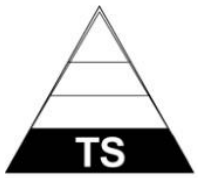

NOT MEASUREMENT SENSITIVE

DOE-STD-1146-2007
REAFFIRMED: March 2015

DOE STANDARD

GENERAL TECHNICAL BASE QUALIFICATION STANDARD

DOE Defense Nuclear Facilities Technical Personnel

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

This document is available on the

Department of Energy

Technical Standards Program

Website at

http://energy.gov/ehss/services/nuclear-safety/department-energy-technical-standards-program

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 L. Boardman 3.24.15

Karen L. Boardman, Chairperson Date
Federal Technical Capability Panel

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ACKNOWLEDGEMENT

The Office of the Associate Administrator for Safety and Health 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 the technical content of the standard is accurate and adequate for Department-wide application for those involved in the program. The sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring 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:

James O'Brien	DOE AU-30 (Team Leader)
Rex Borders	NA-SH/NA-50
Donald Brady	Sandia Field Office
Kim Delman	NA-SH/NA-50
Stephen Domotor	DOE AU-20
Jody Eggleston	NA-SH/NA-50
Joseph Robbins	NA-GC
William Schleyer	NA-SH/NA-50
David Chaney	NA-SH/NA-50 (GTB FAQS Sponsor)
Earl Hughes	DOE AU-32
Patricia Worthington	DOE AU-10
Jeanette Yarrington	DOE AU-10

DOE-STD-1146-2007

U.S. DEPARTMENT OF ENERGY
FUNCTIONAL AREA QUALIFICATION STANDARD

GENERAL TECHNICAL BASE

PURPOSE

The primary purpose of the Technical Qualification Program (TQP) is to ensure 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 technical qualification standards are not intended to replace the U.S. Office of Personnel Management (OPM) qualifications standards or other departmental personnel standards, rules, plans, or processes. However, the technical qualification functional area 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.

APPLICABILITY

The General Technical Base Qualification Standard establishes common technical competency requirements for all DOE personnel who provide assistance, direction, guidance, 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 DOE Program and Field Offices in the development and implementation of the TQP in their organization. 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 must use this qualification standard without modification or addition to competency statements or Knowledge, Skills and Abilities (KSA's). Needed additional office/site/facility specific technical competencies should be handled separately.

It should be noted that competencies related to management and leadership, general technical knowledge, regulations, departmental requirements and program implementation, administrative capability, and assessment and oversight are embodied in the competencies in this standard. All these factors have a bearing on safety. Although the focus of this standard is technical competence, 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 competencies impacting safety.

IMPLEMENTATION

This qualification standard identifies the minimum technical competency requirements for DOE personnel. Although there are other competency requirements associated with these positions, this standard identifies the specific, common technical competencies required throughout all defense nuclear facilities.

The term “must” denotes a mandatory requirement, “should” denotes a recommended practice that is not required, and “may” denotes an option in this standard.

The competencies identify a familiarity level of knowledge defined as follows:

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

NOTE: Supporting knowledge and/or skill statements should be considered by qualifying officials in the sign-off of individual competencies, however how all of the listed Knowledge, Skills and Abilities to be met for an individual competency are determined by the TQP participant’s supervisor and qualifying official to satisfy the competency.

Headquarters and field elements must establish a program and process to ensure DOE personnel possess the competencies required by their position and identified in this standard. Documentation of the completion of the requirements in this standard must be included in the employees’ training and qualification records. Satisfactory attainment of competency requirements contained in this standard may be documented using the General Technical Base qualification card from the Federal Technical Capability Program Guiding Documents page, http://energy.gov/ehss/ftcp-guiding-documents.

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 must be granted in accordance with the TQP plan of the site/office/headquarters organization qualifying the individual. Supporting knowledge and/or skill statements should, and mandatory performance activities must, be met before granting an equivalency for a competency.

Training must be provided to employees in the TQP who do not meet competencies contained in this FAQS. 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 must be based on appropriate supporting knowledge and/or skill statements similar to those listed for each competency requirement. Headquarters and field elements should use the supporting knowledge and/or skill statements as a basis for evaluating the content of any training.

EVALUATION REQUIREMENTS

Attainment of competencies listed in this standard must be documented in accordance with the TQP plan or policy of the site/office/headquarters organization qualifying the individual and the requirements in DOE O 360.1C, *Federal Employee Training*, and DOE O 426.1, Chg. 1, *Federal Technical Capability.*

The qualifying official or immediate supervisor should ensure the candidate meets the background and experience requirements of this standard. If the immediate supervisor is not a qualified TQP participant, the supervisor should consult with a qualified individual prior to using one or a combination of the following individual competency evaluation methods:

- Satisfactory completion of a written examination
- Satisfactory completion of an oral examination
- Satisfactory accomplishment of an observed task or activity related to a competency;

  or

- Documented evaluation of equivalencies.

Field element managers/headquarters program managers must qualify candidates as possessing the basic technical knowledge, technical discipline competency, and position-specific knowledge, skills, and abilities required for their positions.

Final qualification of candidates must be performed using one or a combination of the following methods:

- Satisfactory completion of a comprehensive written examination with a minimum passing score of 80 percent;

- Satisfactory completion of an oral examination by a qualified STSM or a qualification board of technically qualified personnel that includes at least one qualified STSM;

- Satisfactory completion of a walkthrough of a facility with a qualifying official for verifying a candidate's knowledge of and practical skills related to 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 must 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 National Training Center Learning Management System, at https://ntc.doe.gov/ntclms/. The use of this training is encouraged. A study guide and references can be found on the FTCP Web site under the FTCP Guiding Documents at http://energy.gov/ehss/functional-area-qualification-standard-reference-guides.

INITIAL QUALIFICATION AND TRAINING

General Technical Base qualification of personnel must be conducted in accordance with the requirements of DOE O 426.1 Chg. 1, *Federal Technical Capability*.

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 competency requirement defines the level of expected knowledge and/or skill an individual must possess to meet the intent of this standard. Each competency requirement is further described by 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.

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
- 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.

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

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-1098-2008, *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

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 436.1, *Departmental Sustainability*
- DOE O 451.1 B, Chg. 3, *National Environmental Policy Act Compliance Program*
- DOE O 435.1, Chg. 1, *Radioactive Waste Management*
- DOE O 458.1, Chg. 3, *Radiation Protection of the Public and the Environment*

d. Using DOE O 436.1 as a reference, discuss the concept of an Environmental Management System.

e. Using DOE O 458.1, Chg. 3 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*.

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 O 450.2, *Integrated Safety Management*
- DOE G 450.4-1C, *Integrated Safety Management System Guide*
- Standards/Requirements Identification Documents (S/RIDs) and Work Smart Standards
- Contract reform and performance-based contracting

e. Discuss the purpose, content, and application of DOE P 450.4A, *Integrated Safety Management 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 414.1D, Chg. 1, 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, Chg. 2, *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 440.1B, Chg. 2, respectively.

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

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/m^3)]
- Hierarchy of controls (engineering, substitution, administrative, PPE)
- Health hazards (chemical, physical, biological)
- 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 O 422.1, Chg. 2, *Conduct of Operations*, 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 422.1, Chg. 2, *Conduct of Operations.*

b. State the eighteen requirement areas in attachment 2 of DOE O 422.1, Chg. 2, and discuss how each requirement 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 231.1B, Chg. 1, *Environment, Safety, and Health Reporting*
- DOE O 433.1B, Chg. 1, *Maintenance Management Program for DOE Nuclear Facilities*
- DOE O 414.1D, Chg. 1, *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.

18. Personnel shall demonstrate a familiarity level knowledge of DOE O 231.1B, Chg. 1, *Environment, Safety, and Health Reporting*, and DOE O 232.2, Chg. 1, *Occurrence Reporting and Processing of Operations Information*.

Supporting Knowledge and/or Skills

a. State the purpose of DOE O 231.1B, Chg. 1, *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 Requirements,* and DOE O 414.1D, Chg. 1, *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 414.1D, Chg. 1, 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 414.1D, Chg. 1, *Quality Assurance,* 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 414.1D, Chg. 1:

- Management
- Performance
- Assessment

d. Discuss the quality requirements in the following attachments (and their supporting implementing guides) of DOE O 414.1D, Chg. 1, 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 414.1-2B, Chg. 2, *Quality Assurance Program Guide*.
- Attachment 4, Safety Software Quality Requirements for Nuclear Facilities, and the supporting guide, DOE G 414.1-4, *Safety Software Guide for Use with 10 CFR 830, Subpart A, Quality Assurance Requirements, and DOE O 414.1C, Quality Assurance.*

e. Describe the Federal responsibilities for review, approval, and oversight of contractor quality assurance programs developed under 10 CFR 830, Subpart A, and DOE O 414.1D, Chg. 1.

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.

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 420.1C, *Facility Safety*.

Supporting Knowledge and/or Skills

a. Discuss the purpose and applicability of DOE O 420.1C, *Facility Safety.*

b. Discuss the requirements imposed by DOE O 420.1C 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 420.1C:

- Nuclear safety design criteria
- Fire protection
- Criticality safety
- Natural phenomena hazards mitigation
- Cognizant system engineer program

OVERSIGHT

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

Supporting Knowledge and/or Skills

a. Discuss the purpose and scope of DOE P 226.1B, *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 226.1B.

f. Describe the attributes of effective oversight.

g. Discuss the requirements imposed by DOE O 226.1B 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 210.2A, *DOE Corporate Operating Experience Program.*

Supporting Knowledge and/or Skills

a. Describe the objectives of DOE O 210.2A, *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 225.1B, *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.

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 470.4B, Chg. 1, *Safeguards and Security Program,* and its supporting directives.

Supporting Knowledge and/or Skills

a. Discuss information security programs, including control of classified materials, as described in DOE O 471.6, Chg. 1, *Information Security*.

b. Discuss physical protection programs, including security areas, intrusion detection, and access controls, as described in DOE O 473.3, *Protection Program Operations*.

c. Describe how graded security protection is used in safeguards and security planning in accordance with DOE O 473.3, *Program Protection Operations*.

d. Discuss the basic requirements of material control and accountability per DOE O 474.2, Chg. 2, *Nuclear Material Control and Accountability*.

e. Discuss the responsibilities of field elements and contractor employees in identifying classified information as defined in DOE O 471.6 Chg. 1, *Information Security*.

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.

CONCLUDING MATERIAL

Review Activity:
EM
NNSA
NE
SC
EA
AU

Preparing Activity:
AU-30/NA-50/EA-50

Project Number:
TRNG-0056

Field and Operations Offices:
CBFO CH

ID
OR
ORP
RL
SR

Field or Site Offices:
Argonne Site Office
Brookhaven Site Office
Fermi Site Office
Kansas City Field Office
Livermore Field Office
Los Alamos Field Office
Nevada Field Office
NNSA Production Office
Princeton Area Office
Savannah River Field Office
Sandia Field Office