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DOE STANDARD

RADIATION PROTECTION 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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APPROVAL

The Federal Technical Capabilities Panel is responsible for reviewing and approving Functional Area Qualification Standards (FAQS) for Department-wide application. Approval of this FAQS from the Federal Technical Capabilities Panel is indicated by the signature below.

Gabriel Pugh Digitally signed by Gabriel Pugh
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Federal Technical Capabilities Panel

Date

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ACRONYM LIST

ALARA	As Low As Reasonably Achievable
CAM	Continuous Air Monitor
CHP	Certified Health Physicist
DOE	Department of Energy
eTQP	electronic Technical Qualification Program
DOELAP	Department of Energy Laboratory Accreditation Program
ERPP	Environmental Radiological Protection Program
eTQP	electronic Technical Qualification Program
FTCP	Federal Technical Capabilities Panel
FAQS	Functional area qualification standards
GM	Geiger-Mueller
GTB	General Technical Base
HPGe	High Purity Germanium
JTA	Job Task Analysis
LNT	Linear No-Threshold
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCNP	Monte Carlo N-Particle Transport Code
MPA	Mandatory Performance Activities
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NRRPT	National Registry of Radiation Protection Technologists
NTC	National Training Center
O	Order
ORPS	Occurrence Reporting and Processing of Operations Information
PAAA	Price Anderson Amendment Act
PCM	Personnel Contamination Monitor
PPE	Personal Protective Equipment
QO	Qualifying Official
QS	Qualification Standard
RCT	Radiological Control Technician
RGD	Radiation Generating Device
RP	Radiation Protection
RPP	Radiation Protection Program
RWP	Radiological Work Permit
SME	Subject Matter Expert
TQP	Technical Qualification Program
QO	Qualifying Official
QS	Qualification Standard

DOE-STD-1174-2024

U.S. DEPARTMENT OF ENERGY
FUNCTIONAL AREA QUALIFICATION STANDARD

Radiation Protection

PURPOSE

Functional area qualification standards (FAQSs) establish common performance competencies in key nuclear facility functional areas for personnel in the U.S. Department of Energy (DOE) Technical Qualification Program (TQP).

This FAQS establishes performance competencies to ensure designated personnel have the technical competency to perform the duties and responsibilities of radiation protection personnel.

The content of this FAQS should be referenced and used, as appropriate, to develop vacancy announcements, interview questions, and other criteria associated with the recruitment, selection, and placement of personnel assigned to this FAQS.

APPLICABILITY

The DOE Order (O) 426.1, *Federal Technical Capabilities,* requires FAQS to be developed for DOE employees whose duties and responsibilities could affect the safe operation of defense nuclear or high hazard facilities to assist DOE Program, Field Offices, and sites with implementation of their organization-specific TQP.

This FAQS establishes common performance competencies for DOE personnel who perform the duties and responsibilities of radiation protection personnel. For ease of transportability of qualifications between DOE elements, Program and Field Offices must use this FAQS without modification or addition to the competency requirements.

Satisfactory and documented attainment of the competencies in this FAQS ensures personnel possess the minimum requisite knowledge and skills to perform radiation protection personnel duties and tasks. To supplement this FAQS, DOE O 426.1 requires organization-specific qualification standards to establish unique organization (headquarters, field element, site, or facility) level competencies.

IMPLEMENTATION

This FAQS, derived from a Radiation Protection Job Task Analysis (JTA), is comprised of performance competencies based on task performances. Each performance competency includes knowledge requirements and, if necessary, Mandatory Performance Activities (MPAs). The objective of the MPA(s) is to demonstrate the competency has been met by

having the participant apply the related knowledge to satisfactorily perform the associated job task.

An evaluation guide has been developed for this FAQS detailing the expected level of knowledge required to obtain qualification and assist the qualifying officials (QOs) responsible for verifying the attainment of the knowledge. The evaluation guide is available through the National Training Center (NTC) FTCP SharePoint site at: https://ntc.doe.gov/sites/tqp/SitePages/Home.aspx.

For initial qualification, participants assigned this FAQS must demonstrate attainment of the knowledge in the “Required Performance Competencies” section.

The MPAs listed in this FAQS must be satisfactorily performed and documented once. If any of the evaluation criteria are not satisfactorily met, the designated QO may require the participant to repeat the MPA. Some MPAs may be duplicated in other qualification standards. In these cases, the designated QO must verify and document the satisfactory completion of each MPA required by the applicable standards in the eTQP.

Participants should perform the MPAs in their assigned work area(s). When participants cannot perform the MPAs as written in their assigned work area(s) or within the required qualification timeframe, supervisors may use other options to facilitate completion. These options include performance in a simulated environment or making minor accommodations to either the MPA or the evaluation criteria. Justification(s) for the accommodation(s) must be documented by the QO, with approval of the supervisor and the FTCP agent.

EVALUATION CRITERIA

Attainment of the performance competency knowledge requirements and MPAs listed in this FAQS must be documented in accordance with the qualifying organization TQP Plan (or policy) and the requirements in DOE O 426.1.

Each performance competency includes knowledge requirements and/or MPAs designed to demonstrate attainment of the competency. The QO verifies the evaluation criteria, including organization-specific requirements, were satisfactorily met during observation of the MPA and/or review of the MPA results. Attainment of competency knowledge or MPAs must be verified by a designated QO using one (or a combination) of the following methods listed in DOE O 426.1:

- Satisfactory completion of a written examination
- Satisfactory completion of an oral evaluation
- Documented evaluation of equivalencies
- Completion of approved training courses that confirm attainment of specific knowledge requirements

Satisfactory attainment of the competency knowledge requirements and MPAs contained in this FAQS must be documented in the electronic Technical Qualification Program (eTQP) at https://etqp.ntc.doe.gov.

Once performance competency knowledge requirements and MPAs in this FAQS have been attained by the participant and verified by a QO, the participant must satisfactorily complete final qualification activity requirements identified in DOE O 426.1B and/or any applicable organization-specific requirements before being designated as a qualified radiation protection worker.

INITIAL QUALIFICATION AND CONTINUING TRAINING

Appendix A, *Initial Qualification Training Recommendations*, includes a list of NTC and external training courses supporting the attainment of the required performance competencies for Radiation Protection participants.

Appendix B, *Continuing Training Recommendations*, outlines courses for radiation protection personnel participants to participate in as part of the continuing training program.

DUTIES AND RESPONSIBILITIES

The following are typical duties and responsibilities expected of radiation protection personnel:

- Analyze documents related to radiation protection.
- Monitor day-to-day program activities to support periodic contractor performance evaluations.
- Conduct oversight activities to evaluate contractor compliance with the applicable requirements and regulations.
- Provide subject-matter expertise, as requested.

Technical support duties are dependent on the organizational needs and the participant's level of subject-matter expertise and will not be addressed by the competencies in this FAQS. Position-specific duties and responsibilities for radiation protection personnel should be included in position descriptions and other qualification standards, as applicable.

BACKGROUND AND EXPERIENCE

The knowledge requirements and associated MPAs identified in the FAQS were developed based on the assumption that participants have the preferred education and experience levels identified below. Based on input from the supervisor and QO, personnel assigned to complete this FAQS may need additional developmental assignments and supporting training to satisfactorily complete this FAQS.

The preferred education and experience for radiation protection (RP) subject matter experts (SMEs) are as follows:

1. **Education**: Natural science or engineering that includes at least 30 semester hours in health physics, engineering, radiological science, chemistry, physics, biology, mathematics,

and/or calculus. An advanced technical degree and/or a professional or industry certification is considered to be an advantage.

And/or

2. **Experience**: Industrial, military, Federal, state, or other directly related background that has provided specialized experience in health physics and/or radiation protection. Specialized experience can be demonstrated through possession of the competencies outlined in this standard. Courses as shown in education above, plus appropriate experience or other education; or certification as a health physicist by the American Board of Health Physics, (or other associations such as National Registry of Radiation Protection Technologists), plus appropriate experience and other education that provided an understanding of sciences applicable to health physics comparable to that described in the education section.

REQUIRED PERFORMANCE COMPETENCIES

Each competency defines the expected level of knowledge and performance the Participant must attain. The performance competencies contained in this FAQS include additional knowledge requirements distinct from the knowledge requirements contained in the General Technical Base (GTB) Part A and B Qualification Standard (QS). Prior to (or in parallel with) initial qualification to this FAQS, participants must satisfy the requirements of the GTB Part A and GTB Part B QS.

Note 1: When regulations, DOE directives, or other industry standards are referenced in this FAQS, the most recent revision should be used. However, radiation protection personnel participants and QOs should also refer to the versions of requirements included in the local contract during qualification. Applicable knowledge requirements in predecessor documents not included in this FAQS should be included in the organization-specific QS or continuing training program.

Note 2: If specific evaluation criteria are not identified for any of the MPAs in this FAQS, the following generic evaluation criteria should be used in conjunction with local requirements:

Generic MPA Evaluation Criteria:

- Identify criteria for the specific activity.
- Compare results to the criteria and document conclusions.
- Document identified issues or recommendations.
- Discuss, if applicable, how to communicate results to appropriate Federal and/or contractor personnel.

Radiation Protection Fundamentals

1. Radiation protection personnel shall define the various types of radiation and how they interact with matter.

<u>Knowledge Requirements</u>:

A. Describe the interactions of the following with matter:
   1. Charged particle interactions –
      a. Alpha particle

   b. Beta particle (Positron annihilation and Bremsstrahlung)
2. Neutron interaction
   c. Elastic scattering
   d. Inelastic scattering
   e. Fission (capture, absorption, or activation)
3. Photon interactions
   f. Photoelectric effect
   g. Compton scattering
   h. Pair production

B. Discuss the shielding materials used for each of the above types of radiation and explain what the best materials are based on the interactions of radiation with matter.

C. Define “range” and describe the range energy relations of charged particles, including:
   1. Factors that affect the range of charged particles
   2. The relative range of alpha and beta particles in the air and tissues

D. Describe the attenuation of gamma and neutron radiation in shielding materials including:
   1. Exponential attenuation
   2. Build-up

E. Discuss radiation field characteristics for point, line, plane, and volume-distributed sources.

F. Describe the following particle ejection nuclear reactions and provide an example of each:
   1. Alpha, n
   2. Gamma, n
   3. n, Alpha

G. Define and discuss radioactivity and transformation mechanisms.
   1. Describe the following processes including any resulting product of decay:
      a. Alpha decay
      b. Beta-minus decay
      c. Beta-plus decay
      d. Electron capture
      e. Isomeric transition
      f. Internal conversion
      g. X-ray generation

H. Describe the principle of operation, proper use, placement, function, and type of radiation detected by external dosimetry.

I. Discuss the various types, methods, and processes for measuring internally deposited radionuclides.

J. Discuss various methods used to estimate worker exposure in the absence of individual monitoring results.

K. Describe the effects of radiation exposure on the cellular level including:
   1. Direct effects

2. Indirect effects

L. Describe the factors affecting radiation sensitivity of cells (i.e., The Law of Bergonie and Tribondeau).

M. Describe the acute effects and corresponding doses associated with the following:
   1. Hemopoietic syndrome (discuss blood changes as well as other symptoms)
   2. Gastrointestinal syndrome
   3. Central nervous system syndrome

N. Discuss delayed effects of radiation exposure including:
   1. Cancer induction
   2. Genetic effects
   3. Prenatal developmental effects
   4. Cataracts

O. Discuss the principles and use of radiological instrumentation and radiological monitoring/survey practices.
   1. Describe the principle of operation of gas-filled detectors.
   2. Discuss the following for gas-filled detectors:
      a. Voltage-response curve (i.e., six region curve)
      b. The three regions useful for radiation detection and measurement
      c. The sequence of events after an initial ionizing event in an ionization chamber, a proportional counter and a Geiger-Mueller counter
   3. Describe the principles of operation of liquid and crystal scintillation detectors.
   4. Describe the principles of operation and applications of semiconductor detectors (i.e., HPGe).
   5. Describe the various types and applications of spectroscopy.
   6. Discuss the purpose, principles of detection and operation, and field application of the following:
      a. Continuous air monitors (CAM)
      b. Airborne radioactivity samplers
      c. Radiation area monitors
      d. Criticality detection/alarm systems
      e. Personnel contamination monitors (PCM)
      f. Process radiation monitors
   7. Discuss the basic elements and applicable standards of a radiological instrument calibration program, including the following:
      a. Calibration source selection and traceability
      b. Source check and calibration frequency
      c. Instrument energy dependence
      d. Routine testing for operability
   8. Discuss the following concepts as they relate to radiological counting measurements:
      a. Background
      b. Critical level (Lc)
      c. Minimum detectable activity (MDA)
      d. Counting efficiency
      e. Counting uncertainties
   9. Describe various radiological situations and the use of appropriate radiological surveys including radiation, contamination, and airborne radioactivity surveys.

P. Describe internal and external radiation protection principles and control techniques.

1. Discuss how the following items affect the identification of hazards associated with radiological work activities and how they might affect the controls specified on a Radiological Work Permit (RWP):
   a. Location of the work (i.e., in a radiation, contaminated, or airborne area)
   b. System being worked on (i.e., fluid under pressure, hazardous or radioactive)
   c. Nature of the work activity (inspection, opening system, etc.)
2. Discuss special exposure control, survey and personnel monitoring techniques associated with work in the following areas or situations:
   a. Non-uniform radiation fields
   b. High radiation areas
   c. Contact work with radioactive materials/sources
3. Discuss the hierarchy of controls used to prevent uptake of radioactive material by personnel, and potential worker hazards associated with implementation of these controls.
4. For a radiological incident (i.e., spill, loss of containment), discuss the potential and magnitude of the following:
   a. Loose surface contamination levels
   b. Airborne radioactivity levels
5. Discuss appropriate personal protective equipment (including respiratory protection) for subsequent entry into and decontamination of radiological areas.

Q. Define the concept of As Low As Reasonably Achievable (ALARA).

R. Discuss the application of engineered radiological controls and facility design, including containment/confinement systems.
   1. Define containment/confinement systems.
   2. Discuss the general design and installation principles for radiation protection containment/confinement systems, including the following radiological protection considerations:
      a. Selection of materials and the associated surfaces for components used in radiological control areas
      b. Design, construction, and operation of containment/confinement systems to minimize internal radiation exposure including:
         1. Engineered ventilation
         2. Engineered containment
         3. Hot cells
         4. Radioactive liquid and solid waste processing facilities
      c. Design, construction, and operation of systems that minimize personnel external radiation exposure including shielding and interlock systems.
   3. Discuss the design and application of temporary engineered radiological controls.

S. Discuss how the linear no-threshold (LNT) Theory is used in developing current regulatory requirements.

T. Describe internal and external radiation protection principles and control techniques.

U. Discuss application of engineered radiological controls and facility design, including containment/confinement systems.
   1. Define containment/confinement systems.
   2. Discuss the general principles relating to the design and installation of radiation protection containment/confinement systems, including the following radiological protection considerations:

a. Selection of materials and the associated surfaces for components used in radiological control areas.
b. Design, construction, and operation of containment/confinement systems to minimize internal radiation exposure including:
    1. Engineered ventilation
    2. Engineered containment
    3. Hot cells
    4. Radioactive liquid and solid waste processing facilities
c. Design, construction, and operation of systems that minimize personnel external radiation exposure including shielding and interlock systems.

3. Discuss the design and application of temporary engineered radiological controls.

Requirements for Radiation Protection Programs

2. A Radiation Protection SME shall demonstrate knowledge of the requirements for radiation protection programs per 10 CFR 835, *Occupational Radiation Protection*, DOE O 458.1, *Radiation Protection of the Public and the Environment*, and other applicable orders, guides, and standards.

Knowledge Requirements:

A. Discuss 10 CFR 835 Subpart A (General Provisions):
    1. Scope (835.1)
    2. Definitions (835.2)
    3. General rules (835.3)
    4. Radiological units (835.4)

B. Discuss methods of meeting the key requirements in 10 CFR 835 Subpart B (Management and Administrative Requirements) including:
    1. Radiation Protection Program (RPP), including ALARA (835.101)
    2. Internal audits (835.102)
    3. Education, Training and Skills (835.103)
    4. Written Procedures (835.104)

C. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart C (Standards for Internal and External Exposure) including:
    1. Occupational limits for general employees (835.202)
    2. Combining internal and external doses resulting from DOE activities (835.203)
    3. Planned special exposures (835.204)
    4. Determination of compliance for non-uniform exposure of the skin (835.205)
    5. Limits for the embryo/fetus (835.206)
    6. Limits for members of the public and minors entering a controlled area (835.207, .208)
    7. Concentrations of radioactive materials in air (835.209, Appendix A, C)

D. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart E (Monitoring of Individuals and Areas), including:
    1. General monitoring requirements (835.401)
    2. Individual monitoring (835.402)
    3. Air monitoring (835.403 and Appendix A, C)
    4. Receipt of Packages containing radioactive material (835.405)

E. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart F (Entry Control Program), including:
   1. Radiological areas (835.501)
   2. High and very high radiation areas (835.502)

F. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart G (Posting and Labeling) including:
   1. General posting and labeling requirements (835.601)
   2. Controlled areas (835.602)
   3. Radiological areas and radioactive material areas (835.603)
   4. Exceptions to posting requirements (835.604)
   5. Labeling items and containers (835.605, Appendix E)
   6. Exceptions to labeling requirements (835.606, Appendix E)

G. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart H (Records), including:
   1. Individual monitoring records (835.702)
   2. Other monitoring records (835.703)
   3. Administrative records (835.704)

H. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart I, Reports to Individuals.

I. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart J, Radiation Safety Training.

J. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart K (Design and Control) including:
   1. Design and control (835.1001)
   2. Facility design and modification (835.1002)
   3. Workplace controls (835.1003)
   4. Define engineering and administrative controls and their applications

K. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart L (Radioactive Contamination Control) including any exemptions:
   1. Control of material and equipment (835.1101 and Appendix D)
   2. Control of areas (835.1102 and Appendix D)
   3. In alignment with 851 requirements, discuss protective clothing/PPE and respiratory controls. 835 Appendix A, C, and D) (10 CFR 851 reference as well)

L. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart M (Sealed Radioactive Source Control) including:
   1. Sealed radioactive source control (835.1201 and Appendix E)
   2. Accountable sealed radioactive sources (835.1202 and Appendix E)

M. Discuss methods of meeting the key requirements in 10 CFR 835, Subpart N (Emergency Exposure Situations), including:
   1. General provisions (835.1301)
   2. Emergency exposure situations (835.1302)
   3. Nuclear accident dosimetry (835.1304)

N. Discuss methods of meeting the key requirements in DOE O 458.1, including:

1. Environmental Radiological Protection Program (2.a., CRD)
2. Public dose limits (2.b., CRD)
3. ALARA (2.d., CRD)
4. Demonstrating compliance with the public dose limits (2.e., CRD)
5. Airborne radioactive effluents (2.f., CRD)
6. Control and management of radionuclides in liquid discharges (2.g., CRD)
7. Radioactive waste and spent nuclear fuel (2.h., CRD)
8. Protection of drinking water and ground water (2.i., CRD)
9. Protection of biota (2.j., CRD)
10. Records, retention and reporting requirements (2.l., CRD)

O. Discuss methods of meeting the key requirements in DOE O 458.1, Release and Clearance of Property, including:
   1. Dose constraints (2.k.(2), CRD)
   2. Process and historical knowledge (2.k.(3) and (5), CRD)
   3. Institutional controls (2.k.(4), CRD)
   4. Authorized limits (2.k.(6)(a)-(e), CRD)
   5. Pre-approved authorized limits (2.k.(6)(f), CRD)
   6. Radiological monitoring and surveys (2.k.(8), CRD)
   7. Documentation and verification (2.k.(9), CRD)
   8. Public notification of clearance of property (2.k.(10), CRD)
   9. Final clearance documentation (2.k.(11), CRD)

P. Explain how official interpretations of 10 CFR 835 and 458.1 are used to adapt the radiation protection requirements to unique conditions at DOE sites and facilities, including policy interpretation process, DOE corporate operating experience program, and policy clarification portal.

Q. Discuss the relationship of the following documents and how they're used to develop and implement local programs to meet DOE occupational radiation protection program requirements.
   1. 10 CFR 835, *Occupational Radiation Protection*
   2. DOE G 441.1-1C, *Radiation Protection Programs Guide for Use with 10 CFR 835, Occupational Radiation Protection*
   3. DOE-STD-1098, *Radiological Control*

R. Discuss the Department's guidance for the structure, function, and operation of a radiation generating device (RGD) control program as discussed in chapter 7 of DOE Programs Guide G 441.1-1C, in the section entitled “Radiation Generating Devices” (RGD).

Radiation Protection Program Evaluation and Approval

3. An RP SME shall evaluate and determine the acceptability of the contractor's radiation protection program per 10 CFR 835 and DOE O 458.1, and other supporting documentation.

Knowledge Requirements:

A. Discuss the 10 CFR 835 approval process for a documented Radiation Protection Program (RPP), including delegations and authorities.

B. Discuss the DOE O 458.1 CRD requirements for a documented program to protect the public and environment, such as Environmental Radiological Protection Program (ERPP).

C. Describe the 10 CFR 835 exemptions and/or exceptions process.

Mandatory Performance Activity (MPA)

MPA 3.1: Review either an existing contractor RPP or a new RPP submittal and recommend approval of program document(s) and document recommendation(s) to head of field element, contractor, or other in accordance with 10 CFR 835.
MPA 3.2: Review either an existing contractor ERPP (or equivalent) or a new ERPP submittal and evaluate it against the requirements of DOE O 458.1 CRD.

Radiation Protection Program Implementation

4. An RP SME shall understand the site contractor's implementation of the radiation protection program.

Knowledge Requirements:

A. Locate and discuss contractor's RP implementing documents and processes.

Mandatory Performance Activity (MPA)

MPA 4.1: Evaluate the contractor flow down of implementing documents from requirements through implementation of the specific program for at least two topical areas of RPP/ERPP requirements (such as posting/labeling, air sampling, property clearance, etc.).

Radiation Protection Program Performance: Evaluation

5. An RP SME must evaluate the performance of the radiation protection programs.

Knowledge Requirements:

A. Describe the contractor's abnormal event response process.

B. Describe how site/field office conducts contractor RPP assessments, including periodicity requirements.

Mandatory Performance Activity (MPA)

MPA 5.1: Participate in and provide a written evaluation of an RP operational awareness activity.
MPA 5.2: Conduct a contractor assurance system (CAS) evaluation within the radiation protection program based on DOE O 226.1, *Implementation of Department of Energy Oversight Policy.*
MPA 5.3: Evaluate and provide input on contractor RP periodic performance review.

1. Provide input based on oversight data analysis for a periodic contractor performance review.
2. Participate in a periodic contractor performance review.

Radiation Protection Program Performance: ALARA

6. An RP SME shall have knowledge of ALARA principles and their application to radiological work activities.

Knowledge Requirements:

A. Describe the various components of an effective ALARA program, including operations, engineering, and management controls.

B. Describe how optimization techniques, including cost-benefit analysis, are used in the ALARA process.

C. Discuss the essential elements of the job planning process and the post-job ALARA review for work performed in a radiation or radioactive contamination area.

D. Describe the various radiological performance indicators that are applicable to the ALARA process.

Mandatory Performance Activity (MPA)
MPA 6.1: Perform a review of a contractor's ALARA evaluation for a specific radiation work authorization, RPP, or equivalent, and the associated worker job performance, to determine compliance with the contractor's ALARA program.

Radiation Protection Program Additional Elements

7. An RP SME should have knowledge of additional radiation protection program elements.

Knowledge Requirements:

A. Discuss the purpose, scope, applicability to radiation protection activities, and identify site point of contact for the following:

1. Price Anderson Amendment Act (PAAA) Noncompliance Tracking System (NTS)
2. Occurrence Reporting and Processing System (ORPS) (Group 6) for contamination/radiation control
3. National Environmental Policy Act (NEPA)
4. National Emission Standards for Hazardous Air Pollutants (NESHAPS)

B. Discuss the importance of DOE O 414.1, *Quality Assurance (QA),* as implemented in the radiation protection program, including software quality assurance requirements, to ensure contractors maintain an appropriate level of QA for all tools (e.g., software, spreadsheets, etc.).

C. Discuss the purpose, scope, and applicability of the following DOE orders, standards, guides, and rules as they pertain to the RPP:

Orders:
DOE O 140.1A, *Interface with the Defense Nuclear Facilities Safety Board*
DOE O 151.1D, *Comprehensive Emergency Management System*
DOE O 153.1A, *Departmental Nuclear Emergency Support Team Capabilities*
DOE O 225.1B, *Accident Investigations*
DOE O 226.1, *Implementation of Department of Energy Oversight Policy*

DOE O 251.1D, *Departmental Directives Program*
DOE O 252.1A, *Technical Standards Program*
DOE O 410.1, *Central Technical Authority Responsibilities Regarding Nuclear Safety Requirements* (i.e., requirements of list B, role of CTA, contracts)
DOE O 414.1D, *Quality Assurance*
DOE P 420.1, *Department of Energy Nuclear Safety Policy*
DOE O 420.1C, *Facility Safety*
DOE O 420.2D, *Safety of Accelerators*
DOE O 425.1D, *Verification of Readiness to Start Up or Restart Nuclear Facilities* (i.e., Operational Readiness Review)
DOE O 435.1, *Radioactive Waste Management*
DOE M 441.1-1, *Nuclear Material Packaging*
DOE O 442.2: *Differing Professional Opinions for Technical Issues Involving ES&H Technical Concerns*
DOE O 450.2, *Integrated Safety Management*
DOE O 460.1D, *Hazardous Materials Packaging and Transportation Safety*
DOE O 460.2B, *Departmental Materials Transportation Management*
DOE O 461.1C, *Packaging and Transportation for Offsite Shipment of Materials of National Security Interest*

Guides:
DOE G 441.1-1C, section entitled “Radiation Generating Devices.”
International Commission on Radiological Protection (ICRP)
National Council on Radiation Protection and Measurements (NCRP)

Standards:
DOE-STD-1027, *Hazard Categorization of DOE Nuclear Facilities*
DOE-STD-1083, *Processing Exemptions to Nuclear Safety Rules and Approval of Alternative Methods for Documented Safety Analyses*
DOE-STD-1095, *DOELAP for Personnel Dosimetry*
DOE-STD-1098, *Radiological Control*
DOE-STD-1104, *Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents*
DOE-STD-1111, *DOELAP Administration*
DOE-STD-1112, *DOELAP for Radiobioassay*
DOE-STD-1121, *Internal Dosimetry*
DOE-HDBK-1122, *RCT Training*
DOE-STD-1128, *Good Practices for Plutonium Facilities*
DOE-STD-1129, *Tritium Handling and Safe Storage*
DOE-HDBK-1130, *Radiological Worker Training*
DOE-STD-1136, *Good Practices for Occupational Radiological Protection in Uranium Facilities*
DOE-STD-1153, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*
DOE-STD-1196, *Derived Concentration Technical Standard*
DOE-HDBK-1215, *Optimizing Radiation Protection of the Public and the Environment For Use With DOE O 458.1, ALARA Requirements*
DOE-HDBK-1216, *Environmental Radiological Effluent Monitoring and Environmental Surveillance*
DOE-STD-1241, *Implementing Release and Clearance of Property Requirements*
DOE-STD-3006, *Planning and Conducting Readiness Reviews*

DOE-STD-3009, *Preparation of Nonreactor Nuclear Facility Documented Safety Analysis, Chapter 7*
DOE-HDBK-3010, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*
DOE-STD-6004, *Clearance and Release of Personal Property from Accelerator Facilities*

Other:
40 CFR Part 61, Subpart H: NESHAPS
10 CFR 820: procedural rules for nuclear activities
49 CFR 172, 173: applicable sections related to shipments of radioactive materials

D. Discuss RP communities of practice and internal and external resources available.

APPENDIX A

INITIAL QUALIFICATION TRAINING RECOMMENDATIONS

Technical education and/or training may include courses/training provided by the Department of Energy, other government agencies, outside vendors, or local educational institutions. Training topics should also address identified weaknesses in the knowledge and/or skills of the individual personnel and current technical issues related to the associated FAQS.

Table 1: Initial Qualification Training Recommendations

Performance competency category	***Training Opportunity***
Radiation Protection Fundamentals	• Fundamental Radiation Worker training at site • Radiation Control Technician Academics • 4-week course at Oak Ridge Institute of Science and Education (ORISE) applied health physics

APPENDIX B

CONTINUING TRAINING RECOMMENDATIONS

Radiation Protection personnel shall participate in a continuing training and qualification program that includes the following elements:

1. Continuing technical education and/or training covering topics directly related to radiation protection 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 individual personnel.

2. Specific continuing training requirements shall be documented in individual development plans.

Continuing Training Recommendations:

- Participation in professional societies such as:
  - Health Physics Society
  - American Board of Health Physics
  - National Registry of RP Technologists.
- Maintenance of profession credentials (e.g., Certified Health Physicist (CHP), National Registry of Radiation Protection Technologists (NRRPT)
- Training in specific technical subfields as appropriate to site concerns or SME interest, such as the following:
  - Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)
  - Monte Carlo N-Particle Transport Code (MCNP)
  - Internal Dosimetry
  - NRC Class 7 Radioactive Material Shipping
- Participate in radiological reviews periodically at other sites. Those can be excellent continuing training opportunities. (Functional Area assessments or reviews, Federal Readiness Assessments, CDNS Biennial Reviews, etc.)

Training Opportunities
Continue professional certifications
Health Physics Society annual meeting
4-week course at Oak Ridge Institute of Science and Education (ORISE) applied health physics
DOE Operational Health Physics Training book: https://inis.iaea.org/collection/NCLCollectionStore/_Public/20/033/20033531.pdf
Nuclear Regulatory Commission provided training: https://scp.nrc.gov/training.html

- Introductory Health Physics Self-Study Course (H-117S)
- Environmental Monitoring and Air Sampling for Radioactivity Self-Study Course (H-130S)
- Advanced Health Physics (H-201)
- NRC class 7 shipping training
- Transportation of Radioactive Materials (H-308S)
- Internal Dosimetry (H-312S)
- MARSSIM: Multi-Agency Radiation Survey and Site Investigation (H-121S)
- MARSAME: Multi-Agency Radiation Survey and Assessment of Materials and Equipment (H120S)

CONCLUDING MATERIAL

Review Activity:
EM
NA
NE
SC
EA

Preparing Activity:
EA-50

Project Number:
DOE-STD-1174-2024

Field and Operations Offices:
CBFO
CH
EM
EM-LA
EMCBC
EMHQ
ID
OH
OR
ORP
RL
SR

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