		
Maintenance Personnel	HS	1 Yr		

Notes:

1. The training manager must have a baccalaureate degree. The training manager must have courses or related experience in education or training that focus on instructional analysis, design, development, delivery and testing as well as evaluation of training programs if not included in the baccalaureate course material (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 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. Instructional Technologist must have courses or related experience in education or training that focus on instructional analysis, design, development, implementation, and evaluation.
5. Experience consistent with the material being presented.
6. Instructors who are responsible for instruction of subjects such as TSRs, reactor operating principles and characteristics, and control manipulations must have received senior reactor operator (or equivalent) training.
7. Instructors must have demonstrated knowledge of instructional techniques through training or experience and be qualified by the training manager (or equivalent) for the material being presented.
8. Managers must receive some facility specific training based upon a comparison of the individual's background and abilities within the responsibilities and duties of the position.
9. Full time academic training may be substituted on a one for one basis for 2 of the 3 years of required nuclear experience.
10. The operations manager must hold a senior reactor operator certification at the time of appointment to the position.

3. Specific Requirements: Hazard Category 1/Category A Reactor

This section provides additional position-specific training requirements for Hazard Category 1/Category A reactor personnel.

(a) Engineering Expertise on Shift Requirements

The contractor must 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 must have the following qualifications:

1. Currently certified as a senior reactor operator; and
2. Successful completion of the STA training requirements in paragraph 8c, and
3. One of the following educational requirements:
   a. Baccalaureate in engineering;
   b. Professional engineer's license;
   c. Baccalaureate in engineering technology including course work in the physical, mathematical, or engineering sciences; or
   d. Baccalaureate in a physical science including course work in the physical, mathematical, or engineering sciences.

(b) Simulator Requirements

DOE production reactors must have a full-scope simulator that meets the requirements contained in ANSI/ANS 3.5-2009, *Nuclear Power Plant Simulators for Use in Operator Training and Examination*, and Nuclear Regulatory Commission Regulatory Guide 1.149, Revision 4, (April 2011), *Nuclear Power Plant Simulation Facilities for Use in Operator Training, License Examinations and Applicant Experience Requirements*.

(1) If a full-scope simulator is to be utilized for more than one production reactor, the differences between the simulator and reactor must be identified and documented by the operating organization and must be approved by the Heads of Field Organizations/Field Element 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 3.5-2009.

(2) The need for a full-scope or part-task simulator for DOE test and research reactors must be based on an evaluation conducted by the operating organization. The evaluation must consider whether adequate training may be achieved by actual facility maneuvers, drills, part-task simulators, or combinations of these. The evaluation must also consider the ability to adequately provide in-facility training covering all operator actions needed to achieve and maintain safe shutdown. The operating contractor should also evaluate the ability to provide adequate training in normal operations, anticipated transients, and accident conditions. The assessment of the need for a simulator must be approved by the DOE Head of Field Organization/Field Element Manager for NNSA Operations and the Program Secretarial Officer/Deputy Administrator, NNSA.

(c) Shift Technical Advisor

Shift Technical Advisor training must include:

1. The duties, responsibilities, and authorities of the STA;
2. Accidents analyzed in the facility DSA and the potential consequences of these accidents;
3. Thermodynamics/fluid flow, reactor physics, system engineering, nuclear instrumentation, process computer, and facility response;
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.

(d) Fuel Handling Operations

1. Fuel handling operations must be performed by or under the direct supervision of a person certified to perform the required functions.
2. A specific training program must be established to certify fuel handling operators and supervisors. The program must include training for their assigned tasks.
3. The training program for fuel handling operators and supervisors must 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.

4. The training requirements in items (1), (2) and (3) above are not necessary if fuel handling is performed by persons trained for such as part of reactor operator and senior reactor operator certification programs.

(e) Reactor Operators

Qualification programs must be developed using a systematic approach to training. Learning objectives should include an understanding of the DSA, TSRs, system description manuals and operating procedures, lessons learned from Occurrence Reports and other applicable sources. In addition, the objectives should cover:

1. Fundamentals of reactor theory, heat transfer, thermodynamics and fluid mechanics;
2. General design features of the core;
3. Components and design features of major systems;
4. Facility operating characteristics during steady state and transient conditions;
5. Procedures and TSRs including normal, abnormal, emergency, and administrative procedures; and operational limitations;
6. Radiological safety principles and procedures;
7. Use of installed facility systems for the control and mitigation of an accident in which the core may be severely damaged.

Written examinations must be administered to reactor operator candidates. These examinations must contain a selection of questions from the learning objectives developed from the analysis of the job.

(f) Senior Reactor Operators

Qualification programs must be developed using a systematic approach to training. Learning objectives developed from the analysis of the job should include information in facility DSA, TSRs, system description manuals and operating procedures, lessons learned from Occurrence Reports and other applicable sources, and applicable information 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 TSRs 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.

Written examinations must be administered to senior reactor operator candidates. These examinations must contain a representative selection of questions from the learning objectives developed from the analysis of the job.

(g) Operating Crew/Shift Training

1. Reactor operator candidates must be assigned to an operating crew full-time for a minimum of 3-month shift training, with no concurrent duties unrelated to the operation of the facility. During this period, under the observation and control of a certified reactor operator, the trainee must manipulate the facility controls and perform the same duties as a certified reactor operator.
2. Senior reactor operator candidates must be assigned to an operating crew full-time for a minimum of 3-month shift training with no concurrent duties un related to the operation of the facility. During this period, under the observation and control of a certified senior reactor operator, the trainee must supervise the manipulation of the facility controls and perform the same duties as a certified senior reactor operator.

(h) Control Manipulation Requirements for Certified Positions

The operating contractor must prepare a list of control manipulations for certified positions in reactor nuclear facilities.

1. Control manipulation lists must be based on a SAT.
2. Candidates for certification must perform control manipulations for initial certification and on a biennial basis as part of the continuing training program after certification is achieved.
3. Certified supervisors need only supervise or direct the performance of control manipulations to satisfy this requirement.
4. The list of control manipulations must specify which manipulations are to be performed annually and which are to be performed biennially by reactor operators and senior reactor operators.
5. Reactor operator and senior reactor operator candidates must perform a minimum of 5 significant reactivity manipulations (e.g., reactor startup) for initial certification. Additional control manipulations should be based on the analysis.

(i) Medical Examination Requirements

For Hazard Category 1/Category A reactors, medical examination requirements must be in accordance with ANSI/ANS 3.4-2013, *Medical Evaluation of Licensed Personnel at Nuclear Power Plants*, and NRC Regulatory Guide 1.134, *Medical Evaluation of Licensed Personnel at Nuclear Power Plants*, Rev. 4, Sept. 2014.

4. Specific Requirements: Hazard Category 2/Category B Reactor

This section provides additional position-specific training requirements for Hazard Category 2/Category B reactor personnel.

(a) Fuel Handling Operations

All fuel handling operations must be performed by or under the direct supervision of a person certified to perform the required functions. The requirements below do not apply if fuel handling is performed by reactor operators and senior reactor operators trained for fuel handling.

1. A specific training program must be established to certify fuel handling operators and supervisors. The program must include training for their assigned tasks.
2. The program for fuel handling operators and supervisors must 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.

(b) Reactor Operators

Qualification programs must be developed using a SAT. Training for reactor operators should take into account the previous experience, training, and level of responsibility of the candidate. The qualification program must 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.

Learning objectives should include an understanding of the DSA, TSRs, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources. In addition, the objectives should cover:

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

Written examinations must be administered to reactor operator candidates. These examinations must contain a representative selection of questions on the knowledge and skills identified from learning objectives developed from the analysis of the job.

(c) Senior Reactor Operators

Qualification programs must be developed using a SAT. Training for senior reactor operators should take into account the previous experience, training, and level of responsibility of the candidate. Learning objectives developed from the analysis of the

job should include information in the DSA, TSRs, system description manuals and operating procedures, lessons learned from Occurrence Reports, and other applicable sources. In addition, the objectives should cover:

1. Radioactive materials handling, including special nuclear material 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, TSRs and their technical bases, and administrative responsibilities associated with the facility and appropriate for the senior reactor operator's level of responsibility.

Written examinations must also be administered to senior reactor operator candidates. These examinations must contain a representative selection of questions on the knowledge and skills identified from learning objectives developed from the analysis of the job.

(c) Control Manipulation Requirements for Certified Positions. (See Chapter III, Section 3.)

(d) Medical Examination Requirements

For Hazard Category 2/Category B reactors, medical examination requirements must be in accordance with ANSI/ANS 15.4-2016, *Selection and Training of Personnel for Research Reactors*.

5. Proficiency

General proficiency requirements are provided in Chapter II, Section 4.

- Hazard Category 1/Category A Reactors: To maintain proficiency, reactor operators and senior reactor operators must perform certification duties for a minimum of 36 hours per quarter, in blocks of time no less than 4 hours.
- Hazard Category 2/Category B Reactors: To maintain active status, reactor operators and senior reactor operators must perform certification duties for at least 4 hours per calendar quarter.

For other operators, operations supervisors, and on-shift technical staff, specific activities or duty hours per quarter required to maintain active status must be defined by the contractor.

If proficiency is not maintained, qualification/certification must be suspended and the person must not be assigned duties. Prior to reassigning an employee to duty following loss of active status, the contractor must evaluate and document the following factors:

- Continuing training topics missed;
- Required reading applicable to the position;
- Changes in facility systems/processes;
- Performance of duties under the direct supervision of a person qualified in that position for a prescribed period; and

- Written and oral examinations and performance evaluations as deemed necessary.

Certified reactor operators and senior reactor operators must (a) perform certification duties under the direct supervision of a person certified in that position for a minimum period of time as stated below and (b) tour the facility and (c) review shift turnover procedures. The minimum required performance times for certified duties are:

- Hazard Category 1/Category A reactor certified reactor operators and senior reactor operators: 24 hours.
- Hazard Category 2/Category B reactor certified reactor operators and senior reactor operators: 6 hours.

6. Definitions

Auxiliary Operator is an operator whose duties and responsibilities involve balance of plant operations typically outside the control area.

Category A Reactor Facilities means those production, test, and research reactors designated by DOE based on power level, potential fission product inventory, and experimental capability. Category A reactors are Hazard Category 1 nuclear facilities.

Category B Reactor Facilities means those test and research reactors designated by DOE based on power level, potential fission product inventory, and experimental capability. Category B reactors are Hazard Category 2 nuclear facilities.

Certification is the process by which contractor management endorses and documents, in writing, the satisfactory achievement of qualification of a person for a position designated for certification. Certification follows the completion of the qualification program for those positions identified as requiring certification. The notable differences between initial certification and qualification are: (1) requirements for an oral examination or board and (2) that certification requires official contractor management endorsement, outside of the individual's direct supervisor, of their qualification to ensure senior management involvement in the qualification of designated operations positions (i.e., operators and supervisors).

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 or the status of an engineered safety feature. 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 facility in such a manner as to affect the protection of health and safety.

Critical Assembly means special nuclear devices designed and used to sustain nuclear reactions, which may be subject to frequent core and lattice configuration changes and which frequently may be used as mockups of reactor configurations. (10 CFR Part 830) For purposes of this Order, critical assemblies are considered Hazard Category 2 nuclear facilities or Category B reactors.

Direct Supervision occurs when the supervisor's sole responsibility is the supervision of one individual and the supervisor is continuously capable of physically preventing any adverse actions of the supervisee.

Documented Safety Analysis means a documented analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety. (10 CFR Part 830)

Engineered Safety Features mean structures, systems, or components that prevent and/or mitigate the consequences of potential accidents described in the DSA.

Exception, as used in this order, refers to a release of an individual from portions of a training program through prior education, experience, evaluation of work products, and training that is determined using a DOE approved procedure.

Fissionable Materials mean a nuclide capable of sustaining a neutron-induced fission chain reaction. These nuclides are uranium-233, uranium-235, plutonium-238, plutonium-239, plutonium-241, neptunium-237, americium-241, and curium-244.

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.

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 area operating consoles are included. Such a simulator demonstrates expected facility response to normal and abnormal conditions.

Graded Approach means the process of ensuring that the level of analysis, documentation, and actions used to comply with a requirement are commensurate with: 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 the facility; (5) the particular characteristics of a facility; (6) the relative importance of radiological and nonradiological hazards; and (7) any other relevant factor. (10 CFR Part 830)

Hazard Categories are the consequences of unmitigated releases of radioactive and/or hazardous material are evaluated as required by 10 CFR Part 830 and classified by the following hazard categories:

a. Category 1. The hazard analysis shows the potential for significant offsite consequences.

b. Category 2. The hazard analysis shows the potential for significant onsite consequences.

c. Category 3. The hazard analysis shows the potential for only significant localized consequences.

Implementation Documentation is one or more documents prepared by the operating organization and approved by DOE that identifies those sections of the Contractor Requirements Document (CRD) to this order that are applicable to a particular facility. Implementation documentation defines and describes the application of the selection, qualification, certification, and training requirements of this Order. It defines the organization, planning, and administration of the program and sets forth the responsibility,

authority, and methods for conducting training, and provides justification for sections of the CRD to this order that are not included. This term is used to describe common documents currently used for this purpose, such as Training Implementation Matrix, Training Program Plan, or Training Program Description.

Instructional Technologist is the individual primarily involved in the analysis, design, development, and implementation of training for job positions/activities in nuclear facilities. This individual works under the direction of the Training Manager and in coordination with the training instructors to 1) conduct needs and job analysis to identify training requirements (valid task list, training requirements matrix), 2) design training including determination of training setting and development of learning objectives, evaluation standards, and examination test items, 3) develop training materials including lesson plans and trainee support materials, 4) conduct classroom, on-the-job, simulator, or laboratory training, and 5) assist line management in the evaluation of training program evaluations.

Job Analysis is a systematic method used in obtaining a detailed listing of the tasks of a specific job.

Maintenance Personnel are persons responsible for performing maintenance on engineered safety features and support systems as identified in the DSA.

Manager refers to a person whose assigned responsibilities include one or more of the following: 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. This functional level typically includes the Plant/Facility Manager or Director, the Operations Manager, the Maintenance Manager, the Training Manager, and the Technical/Engineering Manager.

Medical Examination means an examination performed by a licensed physician, or an examination performed by physician's assistant that is subsequently reviewed and approved by a licensed physician, to determine the physical condition and general health of a person for duty

Nonreactor Nuclear Facility means those facilities, activities, or operations that involve, or will involve, radioactive and/or fissionable materials in such form and quantity that a nuclear or a nuclear explosive hazard potentially exists to workers, the public, or the environment, but does not include accelerators and their operations and does not include activities involving only incidental use and generation of radioactive materials or radiation such as check and calibration sources, use of radioactive sources in research and experimental and analytical laboratory activities, electron microscopes, and X-ray machines. (10 CFR Part 830)

Nuclear Experience when used in reference to Hazard Category 1/Category A and Hazard Category 2/Category 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 are job-related may also be considered. Appropriate research, or teaching, or both may be counted as nuclear experience. When used in reference to nonreactor nuclear

facilities, is experience acquired at any facility in which radioactive materials are routinely handled, stored, processed, or utilized.

Nuclear Facility means a reactor or a nonreactor nuclear facility where an activity is conducted for or on behalf of DOE and includes any related area, structure, facility, or activity to the extent necessary to ensure proper implementation of the requirements established in 10 CFR Part 830.

Operable means the state of being operated or having 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.

Operators are persons responsible for performing operations associated with engineered safety features as identified in the DSA, operating support systems which could affect engineered safety features, or conducting activities with special nuclear materials and/or radioactive materials. Duties may include manipulating facility controls, monitoring parameters, and operating facility equipment. Operators include reactor operators, fissionable material handlers, tritium facility operators, chemical process operators, waste tank operators, and enrichment facility operators.

Operating Organization is the contractor organization responsible for facility operation, maintenance, and technical support services related to DOE nuclear facility operations.

Operational Drill is a drill conducted in the facility which exercises process/facility equipment, procedures, and level of knowledge for certified positions. These activities are also intended to demonstrate knowledge of operational procedures during abnormal conditions.

Operational Evaluation is a documented evaluation of an individual's knowledge and skills for a position requiring qualification/certification. The operational evaluation is a facility walkthrough that includes system and/or component operation, or simulation of operations, during which the candidate is observed and questioned regarding procedures, safety implications, and TSRs.

Operations Manager is the individual responsible for maintaining the safety envelope of the facility/operation; managing operators and their supervisors; and achieving operational goals within budget and schedule.

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.

Power Plant Experience is experience acquired in the testing, operation, or maintenance of nuclear or other 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.

Qualification is the process for attaining, demonstrating, and documenting the knowledge, skills, and abilities identified for a position by the SAT process. It includes education, experience, classroom and on-the-job training, examination, and any special requirements necessary to perform assigned responsibilities for a given position.

Reactor Operator means a person certified by contractor nuclear facility management to operate (manipulate the controls of) a DOE-owned reactor.

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.

Safety Basis means the documented safety analysis and hazard controls that provide reasonable assurance that the DOE nuclear facility can be operated safely in a manner that adequately protects workers, the public, and the environment. (10 CFR Part 830)

Senior Reactor Operator means a person certified by contractor nuclear facility management to operate and direct the operation of a DOE-owned reactor.

Shift Supervisor is a qualified or certified person in the operating organization designated by contractor facility management to directly supervise operations, operational activities, and operations-related activities of personnel at DOE-owned Hazard Category 1, 2, and 3 nuclear facilities. Substitute titles may be used for positions of equivalent functions.

Shift Technical Advisor is a person who has been assigned to provide on-shift advice and counsel to shift operating personnel during shift activities and to help determine cause and mitigation of facility accidents.

Significant Quantity of Fissionable Materials is the minimum quantity of fissionable material in designated form for which control is required to maintain subcriticality under all normal and credible abnormal conditions. The single parameter limits for fissionable materials are listed in ANSI/ANS-8.1-2014, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors*, and ANSI/ANS-8.15-2014, *Nuclear Criticality Control of Special Actinide Elements*. These standards require that limits be adjusted where process conditions could credibly involve moderators or reflectors that are more effective than light water.

Supervisors are individuals who are responsible for the quantity and quality of work performed and who direct the actions of operators, fissile material handlers, technicians, or maintenance personnel. Supervisory positions typically include Shift Operations Manager (or Shift Manager), reactor supervisors, fissionable material handler supervisors, tritium operator supervisors, chemical process operator supervisors, waste tank operator supervisors, maintenance supervisors, technician supervisors, and technical support supervisors. Their duties include ensuring that work is performed in compliance with procedures, policies, and industrial safety practices.

Systematic Approach to Training is a logical process for identifying and acquiring the knowledge, skills, and abilities required to safely perform the duties of a specific position. It includes the following elements:

- An analysis of the jobs to be performed;
- Design of learning objectives derived from the analysis of the job that describe desired Performance after training;
- Development of lesson plans and other training materials;
- Implementation of the developed training;
- Evaluation of trainee mastery of the objectives during training; and
- Evaluation and revision of the training based on the performance of trained personnel in the job setting.

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.

Technical Safety Requirements mean the limits, controls, and related actions that establish the specific parameters and requisite actions for the safe operation of a nuclear facility and include, as appropriate for the work and hazards identified in the documented safety analysis for the facility: Safety limits, operating limits, surveillance requirements, administrative and management controls, use and application provisions, and design features, as well as a bases appendix. (10 CFR Part 830)

Technicians are principally involved in calibration, inspection, troubleshooting, testing, maintenance, and radiation protection activities. Examples are laboratory technicians, instrument technicians, industrial hygiene, environmental, quality control, and decontamination and decommissioning technicians, and radiological control technicians.

Technical Staff are personnel responsible for supervision, design, evaluation, modification, testing, and performance of technical support functions for the operating organization. Technical staff typically has expertise in mechanical, electrical, instrumentation and control, chemistry, radiation protection, safety, quality assurance/independent assessment, software quality assurance, facility engineering, system/process engineering, safety basis engineering, criticality safety, or nuclear safety.

Training is instruction designed for acquisition of knowledge, skills, and abilities to develop or improve job performance.

Training Instructor is an individual with duties and responsibilities for instructing personnel or developing training materials.

Training Organization is responsible for supporting the line organization to identify, meet, and monitor training needs in support of the facility mission. The training organization assists line organizations in performing the SAT. The training organization may include a Training Manager, Instructional Technologists, and Instructors.

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.