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DOE STANDARD

GENERAL TECHNICAL BASE QUALIFICATION STANDARD

DOE Defense Nuclear Facilities Technical Personnel



**U.S. Department of Energy
Washington, D.C. 20585**

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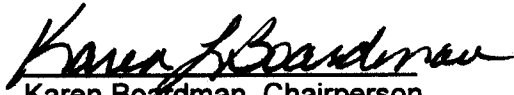
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DOE-STD-1146-2007

APPROVAL

The Federal Technical Capability Panel consists of senior U.S. Department of Energy (DOE) managers responsible for overseeing the Federal Technical Capability Program. This Panel is responsible for reviewing and approving the qualification standard for Department-wide application. Approval of this qualification standard by the Federal Technical Capability Panel is indicated by signature below.



Karen Boardman, Chairperson
Federal Technical Capability Panel

DOE-STD-1146-2007

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DOE-STD-1146-2007

TABLE OF CONTENTS

ACKNOWLEDGMENT	vii
PURPOSE	9
APPLICABILITY	9
IMPLEMENTATION	10
EVALUATION REQUIREMENTS	11
INITIAL QUALIFICATION, REQUALIFICATION, AND TRAINING	12
DUTIES AND RESPONSIBILITIES	13
BACKGROUND AND EXPERIENCE	13
REQUIRED TECHNICAL COMPETENCIES.....	13
APPENDIX A, CONTINUING EDUCATION, TRAINING, AND PROFICIENCY PROGRAM.....	27

DOE-STD-1146-2007

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DOE-STD-1146-2007

ACKNOWLEDGMENT

The Office of Health, Safety and Security is the sponsor for the General Technical Base Qualification Standard. The sponsor is responsible for coordinating the development and/or review of the General Technical Base Qualification Standard by subject matter experts to ensure that the technical content of the standard is accurate and adequate for Department-wide application. The sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring that the General Technical Base Qualification Standard is maintained current.

The following subject matter experts participated in the development and/or review of this qualification standard:

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DOE-STD-1146-2007

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DOE-STD-1146-2007

U.S. DEPARTMENT OF ENERGY FUNCTIONAL AREA QUALIFICATION STANDARD

General Technical Base

PURPOSE

DOE M 426.1-1A, *Federal Technical Capability Manual*, commits the Department to continuously strive for technical excellence. The Technical Qualification Program (TQP), along with the supporting technical qualification standards, complements the personnel processes that support the Department's drive for technical excellence. In support of this goal, the competency requirements defined in the technical qualification standards should be aligned with and integrated into the recruitment and staffing processes for technical positions. The technical qualification standards should form the primary basis for developing vacancy announcements, qualification requirements, crediting plans, interview questions, and other criteria associated with the recruitment, selection, and internal placement of technical personnel. The U.S. Office of Personnel Management (OPM) minimum standards qualifications will be greatly enhanced by application of appropriate materials from the technical functional area qualification standards (FAQSs).

The technical qualification standards are not intended to replace the OPM qualification standards or other Departmental personnel standards, rules, plans, or processes. The primary purpose of the TQP is to ensure that employees have the requisite technical competency to support the mission of the Department. The TQP forms the basis for the development and assignment of DOE personnel responsible for ensuring the safe operation of defense nuclear facilities.

The General Technical Base Qualification Standard is intended to ensure that all technical employees in the TQP have a common level of core technical knowledge. Functional area qualification standards build on this base knowledge to provide greater knowledge and skills for each individual functional area. Office/site/facility-specific qualification standards build upon the knowledge and skills of the functional areas and provide the unique knowledge and skills for a functional area at a specific office, facility, or site.

APPLICABILITY

The General Technical Base Qualification Standard establishes common technical competency requirements for all DOE personnel who provide assistance in, direction or guidance to, or oversight or evaluation of contractor technical activities that could impact the safe operation of DOE's defense nuclear facilities. The General Technical Base Qualification Standard has been developed as a tool to assist program and field offices in the development and implementation of the TQP in their organizations. It is intended to provide a common base for further functional area qualifications. For ease of transportability of qualifications between DOE elements, program and field offices are expected to use this standard without modification. Needed additional office/site/facility specific technical competencies should be handled separately.

DOE-STD-1146-2007

It should be noted that the competency elements of management and leadership, general technical knowledge, regulations, administrative capability, and assessment and oversight are all embodied in the competencies listed in this standard. All of these factors have a bearing on safety. Although the focus of this standard is technical competence, elements such as good communication, recognized credibility, ability to listen and process information, and the ability to guide an effort to get it right the first time are recognized as important aspects of safety.

IMPLEMENTATION

This technical qualification standard identifies the minimum technical competency requirements for DOE personnel. Although there are other competency requirements associated with the positions held by DOE personnel, this standard is limited to identifying the specific, common technical competencies required throughout all defense nuclear facilities. The competency requirements define the expected knowledge and/or skill that an individual must meet. Each of the competency requirements is further described by a list of supporting knowledge and/or skill statements. The supporting knowledge and/or skill statements for each competency statement are provided to challenge the employee in the breadth and depth of his/her understanding of the subject matter. Thus, the employee should be prepared to explain or demonstrate proficiency in all or part of the supporting knowledge and/or skill statements for each competency statement to the qualifying official or examining authority.

The terms “shall,” “must,” and “will” denote mandatory requirements in this Standard. “Should” denotes a recommended practice that is not required. “May” denotes an option.

The competencies identify a familiarity level, a working level, or an expert level of knowledge; or they require the individual to demonstrate the ability to perform a task or activity. These levels are defined as follows:

Familiarity level is defined as basic knowledge of or exposure to the subject or process adequate to discuss the subject or process with individuals of greater knowledge.

Working level is defined as the knowledge required to monitor and assess operations/activities, to apply standards of acceptable performance, and to recognize the need to seek and obtain appropriate expert advice (e.g., technical, legal, safety) or consult appropriate reference materials required to ensure the safety of DOE activities.

Expert level is defined as a comprehensive, intensive knowledge of the subject or process sufficient to provide advice in the absence of procedural guidance.

Demonstrate the ability is defined as the actual performance of a task or activity in accordance with policy, procedures, guidelines, and/or accepted industry or DOE practices.

Headquarters and field elements shall establish a program and process to ensure that DOE personnel possess the competencies required by their positions, including the competencies identified in this technical standard. Documentation of the completion of the requirements of this standard shall be included in the employees' training and qualification records. Satisfactory attainment of the competency requirements contained in this technical standard may be documented using the example General Technical Base qualification card that can be obtained

DOE-STD-1146-2007

from the Federal Technical Capability Program Directives and Standards page at <http://www.hss.energy.gov/depdep/ftcp/directives/directives.asp>.

Equivalencies should be used sparingly and with the utmost rigor and scrutiny to maintain the spirit and intent of the TQP. Equivalencies may be granted for individual competencies based on objective evidence of previous education, training, certification, or experience. Objective evidence includes a combination of transcripts, certifications, and in some cases, a knowledge sampling obtained through written and/or oral examinations. Equivalencies shall be granted in accordance with the TQP plan of the site/office/Headquarters organization qualifying the individual. The supporting knowledge and/or skill statements should be considered before granting equivalency for a competency.

Training shall be provided to employees in the TQP who do not meet the competencies in this standard. Training may include, but is not limited to, formal classroom and computer-based courses, self-study, mentoring, on-the-job training, and special assignments. Departmental training will be based on appropriate supporting knowledge and/or skill statements similar to the ones listed for each of the competency requirements. Headquarters and field elements should use the supporting knowledge and/or skill statements as a basis for evaluating the content of any training used to provide individuals with the requisite knowledge and/or skill required to meet the technical competency requirements.

EVALUATION REQUIREMENTS

Attainment of the competencies listed in this qualification standard shall be documented in accordance with the TQP plan or policy of the site/office/Headquarters organization qualifying the individual and the requirements of DOE M 426.1-1A and DOE O 360.1B, *Federal Employee Training*.

Unless stated otherwise within the program or site TQP plan, attainment of the competencies listed in the General Technical Base should be evaluated and documented by a qualifying official or immediate supervisor (note: if the immediate supervisor is not a qualified TQP participant, it is expected the supervisor will consult with a qualified TQP participant) using a combination of the following methods.

- Satisfactory completion of a written examination
- Satisfactory completion of an oral examination
- Satisfactory accomplishment of an observed task or activity directly related to a competency
- Documented evaluation of equivalencies (such as applicable experience in the field) without a written examination.

Field element managers/Headquarters program managers shall qualify candidates as possessing the basic technical knowledge, technical discipline competency, and position-specific knowledge, skills, and abilities required for their positions. Final qualification should be performed using one or a combination of the following methods:

- Satisfactory completion of a comprehensive written examination. The minimum passing grade should be 80 percent.

DOE-STD-1146-2007

- Satisfactory completion of an oral examination by a qualified Senior Technical Safety Manager (STSM) or a qualification board of technically qualified personnel to include at least one qualified STSM.
- Satisfactory completion of a walkthrough of a facility with a qualifying official for the purpose of verifying a candidate's knowledge and practical skills of selected key elements.

Guidance for oral interviews and written exams is contained in DOE-HDBK-1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*, and DOE-HDBK-1080-97, *Guide to Good Practices for Oral Examinations*.

For oral examinations and walkthroughs, qualifying officials or board members should ask critical questions intended to integrate identified learning objectives during qualification. Field element managers/Headquarters program managers or designees should develop formal guidance for oral examinations and walkthroughs that includes:

- Standards for qualification
- Use of technical advisors by a board
- Questioning procedures or protocol
- Pass/fail criteria
- Board deliberations and voting authorization procedures
- Documentation process

Computer-based training for this qualification standard can be found on the DOE Online Learning Center, at <https://olc2.energy.gov>. The use of this training is encouraged. A study guide and references can be found on the FTCP Web site under the "Directives and Standards" link, at <http://www.hss.energy.gov/dep/ftcp/>.

INITIAL QUALIFICATION, REQUALIFICATION, AND TRAINING

General Technical Base qualification of personnel shall be conducted in accordance with the requirements of DOE M 426.1-1A.

REQUALIFICATION REQUIREMENT — DOE program managers, site/service center managers or NNSA Deputy Administrators shall require personnel completing General Technical Base Qualification Standard to requalify on a periodicity not to exceed 5 years. The DOE sponsor/lead FTCP Agent shall establish the specific requalification training designed to update and maintain the General Technical Base qualifications. DOE program managers, site/service center managers, or NNSA Deputy Administrators shall document the requalification process, which shall, at a minimum, include the following:

1. Items added to the General Technical Base Qualification Standard since the individual's last qualification or requalification
2. A combination of written examinations, oral examinations, or facility/site walkthroughs, as necessary, to demonstrate competency on the new material and those areas from the initial qualification where the individual has not demonstrated ongoing experience during the requalification period, not to exceed 5 years

DOE-STD-1146-2007

There are no continuing training requirements associated with General Technical Base Qualification Standard.

DUTIES AND RESPONSIBILITIES

There are no duties or responsibilities associated with the General Technical Base Qualification Standard.

BACKGROUND AND EXPERIENCE

There are no background or experience recommendations associated with the General Technical Base Qualification Standard.

REQUIRED TECHNICAL COMPETENCIES

Each of the competency requirements defines the level of expected knowledge and/or skill that an individual must possess to meet the intent of this standard. Each of the competency requirements is further described by a list of supporting knowledge and/or skill statements that describe the intent of the competency statement.

Note: When regulations, DOE directives, or other industry standards are referenced in this standard, the most recent revision should be used. It is recognized that some TQP personnel may oversee facilities that utilize predecessor documents to those identified. In those cases, such documents should be included in local qualification standards via the TQP.

NUCLEAR FUNDAMENTALS

1. Personnel shall demonstrate a familiarity level knowledge of basic nuclear theory and principles.

Supporting Knowledge and/or Skills

- a. Identify and describe the three forces that are found within a nucleus.
- b. Define the terms “mass defect” and “binding energy” and discuss how they are related.
- c. Describe the following processes, and trace the decay chain for a specified nuclide on the chart of the nuclides:
 - Alpha decay
 - Beta-minus decay
 - Beta-plus decay
 - Electron capture
- d. Define the following terms:
 - Radioactivity
 - Radioactive decay constant
 - Activity

DOE-STD-1146-2007

- Radioactive half-life
 - Radioactive equilibrium
- e. Describe the following neutron-nucleus interactions:
- Elastic scattering
 - Inelastic scattering
- f. Compare and contrast capture (absorption), fission, and particle ejection nuclear reactions.

2. Personnel shall demonstrate a familiarity level knowledge of the basic fission process and the results obtained from fission.

Supporting Knowledge and/or Skills

- a. Using the liquid drop model, explain the fission process.
- b. Compare and contrast the characteristics of fissile material, fissionable material, and fertile material.
- c. Discuss the various energy releases that result from the fission process.
- d. Define the term “criticality” and explain how criticality is detected.
- e. List five factors that affect criticality.
- f. Identify the hazards that result from an unwanted criticality.
- g. Explain the double contingency principle as it relates to criticality control.
- h. Discuss the potential hazards associated with accidental/unwanted criticality.

3. Personnel shall demonstrate a familiarity level knowledge of radiological controls and theory.

Supporting Knowledge and/or Skills

- a. Define the term “ionizing radiation.”
- b. Describe how nuclear radiation is generated.
- c. Describe each of the following forms of radiation in terms of structure, electrostatic charge, interactions with matter, and penetration potential:
 - Alpha
 - Gamma
 - Beta
 - Neutron (slow and fast)
- d. Discuss the types of materials that are best suited for shielding the radiation types listed in 3c.
- e. Describe the biological effects of ionizing radiation (acute and chronic).
- f. Discuss the primary hazards to the human body (the whole body or the skin or that are internal) of each type of radiation.

DOE-STD-1146-2007

- g. Discuss radiation dose, including the terms rad, rem, roentgen, and international standard units (SI), and how it is measured.
- h. Define the term “quality factor” and discuss its application to radiation.
- i. Discuss the meaning of ALARA and describe the basic methods for achieving ALARA.
- j. Discuss the hazards, safe handling, storage requirements, and operational practices for each of the following nuclides in their various forms:
 - Plutonium
 - Uranium
 - Tritium

4. Personnel shall demonstrate a familiarity level knowledge of contamination control and theory.

Supporting Knowledge and/or Skills

- a. Define the term “contamination” and list three types of contamination.
- b. Describe three ways to control contamination.
- c. Describe how contamination is detected.
- d. Describe three ways contamination could enter the body and the methods used to prevent internal contamination.
- e. Describe the methods used for internal dose determination.
- f. Describe the types of personal protective equipment (PPE).
- g. Describe the potential effects of radioactive contamination outside contamination areas.

5. Personnel shall demonstrate a familiarity level knowledge of basic radiation detection methods and principles.

Supporting Knowledge and/or Skills

- a. Describe the proper use and function of and radiation detected by different types of thermoluminescent dosimeters and self-reading dosimetry.
- b. State the purpose and function of the following radiation-monitoring systems:
 - Criticality
 - Area
 - Process
 - Airborne

DOE-STD-1146-2007

6. Personnel shall demonstrate a familiarity level knowledge of the requirements documents for radiological control practices, procedures, and limits.

Supporting Knowledge and/or Skills

- a. Discuss the purpose and general requirements of 10 CFR 835, "Occupational Radiation Protection," including the following:
 - Access training
 - Dose limits
 - Posting types and use
 - Access requirements
 - Differences in radiological terminology between the 1998 and 2007 revisions of 10 CFR 835
- b. Discuss the purpose of and general guidance provided under DOE-STD-1098-99, *Radiological Control*.

ENVIRONMENTAL MANAGEMENT

7. Personnel shall demonstrate a familiarity level knowledge of the sources and types of radioactive and hazardous waste associated with DOE facilities.

Supporting Knowledge and/or Skills

- a. Discuss the following terms and the differences among them:
 - Low-level radioactive waste
 - Hazardous waste
 - Transuranic waste
 - High-level radioactive waste
 - Mixed hazardous waste
- b. Describe potential sources of each of the following types of waste in a DOE facility:
 - Low-level radioactive waste
 - Hazardous waste
 - Transuranic waste
 - High-level radioactive waste
 - Mixed hazardous waste
- c. Discuss the various types of storage, treatment, and disposal used to manage the following types of waste:
 - Low-level radioactive waste
 - Hazardous waste
 - Transuranic waste
 - High-level radioactive waste
 - Mixed hazardous waste

DOE-STD-1146-2007

8. **Personnel shall demonstrate a familiarity level knowledge of DOE Orders, standards, regulations, and laws related to environmental protection, pollution prevention, environmental restoration, and waste management issues.**

Supporting Knowledge and/or Skills

- a. Discuss the purpose of the following environmental laws as they apply to the Department and the contractors that operate its facilities:
- National Environmental Policy Act (NEPA)
 - Resource Conservation and Recovery Act (RCRA)
 - Comprehensive Environmental Response, Compensation, and Liability Act—Superfund Act (CERCLA)
- b. Using references, discuss the purpose of the following environmental laws as they apply to the Department and the contractors that operate its facilities:
- Clean Water Act (CWA), including the National Pollution Discharge Elimination System (NPDES)
 - Clean Air Act (CAA)
 - Emergency Planning and Community Right-To-Know Act (EPCRA)
 - Federal Facilities Compliance Act (FFCA)
 - Pollution Prevention Act of 1990 (PPA)
 - Safe Drinking Water Act (SDWA)
 - Superfund Amendment Reauthorization Act (SARA)
 - Toxic Substance Control Act (TSCA)
 - Solid Waste Disposal Act (SWDA)
- c. Using the following documents as references, discuss their purpose and general requirements:
- DOE O 450.1, Admin. Chg.1, *Environmental Protection Program*
 - DOE O 451.1 B, Chg. 1 (formerly DOE Order 5440.1), *National Environmental Policy Act Compliance Program*
 - DOE O 435.1, Chg. 1, *Radioactive Waste Management*
 - DOE Order 5400.5, Chg. 2, *Radiation Protection of the Public and the Environment*
- d. Using DOE O 450.1 as a reference, discuss the concept of an Environmental Management System.
- e. Using DOE Order 5400.5 as a reference, discuss the concept of maintaining doses to the public and to the environment as far below dose limits and constraints as is reasonably achievable (i.e., ALARA).
9. **Personnel shall demonstrate a familiarity level knowledge of the purpose and content of 29 CFR 1910.120, “Hazardous Waste Operations and Emergency Response.”**

DOE-STD-1146-2007

Supporting Knowledge and/or Skills

- a. Using 29 CFR 1910.120 as a reference, discuss its purpose, as it applies to the Department and the contractors that operate its facilities, with respect to the following:
 - Cleanup operations
 - Corrective actions
 - Voluntary clean-up operations
 - Operations involving hazardous wastes
 - Emergency response operations
- b. Using 29 CFR 1910.120 as a reference, discuss the role of the Department in the identification, assessment, and reaction to potential risks posed by hazardous wastes that exist at Department sites.
- c. Describe the linkage between 10 CFR 851, "Worker Safety and Health Program," and 29 CFR 1910.120.

10. Personnel shall demonstrate a familiarity level knowledge of potential personal and organizational liability associated with environmental laws.

Supporting Knowledge and/or Skills

- a. Using NEPA as a reference, discuss the Department's responsibilities associated with NEPA and the potential consequences of noncompliance with NEPA.
- b. Using RCRA as a reference, discuss the Department's responsibilities associated with RCRA and the potential consequences of noncompliance with RCRA.

SAFETY MANAGEMENT

11. Personnel shall demonstrate a familiarity level knowledge of the Department's philosophy and approach to implementing Integrated Safety Management (ISM).

Supporting Knowledge and/or Skills

- a. Explain the objective of ISM.
- b. Describe how the seven guiding principles in the ISM policy are used to implement an integrated safety management philosophy.
- c. Describe the five core safety management functions in the ISM policy and discuss how they provide the necessary structure for work activities.
- d. Identify and discuss existing Department manuals, guides, standards, and other documents and practices that support implementation of ISM, including the following:
 - DOE M 450.4-1, *Integrated Safety Management System Manual*
 - DOE G 450.4-1B, *Integrated Safety Management System Guides*
 - Standards/Requirements Identification Documents (S/RIDs) and Work Smart Standards
 - Contract reform and performance-based contracting

DOE-STD-1146-2007

- e. Discuss the purpose, content, and application of DOE P 450.4, *Safety Management System Policy*.
 - f. Discuss the relationship of the DEAR Clause 970.5223-1, "Integration of Environment, Safety and Health into Work Planning and Execution," to the ISM process.
 - g. Describe the requirements in 10 CFR 830 Subpart A and DOE O 414.1C to integrate the ISM system description with the quality assurance program.
- 12. Personnel shall demonstrate a familiarity level knowledge of 10 CFR 851, "Worker Safety and Health Program," and DOE O 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*.**
- Supporting Knowledge and/or Skills
- a. Discuss the requirements for the development and approval of worker safety and health programs.
 - b. Describe management responsibilities and worker rights and responsibilities.
 - c. Describe hazard identification, assessment, prevention, and abatement.
 - d. Discuss applicable safety and health standards.
 - e. Discuss the process for obtaining a variance from a safety and health standard.
 - f. Discuss the 10 CFR 851 enforcement process.
- 13. Personnel shall demonstrate a familiarity level knowledge of the Occupational Safety and Health Act.**
- Supporting Knowledge and/or Skills
- a. Using the following documents as references, discuss the purpose of 29 CFR 1910, "Occupational Safety and Health Standards"; 29 CFR 1926, "Safety and Health Regulations for Construction Industry"; and 29 CFR 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health and Related Matters."
 - b. Discuss the regulatory interfaces between the Occupational Safety and Health Administration (OSHA) and other regulatory agencies.
 - c. Describe DOE's responsibilities with respect to the Occupational Safety and Health Act.
 - d. Discuss workplace inspection techniques.
 - e. Discuss the major components of the OSHA hazard communication protocol.
 - f. Discuss how the OSHA Rule is invoked on DOE Federal and contractor staff by 10 CFR 851 and DOE O 440.1, respectively.
- 14. Personnel shall demonstrate a familiarity level knowledge of fire safety for Department facilities necessary to identify safe and unsafe work practices.**

DOE-STD-1146-2007

Supporting Knowledge and/or Skills

- a. Discuss the critical aspects of fire prevention, fire response planning, and control of fires.
- b. Describe fire hazards that could affect the safety of facility personnel.
- c. Discuss the key elements of the National Fire Protection Association (NFPA) Life Safety Code.
- d. Discuss the purpose of a fire hazard analysis.
- e. Describe the characteristics of and the methods/agents used to extinguish the following classes of fires:
 - Class A
 - Class B
 - Class C
 - Class D
- f. Discuss the key components and use of building fire protection equipment, including detection, alarm, and communication systems, and extinguishing systems (automatic and manual).

15. Personnel shall demonstrate a familiarity level knowledge of electrical safety for Department facilities necessary to identify safe and unsafe work practices.

Supporting Knowledge and/or Skills

- a. Discuss general safety precautions for working near low voltage electrical equipment and high voltage electrical equipment.
- b. Describe basic electrical isolation devices and methods.
- c. Describe how safety considerations differ for alternating current and direct current.
- d. Describe basic office electrical safety precautions.
- e. Discuss NFPA 70E, *Standard for Electrical Safety in the Workplace*.

16. Personnel shall demonstrate a familiarity level knowledge of industrial hygiene principles.

Supporting Knowledge and/or Skills

- a. Define the term "industrial hygiene," including the elements of anticipation, recognition, evaluation, and control of health hazards in the workplace.
- b. Discuss basic industrial hygiene concepts and terminology, including the following:
 - Routes of exposure (inhalation, ingestion, dermal injection)
 - Dose and toxicity (acute, chronic, concentration)
 - Exposure limits [permissible exposure limit (PEL), time-weighted average (TWA), threshold limit values (TLV), short term exposure limit (STEL), ceiling, action level, parts per million (PPM), milligrams per cubic meter (mg/m³)]
 - Hierarchy of controls (engineering, substitution, administrative, PPE)
 - Health hazards (chemical, physical, biological)

DOE-STD-1146-2007

- Key elements of a carcinogen control program, including carcinogenic chemicals and asbestos control
- c. Discuss the key elements (exposure assessment and monitoring, engineering controls, respiratory protection, PPE and clothing, housekeeping, labeling, training, medical surveillance, record keeping) of an industrial hygiene program .
- d. Discuss industrial hygiene requirements as found in the following regulations:
 - 10 CFR 850, "Chronic Beryllium Disease Prevention Program"
 - 10 CFR 851, "Worker Safety and Health Program"
- e. Discuss the key elements of a hazard communication program and the use of material safety data sheets.
- f. Discuss the importance of the following types of equipment used for personnel protection and safety:
 - Eye protection
 - Ear protection
 - Protective clothing/gloves
 - Respiratory protection

CONDUCT OF OPERATIONS

17. **Personnel shall demonstrate a familiarity level knowledge of DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*, and the principles of conduct of operations, and relate these principles to an operational environment.**

Supporting Knowledge and/or Skills

- a. Discuss the purpose of DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*.
- b. State the eighteen chapters in attachment 1 of DOE Order 5480.19, and discuss how each chapter contributes to an effective and safe operational environment.
- c. Discuss how each of the following Orders contributes to a proper conduct of operations environment:
 - DOE O 231.1A, *Environment, Safety, and Health Reporting*
 - DOE O 433.1A, *Maintenance Management Program for DOE Nuclear Facilities*
 - DOE O 414.1C, *Quality Assurance*
- d. Discuss proper critique principles and describe a proper critique process, including key elements.
- e. Define the term "root cause" and explain its importance in operational safety.
- f. Define the term "lessons learned" and explain their importance in operational safety.
- g. Describe stop work authority and the role of personnel in its application.
- h. Describe the key elements of a lockout/tagout system.

DOE-STD-1146-2007

18. **Personnel shall demonstrate a familiarity level knowledge of DOE O 231.1A, *Environment, Safety, and Health Reporting*, and DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*.**

Supporting Knowledge and/or Skills

- a. State the purpose of DOE O 231.1A, *Environment, Safety, and Health Reporting*.
- b. Define the following terms:
 - Event
 - Condition
 - Facility
 - Notification report
 - Occurrence report
 - Reportable occurrence
 - Facility representative
- c. Discuss the occurrence-reporting responsibilities of a facility representative.
- d. State the different categories of reportable occurrences and discuss each.
- e. State the major criteria groups of categorized occurrences and discuss each.

19. **Personnel shall demonstrate a familiarity level knowledge of 10 CFR 830 Subpart A, “Quality Assurance,” and DOE O 414.1C, *Quality Assurance*.**

Supporting Knowledge and/or Skills

- a. Discuss the objectives and applicability of the DOE quality requirements, including the relationship between 10 CFR 830 Subpart A and DOE O 414.1C, and the relationship between DOE quality requirements and American National Standard ASME NQA-1 for nuclear facility applications.
- b. Discuss 10 CFR 830.4, “General Requirements”; 10 CFR 830, Subpart A, “Quality Assurance Requirements”; and DOE O 414.1C, “Requirements”; including the Federal responsibilities and the applicability of the requirements to DOE and its contractors.
- c. Describe, in general terms, the content and objectives of the quality assurance criteria in the following categories, as found in DOE O 414.1C:
 - Management
 - Performance
 - Assessment
- d. Discuss the quality requirements in the following attachments (and their supporting implementing guides) of DOE O 414.1C, how the quality requirements become nuclear safety requirements for contractors, and how they apply to Federal organizations:
 - Attachment 3, *Suspect/Counterfeit Items Prevention*, and the supporting guide, DOE G 414.1-3
 - Attachment 4, *Corrective Action Management Program*, and the supporting guide, DOE G 414.1-5

DOE-STD-1146-2007

- Attachment 5, *Safety Software Quality Requirements*, and the supporting guide, DOE G 414.1-4
 - e. Describe the Federal responsibilities for review, approval, and oversight of contractor quality assurance programs developed under 10 CFR 830 and DOE O 414.1C.
- 20. Personnel shall demonstrate a familiarity level knowledge of DOE O 151.1C, *Comprehensive Emergency Management System*, and its implementing guides.**
- Supporting Knowledge and/or Skills
- a. Describe the relevant requirements, purpose, interrelationships, and importance of the following regulations and directives:
 - 10 CFR 830, “Nuclear Safety Management”
 - 29 CFR 1910.120, “Hazardous Waste Operations and Emergency Response”
 - DOE O 151.1C, *Comprehensive Emergency Management*
 - DOE G 151.1-1A, *Emergency Management Fundamentals and the Operational Emergency Base Program: Emergency Management Guide*
 - DOE G 151.1-2, *Technical Planning Basis: Emergency Management Guide*
 - DOE G 151.1-3, *Programmatic Elements: Emergency Management Guide*
 - DOE G 151.1-4, *Response Elements: Emergency Management Guide*
 - DOE G 151.1-5, *Biosafety Facilities: Emergency Management Guide*
 - b. State what is meant by an operational emergency.
 - c. Describe the purpose of a facility emergency plan and implementing procedures.
 - d. Discuss the requirements for developing the hazards survey and the emergency planning hazards assessment.
 - e. Describe the key roles and safety considerations during emergency response:
 - National Incident Management System
 - Incident Command System
 - Incident commander
 - Emergency director
 - f. Discuss the requirements for testing emergency plans and for interfacing with state and local officials and the public.

SAFETY BASIS REQUIREMENTS AND DOCUMENTATION

- 21. Personnel shall demonstrate a familiarity level knowledge of the Unreviewed Safety Question (USQ) process as discussed in 10 CFR 830 Subpart B, “Nuclear Safety Management.”**
- Supporting Knowledge and/or Skills
- a. Describe the purpose of the USQ process.
 - b. Discuss the reasons for performing a USQ determination.
 - c. Define and discuss key USQ terms.

DOE-STD-1146-2007

- d. Describe the situations that require a USQ determination.
- e. Define the conditions for a USQ.
- f. Describe contractor responsibilities for performing USQ determinations.
- g. Describe site actions for identified potential inadequacy of previous safety analyses.
- h. Discuss site actions to be taken for a USQ.
- i. Discuss the qualification and training requirements for personnel performing safety evaluations.

22. Personnel shall demonstrate a familiarity level knowledge of the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSRs) of 10 CFR 830 Subpart B, "Safety Basis Requirements," and the DOE standards and Guides supporting implementation of 10 CFR 830 Subpart B.

Supporting Knowledge and/or Skills

- a. Define and compare the terms "hazard" and "risk."
- b. Explain and compare the terms "safety basis," "design basis," and "authorization basis."
- c. Discuss the relationship of DSAs to TSRs.
- d. Describe the contractor responsibilities for TSRs and DSAs.
- e. Define the following terms and discuss the purpose of each:
 - Safety limit
 - Limiting control settings
 - Limiting conditions for operation
 - Surveillance requirements
- f. Discuss the possible source documents that may be used in developing TSRs.
- g. Discuss the conditions that constitute a violation of TSRs.
- h. State the general requirements for a DSA and for a preliminary documented safety analysis.

23. Personnel shall demonstrate a familiarity level knowledge of DOE O 420.1B, *Facility Safety*.

Supporting Knowledge and/or Skills

- a. Discuss the purpose and applicability of DOE O 420.1B, *Facility Safety*.
- b. Discuss the requirements imposed by DOE O 420.1B on the contractors that operate DOE nuclear facilities.
- c. Discuss, in general terms, the focus and the content of the following sections of DOE O 420.1B:
 - Nuclear safety
 - Fire protection
 - Nuclear criticality safety

DOE-STD-1146-2007

- Natural phenomena hazards mitigation
- Explosives safety
- Safety systems engineer and configuration management

OVERSIGHT

- 24. Personnel shall demonstrate a familiarity level knowledge of DOE P 226.1, *Department of Energy Oversight Policy*, and its implementing Order DOE O 226.1A, *Implementation of Department of Energy Oversight Policy*.**

Supporting Knowledge and/or Skills

- a. Discuss the purpose and scope of DOE P 226.1A, *Department of Energy Oversight Policy*.
- b. Discuss DOE's oversight model.
- c. Describe the roles and responsibilities of the Central Technical Authorities, the Chief of Defense Nuclear Safety and the Chief of Nuclear Safety, program offices and field offices, facility representatives, and safety system oversight personnel.
- d. Describe the roles and responsibilities of the DOE's Office of Independent Oversight.
- e. Describe "assurance systems" as found in DOE P 226.1.
- f. Describe the attributes of effective oversight.
- g. Discuss the requirements imposed by DOE O 226.1 on the contractors that operate DOE nuclear facilities.
- h. Describe criteria review and approach documents and their use in the performance of oversight activities.
- i. Describe the role of the Defense Nuclear Facilities Safety Board in oversight of DOE defense nuclear facilities.

- 25. Personnel shall demonstrate a familiarity level knowledge of DOE O 210.2, *DOE Corporate Operating Experience Program*.**

Supporting Knowledge and/or Skills

- a. Describe the objectives of DOE O 210.2, *DOE Corporate Operating Experience Program*.
- b. Describe the types of information that are collected and analyzed.
- c. Describe the types of operating experience reports that are developed.

- 26. Personnel shall demonstrate a familiarity level knowledge of DOE O 225.1A, *Accident Investigations*.**

Supporting Knowledge and/or Skills

- a. Describe the accident investigation process.
- b. Describe the roles and responsibilities of key participants in accident investigations.

DOE-STD-1146-2007

- c. Describe accident investigation data collection and data analysis techniques.
- d. Describe the development of conclusions and judgments of need.

27. Personnel shall demonstrate a familiarity level knowledge of DOE O 410.1, Central Technical Authority Responsibility Regarding Nuclear Safety Requirements.

Supporting Knowledge and/or Skills

- a. State the purpose of DOE O 410.1, *Central Technical Authority Responsibility Regarding Nuclear Safety Requirements*.
- b. Define the following terms:
 - Exception
 - Exemption
- c. List all the documents and directives that require Central Technical Authorities/Chief of Nuclear Safety/Chief of Defense Nuclear Safety concurrence before they are issued.
- d. State the responsibilities of the Central Technical Authorities.
- e. State the responsibilities of the Chief of Nuclear Safety and of the Chief of Defense Nuclear Safety.

SECURITY

28. Personnel shall demonstrate a familiarity level knowledge of DOE security programs, including DOE O 470.4A, *Safeguards and Security Program*, and its implementing manuals.

Supporting Knowledge and/or Skills

- a. Discuss information security programs, including control of classified materials, as described in DOE M 470.4-4, *Information Security*.
- b. Discuss physical protection programs, including security areas, intrusion detection, and access controls, as described in DOE M 470.4-2, *Physical Protection*.
- c. Describe how the design basis threat is used in safeguards and security planning in accordance with DOE M 470.4-1, *Safeguards and Security Program Planning and Management*.
- d. Discuss the basic requirements of material control and accountability per DOE M 470.4-6, *Nuclear Material Control and Accountability*.
- e. Discuss the responsibilities of field elements and contractor employees in identifying classified information as defined in DOE M 470.4-4, *Information Security*.

DOE-STD-1146-2007

APPENDIX A CONTINUING EDUCATION, TRAINING, AND PROFICIENCY PROGRAM

There is no specific continuing training associated with the General Technical Base Qualification Standard. However, personnel are encouraged to stay up-to-date on technical fundamentals. In particular, personnel should maintain a current level of knowledge of the Orders, Guides, and regulations referred to in this standard.

DOE-STD-1146-2007

CONCLUDING MATERIAL

Review Activity:

EM
NNSA
NE
SC

Preparing Activity:

DOE-HS-22

Project Number:

TRNG-0056

Field and Operations Offices:

CBFO
CH
ID
OH
ORP
RFFO
RL
SR

Site Offices:

Argonne Site Office
Brookhaven Site Office
Fermi Site Office
Kansas City Site Office
Livermore Site Office
Los Alamos Site Office
NNSA Service Center
Nevada Site Office
Pantex Site Office
Savannah River Site Office
Sandia Site Office
Y-12 Site Office