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DOE STANDARD

FACILITY REPRESENTATIVE FUNCTIONAL AREA QUALIFICATION STANDARD

DOE Defense Nuclear Facilities Technical Personnel



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

AREA TRNG

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DOE-STD-1151-2010

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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.

A handwritten signature in black ink, reading "Karen L. Boardman". The signature is written in a cursive style with a horizontal line underlining the name.

Karen L. Boardman, Chairperson
Federal Technical Capability Panel

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DOE-STD-1151-2010

TABLE OF CONTENTS

ACKNOWLEDGMENT	vii
PURPOSE	1
APPLICABILITY	1
IMPLEMENTATION	1
EVALUATION CRITERIA	3
QUALIFICATION AND TRAINING.....	4
DUTIES AND RESPONSIBILITIES	4
BACKGROUND AND EXPERIENCE	4
NECESSARY TECHNICAL COMPETENCIES.....	5
GENERAL TECHNICAL.....	5
REGULATORY	20
MANAGEMENT, ASSESSMENT, and OVERSIGHT.....	22
APPENDIX A	31

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DOE-STD-1151-2010

ACKNOWLEDGMENT

The Facility Representative (FR) Program Manager is the sponsor for the FR Functional Area Qualification Standard (FAQS). The sponsor is responsible for coordinating the development and review of the FR FAQS by subject matter experts to ensure that the technical content of the standard is accurate and adequate for Department-wide application for those involved in the FR program. The sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring that the FR FAQS 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-1151-2010

U.S. DEPARTMENT OF ENERGY FUNCTIONAL AREA QUALIFICATION STANDARD

FACILITY REPRESENTATIVE

PURPOSE

DOE O 426.1, *Federal Technical Capabilities*, 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 minimum technical competencies and supporting knowledge and skills defined in the qualification standards should be aligned with and integrated into the recruitment and staffing processes for technical positions. The 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 qualifications standards will be greatly enhanced by application of appropriate materials from the technical functional area qualification standards (FAQSs).

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

The FAQS has been developed as a tool to assist DOE program and field offices in the development and implementation of the TQP in their organization. This FAQS supports the facility representative (FR) qualification process described in DOE-STD-1063-2006, *Facility Representatives*.

APPLICABILITY

This FR FAQS establishes common functional area competencies for all DOE FRs who provide assistance, or direction, guidance, oversight, or evaluation of contractor technical activities that could impact the safe operation of DOE's defense nuclear facilities. Program and field offices not required to establish a TQP and have hazardous facilities are encouraged to use this FAQS as is, but may modify or eliminate competencies as necessary.

IMPLEMENTATION

This FAQS identifies the minimum competencies for DOE FRs. Although there are other competencies associated with FR positions held by DOE personnel, this FAQS is limited to identifying the specific, common competencies required throughout defense nuclear facilities. The minimum competencies define the expected knowledge and/or skill that an individual shall have. Each of the competencies is further described by a listing of supporting knowledge and/or skill statements. The supporting knowledge and/or skill statements for each competency are

DOE-STD-1151-2010

provided to challenge the employee in the breadth and depth of his/her understanding of the subject matter.

For ease of transportability of qualifications between DOE elements, program and field offices are expected to use this FAQs without modification. Needed additional office-/site-/facility-specific competencies should be handled separately. Satisfactory and documented attainment of the competencies contained in this FAQs ensures that personnel possess the minimum requisite competence to fulfill their functional area duties and responsibilities common to the DOE complex. Additionally, office-/site-/facility-specific qualification standards supplement this FAQs and establish unique operational competency requirements at the Headquarters or field element, site, or facility level.

It should be noted that the competencies of management and leadership, general technical knowledge, regulations, 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, competencies 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.

DOE technical standards, such as this standard, do not establish requirements. However, all or part of the provisions in a DOE Standard can become requirements under the following circumstances:

- (a) They are explicitly stated to be requirements in a DOE requirements document; or
- (b) The organization makes a commitment to meet a standard in a contract or in an implementation plan or program plan required by a DOE requirements document.

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 or a working level; 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.

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 position, including the competencies identified in this FAQs. Documentation of the completion of the minimum competencies of this standard shall be included in the employees' training and qualification records. Satisfactory attainment of the competencies contained in this FAQs may be documented using the example FR Functional Area Qualification Card that can be obtained from the Federal Technical

DOE-STD-1151-2010

Capability Program (FTCP) FAQ Qualification Cards page at <http://www.hss.energy.gov/depdep/ftcp/directives/FAQcard.asp>.

Equivalencies (as used in this FAQs) 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 and mandatory performance activities should be considered before granting an equivalency for a competency.

Training shall be provided to employees in the TQP who do not meet the 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 shall 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 FAQs competency requirements.

EVALUATION CRITERIA

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

The qualifying official or immediate supervisor should ensure that the candidate meets the background and experience requirements of DOE-STD-1063-2006. Unless stated otherwise within the program or site TQP plan, attainment of the competencies listed in the FR FAQs should be evaluated and documented by either a qualifying official or immediate supervisor (if the immediate supervisor is not a qualifying official, it is expected that the supervisor consult with a qualifying official) using one or 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 or designees shall qualify candidates as possessing the basic technical knowledge, technical discipline competency, and position-specific knowledge, skills, and abilities required for their positions. Initial full qualification shall be performed using the following methods:

- Satisfactory completion of a comprehensive written examination (minimum passing grade should be 80%)

DOE-STD-1151-2010

- Satisfactory completion of an oral examination by a qualified Senior Technical Safety Manager (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 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

QUALIFICATION AND TRAINING

Training and qualification of FRs shall be conducted in accordance with the requirements of DOE-STD-1063-2006 and DOE O 426.1.

A description of suggested learning activities and the requirements for the continuing education and training program for the FR FAQs are included in Appendix A of this document.

DUTIES AND RESPONSIBILITIES

The typical duties and responsibilities expected of personnel assigned to the FR functional area are found in DOE-STD-1063-2006.

Position-specific duties and responsibilities for FRs are contained in their office-/site-/facility-specific qualification standard and position description.

BACKGROUND AND EXPERIENCE

The background and experience criteria for entry into the FR Program are found in DOE-STD-1063-2006.

DOE-STD-1151-2010

NECESSARY TECHNICAL COMPETENCIES

The competencies contained in this standard are distinct from those competencies contained in the General Technical Base (GTB) Qualification Standard. All FRs shall satisfy the necessary competencies of the GTB Qualification Standard prior to or in parallel with the competencies contained in this standard.

Note: When regulations, DOE directives, or other industry standards are referenced in the FAQs the most recent revision should be used. It is recognized that some FRs may oversee facilities that utilize predecessor documents to those identified; in these cases such documents should be included in their office-/site-/facility-specific qualification standard via the TQP.

GENERAL TECHNICAL

1. A facility representative must demonstrate a familiarity level knowledge of principles of steam system theory.

Supporting Knowledge and/or Skills

- a. Discuss the application of the following concepts to steam systems:
 - Enthalpy
 - Saturation
 - Superheat
 - Steam quality
 - Moisture content
 - Condensation
 - Sensible heat
 - Carryover
 - Thermal expansion
 - Thermal contraction
- b. Discuss steam tables and the Mollier diagram and demonstrate their use.

2. A facility representative must demonstrate a working level knowledge of steam system operation including startup, normal and off-normal operation, and shutdown.

Supporting Knowledge and/or Skills

- a. Describe the following steam system evolutions and associated precautions:
 - Pressurization and warm-up of a cold steam system
 - Initiation of steam flow in a stagnant, but pressurized steam system
 - Isolation of a portion of a steam system
 - Pressurization and warm-up of an isolated portion of a steam system
 - Isolation and de-pressurization of an in-service steam system
- b. Discuss the function/application of the following steam system components and describe how the components contribute to steam system operation:
 - Isolation valves
 - Isolation valve bypass valves
 - Vent valves

DOE-STD-1151-2010

- Drain valves
 - Safety/Relief valves
 - Flow control valves
 - Steam trap bypass valves
 - Expansion joints
 - Pressure control valves
 - Moisture separators
 - Pipe hangers/supports
 - Mist eliminators
 - Evaporators
 - Condensers
 - Boilers
 - Reboilers
 - Steam traps (mechanical, impulse, thermostatic)
- c. Describe condensation-induced water hammer and its potential impact on steam systems.
- d. Describe the expected operator response to, and where possible how to prevent, the following steam system abnormal conditions. Include a discussion of associated hazards:
- Water hammer during pressurization/warm-up of a cold steam system
 - Water hammer during initiation of flow in an in-service steam system
 - Seat leakage of an isolation valve
 - Steam leakage to atmosphere
 - Steam header rupture

3. A facility representative must demonstrate a familiarity level knowledge of basic pneumatic and hydraulic systems theory.

Supporting Knowledge and/or Skills

- a. Discuss the following terms:
- Force
 - Pressure
 - Pneumatic
 - Hydraulic

4. A facility representative must demonstrate a working level knowledge of pneumatic and hydraulic systems operations.

Supporting Knowledge and/or Skills

- a. Describe the following pneumatic and hydraulic system evolutions and associated precautions and hazards:
- Start-up and shutdown
 - Normal operation
 - System rupture or leakage

DOE-STD-1151-2010

5. A facility representative must demonstrate a familiarity level knowledge of heat exchanger construction and theory.

Supporting Knowledge and/or Skills

- a. Discuss the following types of heat exchanger construction:
 - Shell and tube
 - Plate
- b. Discuss hot and cold fluid flow in parallel flow, counter flow, and cross flow heat exchangers.
- c. Discuss the following heat exchanger applications:
 - Air conditioner evaporator
 - Air conditioner condenser
 - Preheater
 - Radiator
 - Cooling tower

6. A facility representative must demonstrate a working level knowledge of heat exchanger systems operations.

Supporting Knowledge and/or Skills

- a. Describe the following heat exchanger system evolutions and associated precautions and hazards:
 - Start-up and shutdown
 - Normal operation
 - System rupture or leakage

7. A facility representative must demonstrate a familiarity level knowledge of pump components and characteristics.

Supporting Knowledge and/or Skills

- a. Discuss the principles of operation for centrifugal pumps, including series and parallel pump operation.
- b. Define the following terms and discuss their relationship:
 - Shutoff head
 - Net positive suction head
 - Cavitation
 - Pump run-out
- c. Discuss the principles of operations for positive displacement pumps, and discuss the importance of not operating against a closed valve on the discharge side of the pump.

DOE-STD-1151-2010

8. A facility representative must demonstrate a working level knowledge of valve construction, operation, and application.

Supporting Knowledge and/or Skills

- a. Describe the operation of the following valve classifications to include purpose, construction and application:
 - Ball
 - Check
 - Diaphragm
 - Gate
 - Globe
 - Relief
 - Safety
- b. Given the specific valve below, match the valve to the applicable classification:
 - Butterfly
 - Lift check
 - Needle
 - Pinch
 - Plug
 - Pressure reducing
 - Stop check
 - Swing check
- c. Given a drawing of a gate, globe or check valve, identify the following parts, as applicable:
 - Actuator
 - Ball
 - Body
 - Bonnet
 - Disk
 - Packing
 - Packing gland
 - Packing nuts
 - Plug
 - Stem
 - Seat
- d. Describe the principle of operation, construction, and application for the following types of valve actuators:
 - Manual
 - Electric motor
 - Pneumatic
 - Hydraulic
 - Solenoid
- e. State the purpose and location of body markings (bridge wall markings, flow arrows, etc.).
- f. Given a process or system, explain what type of valve is best suited for the application, what type of valve should not be used for the application, and why the valve(s) should or should not be used.

DOE-STD-1151-2010

- g. Discuss the various methods that can be used to determine and verify valve position. Include in your discussion operation and location of position indicators.
- h. Describe the proper method to lockout valves using the valve actuators below:
 - Manual
 - Electric motor
 - Pneumatic
 - Hydraulic
 - Solenoid

9. A facility representative must demonstrate a familiarity level knowledge of compressed air systems.

Supporting Knowledge and/or Skills

- a. Discuss the basic operation of the following types of air compressors:
 - Reciprocating
 - Centrifugal
 - Rotary
- b. Discuss the uses of pressurized air systems.
- c. Discuss the following major components of air compressors:
 - Low pressure stages
 - Intercooler
 - High pressure stages
 - After cooler
 - Moisture separators
 - Receivers
 - Dryers

10. A facility representative must demonstrate a working level knowledge of air compressor interlocks and safety.

Supporting Knowledge and/or Skills

- a. State hazards associated with pressurized air systems.
- b. State the reason for using cooling systems in air compressors.
- c. Describe the safety aspects and typical interlocks associated with air compressors, including:
 - Low oil pressure
 - High compressor discharge pressure
 - High compressor discharge temperature
 - High cooling water outlet temperature
 - Oil in breathing air

DOE-STD-1151-2010

11. **A facility representative must demonstrate a working level knowledge of heating, ventilation, and air conditioning system operations.**

Supporting Knowledge and/or Skills

- a. Describe the following heating, ventilation, and air conditioning system evolutions and associated precautions and hazards:
 - Start-up and shutdown
 - Normal operation
 - HEPA filter maintenance and testing
 - Ventilation system balancing
- b. Describe the purpose of the HVAC system in the following applications:
 - Hoods
 - Gloveboxes
 - Hot cells
 - Confinement systems
- c. Discuss the reason for and significance of the following system parameters:
 - Positive vs. negative system pressure
 - Differential pressure across filters
 - Differential pressure across components

12. **A facility representative must demonstrate a familiarity level knowledge of basic electrical fundamentals in the areas of terminology and theory.**

Supporting Knowledge and/or Skills

- a. Discuss the following terms:
 - Electrostatic force
 - Electrostatic field
 - Conductor
 - Insulator
 - Resistor
- b. Discuss the following parameters and their relationship:
 - Voltage
 - Current
 - Resistance
 - Ohm's Law
 - Power
 - Inductance
 - Capacitance

13. **A facility representative must demonstrate a familiarity level knowledge of basic electrical fundamentals in the area of direct current (DC).**

Supporting Knowledge and/or Skills

- a. Discuss the basic principle by which the following components produce DC:
 - Battery
 - DC generator

DOE-STD-1151-2010

- Thermocouple
- b. Discuss the purpose of a rectifier.
- c. Discuss the following terms:
 - Resistivity
 - Electric circuit
 - Series circuit
 - Parallel circuit
- d. Discuss the following terms:
 - Battery
 - Electrode
 - Electrolyte
 - Specific gravity
 - Ampere-hour
- e. Discuss in basic terms what happens when a lead-acid battery is charged and discharged.
- f. Discuss the relationship between voltage and current-carrying capacity for series-connected versus parallel-connected batteries.
- g. Discuss the hazards associated with lead-acid storage batteries.

14. A facility representative must demonstrate a familiarity level knowledge of basic electrical fundamentals in the area of alternating current (AC).

Supporting Knowledge and/or Skills

- a. Discuss the basic theory of operation of an AC generator.
- b. Discuss the reasons that three-phase power systems are used in industry.
- c. Discuss the basic theory of operation of an AC motor.
- d. Discuss the basic theory of operation of a transformer.

15. A facility representative must demonstrate a working level knowledge of basic electrical fundamentals in the area of electrical distribution systems.

Supporting Knowledge and/or Skills

- a. Explain the following terms as they apply to electrical distribution systems:
 - Single-line diagram
 - Neutral grounding
 - Protective relays
 - Uninterruptible power supply
 - Automatic transfer switch
 - Diesel-generator
- b. Describe the protection provided by fuses and circuit breakers.
- c. Describe the purpose and functions of a motor controller.

DOE-STD-1151-2010

d. Describe the purpose and functions of a variable frequency drive controller.

16. A facility representative must demonstrate a working level knowledge of electrical system and components in the area of safety.

Supporting Knowledge and/or Skills

- a. Discuss the hazards associated with operations and maintenance of electrical systems and components.
- b. Describe the general safety precautions for operations and maintenance of electrical systems and components.
- c. Describe the safety precautions specific to batteries.
- d. Describe the safety precautions specific to breaker operations.

17. A facility representative must demonstrate a familiarity level knowledge of process instrumentation.

Supporting Knowledge and/or Skills

- a. List the three basic functions that temperature, pressure, flow, and fluid level detectors provide.
- b. For the temperature detection devices listed, discuss how the instrument provides an output representative of the temperature being measured:
 - Thermocouple (TC)
 - Resistance temperature detector (RTD)
- c. For the pressure detection devices listed, discuss how the instrument provides an output representative of the pressure being measured:
 - Bellows type
 - Bourdon tube type
- d. For the fluid level detection devices listed, discuss how the instrument provides an output representative of the level being measured:
 - Gauge-glass type
 - Conductive probe type
 - Magnetic bond type
 - Differential pressure type
 - Ball float type
 - Sonic type
 - Radar type
- e. For the flow detection devices listed, discuss how the instrument provides an output representative of the flow being measured:
 - Orifice plate type
 - Venturi tube type
 - Pitot tube type
 - Displacement type
 - Dall flow tube type
 - Ultrasonic type
 - Electromagnetic

DOE-STD-1151-2010

- f. For the position detection devices listed, discuss how the detector provides an output representative of the position being represented:
- Synchronous type
 - Limit switches
 - Reed switches
 - Potentiometer
 - Linear variable differential transformer types

18. A facility representative must demonstrate a familiarity level knowledge of control system principles of operation and uses.

Supporting Knowledge and/or Skills

- a. Define and discuss the application of each of the following:
- Control system
 - Control system input
 - Control system output
 - Open-loop control system
 - Closed-loop control system
 - Control system feedback
- b. Referring to a basic block diagram, describe an automatic control system, including the four functions required for an automatic control system to operate.
- c. Discuss the following associated with programmable logic controllers (PLCs):
- Purpose
 - Advantages of a PLC system
 - Components and their functions
 - Basic sequence of operation
 - Input/output addressing
 - Equipment used to program the PLC
- d. Discuss the following associated with distributed control systems (DCSs):
- Purpose
 - Components and their functions
 - Functions of DCS consoles
 - Basic operation of components
 - Error indications (DCS and/or component)

19. A facility representative must demonstrate a familiarity level knowledge of chemistry fundamentals in the areas of theory and the periodic table.

Supporting Knowledge and/or Skills

- a. Discuss the four possible states of matter.
- b. Discuss the structure of the Bohr atom.
- c. Discuss the following terms:
- Element
 - Molecule
 - Avogadro's Number
 - Mole

DOE-STD-1151-2010

20. **A facility representative must demonstrate a familiarity level knowledge of chemistry fundamentals in the areas of chemical bonding and chemical reactions.**

Supporting Knowledge and/or Skills

- a. Discuss the following types of chemical bonds:
 - Ionic
 - Covalent
 - Metallic
- b. Discuss how elements combine to form chemical compounds.
- c. Discuss the following terms:
 - Mixture
 - Solvent
 - Solubility
 - Solute
 - Solution
 - Equilibrium
 - Normality
 - Density
 - Molarity
 - Parts per million (ppm)
- d. Given an unbalanced chemical equation, discuss how to balance the equation.
- e. Define the following terms:
 - Acid
 - Base
 - Salt
 - pH
 - pOH

21. **A facility representative must demonstrate a familiarity level knowledge of chemistry fundamentals in the areas of corrosion and water treatment.**

Supporting Knowledge and/or Skills

- a. Discuss the process of general corrosion of iron and steel when exposed to water.
- b. Discuss the two conditions that can cause galvanic corrosion.
- c. Discuss the following types of specialized corrosion:
 - Pitting
 - Stress corrosion cracking
 - Crevice
- d. Discuss the reasons for removing impurities from water prior to use in nuclear and non-nuclear systems.
- e. Discuss the ion exchange process.
- f. Discuss the safety concerns of the “red oil” phenomenon.

DOE-STD-1151-2010

22. A facility representative must demonstrate a working level knowledge of chemistry fundamentals in the area of safety.

Supporting Knowledge and/or Skills

- a. Describe the hazards associated with the use of corrosives (acids and alkalis).
- b. Describe the hazards associated with the use of pyrophorics.
- c. Describe the safety precautions necessary for the handling, storage, and disposal of corrosives.
- d. Describe the safety precautions regarding toxic compounds.
- e. Describe the criteria used to determine if a compound is a health hazard and discuss the methods by which toxic compounds may enter the body.
- f. Describe the safety precautions regarding the use, handling, and storage of compressed gases, including specifically hydrogen, oxygen, and nitrogen.
- g. Describe the safety precautions for working with cryogenic liquids.
- h. Explain the difference between a flammable liquid and a combustible liquid.
- i. Describe the safety precautions regarding the use, handling, and storage of flammable and combustible liquids.

23. A facility representative must demonstrate a familiarity level knowledge of basic thermodynamics concepts and theories.

Supporting Knowledge and/or Skills

- a. Define the following terms:
 - Specific volume
 - Density
 - Specific gravity
 - Mass
 - Weight
- b. Discuss the thermodynamic properties of temperature and pressure.
- c. Discuss the Fahrenheit, Celsius, Kelvin, and Rankine temperature scales, and discuss the concept of absolute zero.
- d. Discuss the relationship between absolute pressure, gauge pressure, and vacuum.
- e. Discuss the following and describe their relationship:
 - Energy
 - Potential energy
 - Kinetic energy
 - Work
 - Heat

DOE-STD-1151-2010

- f. Discuss the following types of thermodynamic systems:
 - Isolated
 - Open
 - Closed
- g. Discuss the First Law of Thermodynamics.
- h. Discuss the Second Law of Thermodynamics.

24. A facility representative must demonstrate a familiarity level knowledge of basic heat transfer and fluid flow concepts and theories.

Supporting Knowledge and/or Skills

- a. Using the ideal gas law, discuss the relationship between pressure, temperature, and volume.
- b. Discuss when a fluid may be considered to be incompressible.
- c. Discuss the effects of pressure and temperature changes on confined fluids.
- d. Discuss the difference between heat and temperature, and heat and work.
- e. Discuss the three modes of heat transfer.
- f. Discuss how the density of a fluid varies with temperature.
- g. Discuss the relationship between the pressure in a fluid column and the density and depth of the fluid.
- h. Discuss the terms mass flow rate and volumetric flow rate.
- i. Discuss the characteristics and flow velocity profiles of laminar flow and turbulent flow.
- j. Discuss the property of viscosity.
- k. Discuss the terms head, head loss, and frictional loss with respect to its use in fluid flow.

25. A facility representative must demonstrate a familiarity level knowledge of basic material science in the areas of concepts, theories, and principles.

Supporting Knowledge and/or Skills

- a. State the five types of bonding that occur in materials and their characteristics.
- b. Discuss the characteristics of the following crystal structures:
 - Body-centered cubic
 - Face-centered cubic
 - Hexagonal close-packed
- c. Identify and discuss the crystalline structure of a metal.
- d. Define the following terms:
 - Grain
 - Grain structure

DOE-STD-1151-2010

- Grain boundary
 - Creep
 - Polymorphism
 - Alloy
- e. Discuss the three possible alloy microstructures and their two main characteristics as compared to pure metals.
- f. Compare and contrast the properties, characteristics and applications of stainless steel to those of carbon steel.
- g. Identify the three types of microscopic imperfections found in crystalline structures.
- h. Discuss the following terms:
- Compressibility
 - Stress
 - Shear stress
 - Tensile stress
 - Compressive stress
- i. Define the following terms:
- Strain
 - Proportional limit
 - Plastic deformation
- j. Identify the two common forms of strain and discuss the differences.
- k. Discuss Hooke's Law.
- l. Discuss what is meant by the terms “bulk modulus” and “fracture point.”
- m. Given the stress-strain curves for ductile and brittle material, identify the following points on the curve:
- Proportional limit
 - Ultimate strength
 - Yield point
 - Fracture point
- n. Discuss the following terms:
- Strength
 - Malleability
 - Ductility
 - Toughness
 - Yield strength
 - Hardness
 - Ultimate tensile strength
- o. Discuss the adverse effects of welding on metal including the types of stress.
- p. Discuss the phenomenon of thermal shock.
- q. Discuss the following terms and discuss their relationship to material failure:
- Ductile fracture
 - Brittle fracture
 - Nil-ductility transition (NDT) temperature

DOE-STD-1151-2010

- r. Discuss the phenomenon of brittle fracture.
- s. Discuss fatigue failure and work hardening with respect to material failure.
- t. Discuss the effects of the following types of radiation on the structural integrity of metals:
 - Alpha
 - Beta
 - Gamma
 - Fast neutron
 - Slow neutron

26. A facility representative must demonstrate a working level knowledge of engineering prints and drawings.

Supporting Knowledge and/or Skills

- a. Given an engineering print, read and interpret the following information:
 - Title block
 - Notes
 - Legend
 - Revision block
 - Drawing grid
- b. Given an engineering piping and instrument drawing, identify the symbols used for:
 - Types of valves
 - Types of valve operators
 - Types of eductors and ejectors
 - Basic types of instrumentation
 - Types of instrument signal controllers and modifiers
 - Types of system components (pumps, etc.)
 - Types of lines
- c. Identify the symbols used on engineering piping and engineering diagrams (P&IDs) to denote the location of instruments, indicators, and controllers.
- d. Identify how valve conditions are depicted.
- e. Determine system flow path(s) for a given valve lineup.

27. A facility representative must demonstrate a working level knowledge of electrical prints, diagrams and schematics.

Supporting Knowledge and/or Skills

- a. Identify the symbols used on engineering electrical drawings.
- b. Identify the symbols and/or codes used on engineering electrical drawings to depict the relationship between components.
- c. State the conditions in which electrical devices are shown, unless otherwise noted on the diagram or schematic.

DOE-STD-1151-2010

- d. Identify the power sources and/or loads and their status, given simple electrical schematics and initial conditions.

28. A facility representative must demonstrate a familiarity level knowledge of engineering fabrication, construction, and architectural drawings.

Supporting Knowledge and/or Skills

- a. State the purpose of engineering fabrication, construction, and architectural drawings.
- b. Given an engineering fabrication, construction, or architectural drawing, identify the specified dimensions of an object.
- c. Discuss the methods used to specify a dimension's allowable tolerance.
- d. Given an engineering fabrication, construction, or architectural drawing, identify the specific dimension's allowable tolerance.

29. A facility representative must demonstrate a working level knowledge of lasers in the area of safety.

Supporting Knowledge and/or Skills

- a. Describe principal hazards associated with non-ionizing radiation.
- b. Describe types and classifications of lasers (ANSI Z136.1, *Safe Use of Lasers*).
- c. Describe engineering controls and use of personnel protective equipment for laser safety:
 - Laser control area
 - Protective housing, barriers and curtains
 - Beam attenuators and stops
 - Interlocks
 - Key control
 - Eyewear
- d. Describe administrative controls and roles of the laser safety officer:
 - Training
 - Authorized personnel
 - Operating and alignment procedures
- e. Describe requirements of laser warning signs, labels and postings.

DOE-STD-1151-2010

REGULATORY

30. A facility representative must demonstrate a working level knowledge of the purpose, scope, and application of applicable Federal Regulations to include:

- 10 CFR 820, “Procedural Rules for DOE Nuclear Activities”
- 10 CFR 830, “Nuclear Safety Management”
- 10 CFR 835, “Occupational Radiation Protection”
- 10 CFR 851, “Worker Safety and Health Program”

Supporting Knowledge and/or Skills

- a. Discuss the purpose, scope, and application of the listed Federal Regulations. Include in this discussion the key terms, essential elements, and personnel responsibilities and authorities.
- b. Discuss what constitutes acceptable contractor work performance in categories as defined by the above Rules.
- c. Describe the methods by which Rule noncompliance is determined and communicated to contractor and DOE management.

31. A facility representative must demonstrate a working level knowledge of the purpose, scope, and application of applicable DOE Orders to include:

- DOE O 151.1C, *Comprehensive Emergency Management System*
- DOE O 231.1A Chg 1, *Environment, Safety and Health Reporting*
- DOE O 420.1B Chg 1, *Facility Safety*
- DOE O 420.2B, *Safety of Accelerator Facilities*
- DOE O 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities*
- DOE O 435.1 Chg 1, *Radioactive Waste Management*
- DOE O 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*
- DOE O 442.1A, *Department of Energy Employee Concerns Program*
- DOE O 451.1B Chg 2, *National Environmental Policy Act Compliance Program*
- DOE O 460.1C, *Packaging and Transportation Safety*

Supporting Knowledge and/or Skills

- a. Discuss the purpose, scope, and application of the listed DOE Orders. Include in this discussion the key terms, essential elements, and personnel responsibilities and authorities.
- b. Discuss what constitutes acceptable contractor work performance in categories as defined by the above Orders.
- c. Describe the methods by which Order noncompliance is determined and communicated to contractor and DOE management.

DOE-STD-1151-2010

32. **A facility representative must demonstrate a working level knowledge of DOE-STD-1063-2006, *Facility Representatives*.**

Supporting Knowledge and/or Skills

- a. Discuss the purpose, scope, and application. Include in this discussion the key terms, essential elements, and personnel responsibilities and authorities.
- b. Discuss the process by which DOE line management determines an appropriate level of coverage by an FR. Include in this discussion factors that may be considered to adjust the established level of coverage.
- c. Describe the FR's role with respect to performance of oversight of government-owned contractor-operated facilities.
- d. Describe the assessment requirements and limitations associated with the FR's interface with contractor employees.
- e. Describe the relationship and interface of FRs with other DOE oversight personnel.
- f. Describe the FR's role in contractor oversight.
- g. Compare and contrast the following:
 - Department of Energy's expectations of the operating contractor
 - Operating contractor's expectations of the Department of Energy

DOE-STD-1151-2010

MANAGEMENT, ASSESSMENT, and OVERSIGHT

- 33. A facility representative must demonstrate a working level knowledge of event investigation principles and techniques necessary to: identify problems, determine causes, determine conclusions, and develop judgments of need (corrective actions).**

Supporting Knowledge and/or Skills

- a. Discuss the techniques associated with identifying the events, facts, and conditions (known and assumed) necessary to perform causal analysis.
 - b. Discuss the principles and techniques associated with the following analytical techniques:
 - Events and causal factors analysis
 - Root cause analysis
 - Barrier analysis
 - Change analysis
 - Factual analysis
 - c. Discuss the process associated with forming conclusions based on the results of the analytical process.
 - d. Discuss the process associated with developing judgments of need.
 - e. Explain the necessity for and differences between the immediate, short-term, and long-term actions taken as the result of a problem identification or occurrence.
 - f. Conduct an interview representative of one that would be conducted during an occurrence investigation.
 - g. Describe the following types of investigations and discuss an example of the application of each:
 - Type A
 - Type B
 - Limited scope
- 34. A facility representative must demonstrate a working knowledge of the DOE oversight process as defined by DOE O 226.1A, *Implementation of DOE Oversight Policy*, such as the essential elements of an oversight program, the contractor assurance system, and DOE line management oversight responsibilities and functions.**

Supporting Knowledge and/or Skills

- a. Explain the four essential elements of an effective oversight program, including a comprehensive and rigorous contractor assurance system, the DOE field element line management oversight process, DOE headquarters line management oversight process, and independent oversight processes.
- b. Describe the DOE oversight model.
- c. Explain the six required elements of a contractor assurance system, and list the

DOE-STD-1151-2010

four aspects of operations that are required in a contractor assurance system.

- d. Identify the key elements and features of an effective Department of Energy and operating contractor relationship, including communications and dispute resolution.
- e. Explain “balanced approach” as it relates to a DOE O 226.1A compliant DOE oversight program.
- f. Explain the following DOE oversight processes, including the reason for conducting each process and types of activities involved in completing each process:
 - Operational awareness
 - Assessments of facilities, operations, and programs
 - Assessments of contractor assurance systems
 - Evaluations of contractor performance
 - Self-assessments of DOE line management functions and performance
- g. Conduct a minimum of three assessments of contractor or Federal employee (as appropriate) work performance.

35. A facility representative must demonstrate a working level knowledge of conduct of maintenance principles and Department of Energy requirements to ensure maintenance is performed in a safe and efficient manner.

Supporting Knowledge and/or Skills

- a. Explain the Department of Energy's role in the oversight of contractor maintenance operations.
- b. Explain the application of DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*, and DOE O 430.1B Chg 1, *Real Property Asset Management*.
- c. Define each of the following maintenance related terms and explain their relationship to each other:
 - Corrective
 - Preventive
 - Predictive
 - Periodic
 - Planned
 - Reliability-centered
 - Troubleshooting
- d. Explain the purpose and content of a master equipment list.
- e. Observe a contractor preventive maintenance activity and describe the preventive maintenance factors to be considered as the activity is planned.
- f. Observe post-maintenance testing and discuss the activity, including several examples of maintenance activities to which post-maintenance testing would be applied.
- g. Explain the purpose of maintaining good facility condition and housekeeping.

DOE-STD-1151-2010

- h. Conduct a facility observation walkthrough and identify any deficiencies often found with respect to material, housekeeping, industrial safety, and radiological areas.
- i. Describe configuration control and its relationship to the maintenance work control process and the maintenance history file.
- j. Explain the intent of a maintenance problem analysis program and discuss a maintenance problem where this program has been recently employed.
- k. Explain facility management's role in facility maintenance.
- l. Describe the principles of instrument calibration to ensure safe and efficient operation.
- m. Conduct an assessment of maintenance activities.

36. A facility representative must demonstrate a working level knowledge of the Occurrence Reporting and Processing System (ORPS) necessary to ensure that occurrences are properly reported and processed in accordance with DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*.

Supporting Knowledge and/or Skills

- a. Define the term reportable occurrence.
- b. Discuss the FR and operating contractor's (facility manager) responsibilities.
- c. Describe the intent and contents of DOE M 231.1-2 requirements for occurrence reporting including the following:
 - Reporting philosophy, including the purpose of the occurrence reporting model
 - Event or condition identification
 - Event or condition categorization
 - DOE HQ operations center prompt notifications
 - Written notification report
 - Occurrence investigation and analysis, including the purpose of the causal analysis tree
 - Occurrence report closure
 - Short form reports
 - Performance analysis and identification of recurring occurrences
 - Training
- d. Discuss the following:
 - Categorizing instructions
 - Occurrence reporting criteria
- e. Discuss information security requirements for ORPS Reports.
- f. Discuss how DOE and contractors should utilize reportable occurrence information, particularly as a feedback mechanism.
- g. Given an actual occurrence report, determine the accuracy of categorization, adequacy of the review process used, that causes were appropriately defined, that corrective actions are appropriate (addressed causes), that the lessons

DOE-STD-1151-2010

learned were communicated, and verify that corrective actions have been completed.

- h. Explain the difference between the ORPS notification requirements and emergency management systems event classification and notification requirements.

37. A facility representative must demonstrate a working level knowledge of the Department's philosophy and approach to implementing integrated safety management (ISM).

Supporting Knowledge and/or Skills

- a. Using DOE M 450.4-1, *Integrated Safety Management System Manual*, review the history of ISM implementation within DOE and identify DOE's primary ISM directives and related programs.
- b. Identify the field element manager's responsibilities.
- c. Discuss what field office ISM system descriptions describe.
- d. Discuss the attributes of each of the ISM guiding principles, and the supplemental safety cultural elements.

38. A facility representative must demonstrate a familiarity level knowledge of the Department's philosophy and approach to implementing quality assurance programs.

Supporting Knowledge and/or Skills

- a. Identify the purpose and key elements of quality assurance programs.
- b. Describe performance measures for measuring the effectiveness of quality assurance programs.
- c. Contrast quality assurance and quality control.
- d. Explain the factors applicable to and methods of implementing the graded approach to quality.
- e. Explain the intent of 10 CFR 830 Subpart A, "Quality Assurance Requirements" and DOE O 414.1C, *Quality Assurance*.
- f. Describe methods for assessing the implementation of quality assurance program elements.
- g. Explain facility management's and the individual's role in quality assurance.

39. A facility representative must demonstrate a working level knowledge in the area of industrial safety programs.

Supporting Knowledge and/or Skills

- a. Identify the purpose and key elements of industrial safety programs.

DOE-STD-1151-2010

- b. Describe performance measures for measuring the effectiveness of industrial safety programs.
- c. Explain facility management's and the individual's role in industrial safety.
- d. Describe the basic requirements for the following elements of industrial safety programs:
 - Hearing protection
 - Eye protection
 - Fall protection (including scaffolding)
 - Machine guarding
 - Lockout/tagout
 - Confined spaces
 - Non-radiological respirator protection
 - Hoisting and rigging

40. A facility representative must demonstrate a working level knowledge of the authorization basis, including the documented safety analysis, technical safety requirements, and safety evaluation reports.

Supporting Knowledge and/or Skills

- a. Explain the Department of Energy's role in the oversight of the authorization basis.
- b. Explain the application of 10 CFR 830 Subpart B, "Safety Basis Requirements" and associated implementation guides and standards.
- c. Define each of the following terms and explain their relationship to each other:
 - Authorization agreement
 - Documented safety analysis (DSA)
 - Technical safety requirements (TSRs): This should include safety limits (SLs), limiting control settings (LCSs), limiting conditions for operations (LCOs), and administrative controls (specific, procedural, or key element)
 - Unreviewed safety question (USQ) process
 - Safety evaluation report (SER)
 - Safety system, structure, or component (safety SSC)
 - Defense-in-depth
- d. Using the guidance in DOE-STD-1073-2003, *Configuration Management Program*, discuss the system engineer concept as it applies to FR oversight of safety systems. Specifically address the areas of configuration management, assessment of system status and performance, relationship and interface between the safety system oversight personnel and FRs, and the technical support for operation and maintenance activities.
- e. Describe configuration control and its relationship to the authorization basis.
- f. Observe a contractor TSR surveillance activity and describe the factors to be considered as the activity is planned and performed.
- g. Conduct a facility walkthrough and identify all facility safety SSCs as well as defense-in-depth SSCs.

DOE-STD-1151-2010

- h. Discuss the purpose, scope, and application of the following DOE guides and standards:
- DOE G 421.1-2, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*
 - DOE G 423.1-1, *Implementation Guide for Use in Developing Technical Safety Requirements*
 - DOE G 424.1-1B, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements*
 - DOE-STD-1027-92 CN1, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*
 - DOE-STD-1104-2009, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*
 - DOE-STD-3009-94 CN3, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Documented Safety Analysis*

41. A facility representative must demonstrate a working level knowledge of training and qualification requirements for facility personnel.

Supporting Knowledge and/or Skills

- a. Describe the five elements of a systematic approach to training described in DOE O 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*.
- b. Discuss the relationship between training, risk, and safe facility operations.
- c. Discuss key elements of an effective on-the-job training program as are described in DOE-HDBK-1206-98, *Guide to Good Practices for On-the-Job Training*.
- d. Using guidelines provided in the applicable DOE standard or handbook as a reference, observe and evaluate a contractor training evolution (e.g., technical staff training, written or oral examination, or on-shift training):
- DOE-HDBK-1001-96, *Guide to Good Practices for Training and Qualification of Instructors*
 - DOE-HDBK-1002-96, *Guide to Good Practices for Training and Qualification of Chemical Operators*
 - DOE-HDBK-1003-96, *Guide to Good Practices for Training and Qualification of Maintenance Personnel*
 - DOE-STD-1040-93 CN1, *Guide to Good Practices for Control of On-Shift Training*
 - DOE-STD-1070-94, *Guidelines for Evaluation of Nuclear Facility Training Programs*
 - DOE-HDBK-1080-97, *Guide to Good Practices for Oral Examinations*
 - DOE-HDBK-1108-2002 CN1, *Radiological Safety Training for Accelerator Facilities*
 - DOE-HDBK-1110-2008, *ALARA Training for Technical Support Personnel*
 - DOE-HDBK-1113-2008, *Radiological Safety Training for Uranium Facilities*
 - DOE-HDBK-1115-98, *Guide to Good Practices for the Selection, Training, and Qualification of Shift Technical Advisors*
 - DOE-HDBK-1122-2009, *Radiological Control Technician Training*

DOE-STD-1151-2010

- DOE-HDBK-1130-2008, *Radiological Worker Training*
 - DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*
 - DOE-HDBK-1141-2008, *Radiological Assessor Training*
 - DOE-HDBK-1145-2008, *Radiological Safety Training for Plutonium Facilities*
 - DOE-HDBK-1203-97, *Guide to Good Practices for Training of Technical Staff and Managers*
 - DOE-HDBK-1204-97, *Guide to Good Practices for the Development of Test Items*
 - DOE-HDBK-1205-97, *Guide to Good Practices for the Design, Development, and Implementation of Examinations*
- e. Perform an assessment of one element of the contractor training program.

42. A facility representative must demonstrate a working level knowledge of conduct of operations principles and Department of Energy requirements to ensure facility operations are performed in a safe and efficient manner.

Supporting Knowledge and/or Skills

- a. Explain the Department of Energy's role in the oversight and implementation of the contractor's conduct of operations program.
- b. Describe the FR's role relative to conduct of operations at DOE facilities as is provided in DOE O 422.1, *Conduct of Operations*.
- c. Describe contractor responsibilities associated with implementing the conduct of operations at DOE facilities.
- d. Explain the general and specific requirements of conduct of operations associated with DOE O 422.1:
- Organization and administration
 - Shift routines and operating practices
 - Control area activities
 - Communications
 - Operator training
 - Investigation of abnormal events, conditions, and trends
 - Notifications
 - Control of equipment and system status
 - Lockout and tagouts
 - Independent verification
 - Logkeeping
 - Turnover and assumption of responsibilities
 - Control of interrelated processes
 - Required Reading
 - Timely instructions/orders
 - Procedures
 - Operator aid postings
 - Component labeling

DOE-STD-1151-2010

- e. Explain the relationship between the specific requirements provided in DOE O 422.1 and the associated technical standard or publication:
- DOE-STD-1032-92 CN1, *Guide to Good Practices for Operations Organization and Administration*
 - National Institute of Standards and Technology Special Publication 800-44, *Guidelines on Securing Public Web Servers*
 - DOE-STD-1041-93 CN1, *Guide to Good Practices for Shift Routines and Operating Practices*
 - DOE-STD-1042-93 CN1, *Guide to Good Practices for Control Area Activities*
 - DOE-STD-1031-92 CN1, *Guide to Good Practices for Communications*
 - DOE-STD-1040-93 CN1, *Guide to Good Practices for Control of On-Shift Training*
 - DOE-STD-1045-93 CN1, *Guide to Good Practices for Notifications and Investigation of Abnormal Events*
 - DOE-STD-1039-93 CN1, *Guide to Good Practices for Control of Equipment and System Status*
 - DOE-STD-1030-96, *Guide to Good Practices for Lockouts and Tagouts*
 - DOE-STD-1036-93 CN1, *Guide to Good Practices for Independent Verification*
 - DOE-STD-1035-93 CN1, *Guide to Good Practices for Logkeeping*
 - DOE-STD-1038-93, *Guide to Good Practices for Operations Turnover*
 - DOE-STD-1037-93 CN1, *Guide to Good Practices for Operations Aspects of Unique Processes*
 - DOE-STD-1033-92 CN1, *Guide to Good Practices for Operations and Administration Updates through Required Reading*
 - DOE-STD-1034-93 CN1, *Guide to Good Practices for Timely Orders to Operators*
 - DOE-STD-1029-92 CN1, *Writer's Guide for Technical Procedures*
 - DOE-STD-1043-93 CN1, *Guide to Good Practices for Operator Aid Postings*
 - DOE-STD-1044-93 CN1, *Guide to Good Practices for Equipment and Piping Labeling*

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DOE-STD-1151-2010

APPENDIX A CONTINUING EDUCATION, TRAINING, AND PROFICIENCY PROGRAM

The following list represents suggested continuing education, training, and other opportunities that are available for FRs after completion of the competency requirements in this FAQs. It is extremely important that FRs with this program maintain their proficiency, primarily by regularly demonstrating their competencies through on-the-job performance, supplemented with continuing education, training, reading, or other activities, such as workshops, seminars, and conferences. The list of suggested activities was developed by the subject matter experts involved in the development of the FAQs and is not all-inclusive.

Based on the knowledge and experience of the subject matter experts, it is suggested that the following activities support the maintenance of proficiency in the FR functional area after completion of the competencies in the standard and other requirements of the TQP.

LIST OF CONTINUING EDUCATION, TRAINING, AND OTHER ACTIVITIES

1. Continuing technical education and/or training covering topics directly related to the FR area as determined appropriate by management. This may include courses/training provided by DOE, other government agencies, outside vendors, or local educational institutions. Continuing training topics should also address identified weaknesses in the knowledge or skills of the individual personnel.
2. Actively perform the duties of the FR at a DOE facility in accordance with DOE-STD-1063-2006 and the office-/site-/facility-specific qualification standard and position description.
3. NNSA TQP continuing training requirements may be met by participating in the NNSA Continuing Training Program (sponsored by the Service Center).
4. Attend seminars, symposia, or technical meetings related to the FR functional area.
5. Engage in self-study of new regulations, requirements, or advances related to the FR functional area.
6. Specific continuing training requirements shall be documented in individual development plans (IDPs).

DOE-STD-1151-2010

CONCLUDING MATERIAL

Review Activity:

National Nuclear Security Administration
Office of Environmental Management
Office of Health, Safety and Security
Office of Nuclear Energy
Office of Science

Preparing Activity:

DOE-HS-21

Project Number:

TRNG-0073

Site Offices:

AMES Site Office
Argonne Site Office
Brookhaven Site Office
Carlsbad Field Office
Chicago Office
Fermi Site Office
Idaho Operations Office
Livermore Site Office
Los Alamos Site Office
Nevada Site Office
New Brunswick Laboratory
Oak Ridge Office
Office of River Protection
Pacific Northwest Site Office
Pantex Site Office
Portsmouth/Paducah Project Office
Richland Operations Office
Sandia Site Office
Savannah River Operations Office
Savannah River Site Office
SLAC Site Office
West Valley Demonstration Project
Y-12 Site Office