



**NOT MEASUREMENT
SENSITIVE**

**DOE-STD-1181-2004
March 2004**

DOE STANDARD FACILITY MAINTENANCE MANAGEMENT FUNCTIONAL AREA QUALIFICATION STANDARD

DOE Defense Nuclear Facilities Technical Personnel



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

AREA TRNG

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

DOE-STD-1181-2004

This document has been reproduced directly from the best available copy.

Available to DOE and DOE contractors from ES&H Technical Information Services, U.S. Department of Energy, (800) 473-4375, fax: (301) 903-9823.

Available to the public from the U.S. Department of Commerce, Technology Administration, National Technical Information Service, Springfield, VA 22161; (703) 605-6000.

DOE-STD-1181-2004

APPROVAL

The Federal Technical Capability Panel consists of senior U.S. Department of Energy 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.


Roy J. Schepens
Chairman
Federal Technical Capability Panel

INTENTIONALLY BLANK

DOE-STD-1181-2004

TABLE OF CONTENTS

ACKNOWLEDGMENT	vi
PURPOSE	1
APPLICABILITY	1
IMPLEMENTATION.....	1
EVALUATION REQUIREMENTS	2
REQUALIFICATION, PROFICIENCY, AND CONTINUING TRAINING.....	3
DUTIES AND RESPONSIBILITIES.....	3
EDUCATION AND EXPERIENCE.....	4
REQUIRED TECHNICAL COMPETENCIES.....	4
APPENDIX A, CONTINUING TRAINING AND PROFICIENCY REQUIREMENTS.....	25

DOE-STD-1181-2004

INTENTIONALLY BLANK

DOE-STD-1181-2004

ACKNOWLEDGMENT

The Administrator for the National Nuclear Security Administration (NNSA) is the Sponsor for the Facility Maintenance Management Qualification Standard. The Sponsor is responsible for coordinating the development and/or review of the Functional Area Qualification Standard 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 Facility Maintenance Management Program. The Sponsor, in coordination with the Federal Technical Capability Panel, is also responsible for ensuring that the Functional Area Qualification Standard is maintained current.

The following subject matter experts (SMEs) participated in the development and/or review of this Qualification Standard:

Kenneth Guay
Mark Sundie

Y-12 Site Office, NNSA (Team Leader)
YSO

INTENTIONALLY BLANK

**U.S. DEPARTMENT OF ENERGY
FUNCTIONAL AREA QUALIFICATION STANDARD**

Facility Maintenance Management

PURPOSE

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

The Technical Qualification Standards are not intended to replace the OPM Qualifications Standards nor other Departmental personnel standards, rules, plans, or processes. The primary purpose of the Technical Qualification Program is to ensure that employees have the requisite technical competency to support the mission of the Department. The Technical Qualification Program forms the basis for the development and assignment of DOE personnel responsible for ensuring the safe operation of defense nuclear facilities.

APPLICABILITY

The Facility Maintenance Management Functional Area Qualification Standard establishes common functional area competency requirements for Department of Energy personnel who provide assistance, direction, guidance, oversight, or evaluation of contractor technical activities that could impact the safe operation of DOE's defense nuclear facilities. The technical Functional Area Qualification Standard has been developed as a tool to assist DOE Program and Field offices in the development and implementation of the Technical Qualification Program in their organization. For ease of transportability of qualifications between DOE elements, Program and Field offices are expected to use this technical Functional Area Qualification Standard without modification or additions. Needed additional office/site/facility specific technical competencies should be handled separately. Satisfactory and documented attainment of the competency requirements contained in this technical Functional Area Qualification Standard ensures that personnel possess the requisite competence to fulfill their functional area duties and responsibilities. Office/Facility-Specific Qualification Standards supplement this technical Functional Area Qualification Standard and establish unique operational competency requirements at the Headquarters or Field element, site, or facility level.

IMPLEMENTATION

This technical Functional Area Qualification Standard identifies the minimum technical competency requirements for Department of Energy personnel. Although there are other competency requirements associated with the positions held by DOE personnel, this Functional Area

DOE-STD-1181-2004

Qualification Standard is limited to identifying the specific technical competencies. The competency statements define the expected knowledge and/or skill that an individual must meet. Each of the competency statements is further explained by a listing of supporting knowledge and/or skill statements.

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

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

Working level is defined as the knowledge required to monitor and assess operations/activities, to apply standards of acceptable performance, and to reference appropriate materials and/or expert advice as required to ensure the safety of Departmental activities.

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

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

Headquarters and Field elements shall establish a program and process to ensure that DOE personnel possess the competencies required of their position. That includes the competencies identified in this technical Functional Area Qualification Standard. Documentation of the completion of the requirements of the Standard shall be included in the employee's training and qualification record.

Equivalencies should be used sparingly and with the utmost rigor and scrutiny to maintain the spirit and intent of the TQP. Equivalencies may be granted for individual competencies based upon objective evidence of previous education, training, certification, or experience. Objective evidence includes a combination of transcripts, certifications, and, in some cases, a knowledge sampling through a written and/or oral examination. Equivalencies shall be granted in accordance with the Technical Qualification Program Plan of the office qualifying the individual. The supporting knowledge and/or skill statements, while not requirements, should be considered before granting equivalency for a competency.

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

EVALUATION REQUIREMENTS

Attainment of the competencies listed in this technical Functional Area Qualification Standard should be documented by a qualifying official, immediate supervisor, or the team leader of personnel in accordance with the Technical Qualification Program Plan of the office qualifying the individual.

DOE-STD-1181-2004

REQUALIFICATION, PROFICIENCY, AND CONTINUING TRAINING

DOE personnel shall participate in continuing education and training as necessary to improve their performance and proficiency and ensure that they stay up-to-date on changing technology and new requirements. This may include courses and/or training provided by:

- Department of Energy
- Other government agencies
- Outside vendors
- Educational institutions

Beyond formal classroom or computer based courses, continuing training may include:

- Self Study
- Attendance at symposia, seminars, exhibitions
- Special assignments
- On-the-job experience

A description of suggested learning proficiency activities and the requirements for the continuing education and training program for Facility Maintenance Management personnel are included in Appendix A of this document.

DUTIES AND RESPONSIBILITIES

The following are the typical duties and responsibilities expected of personnel assigned to the Facility Maintenance Management Functional Area:

1. Ensuring that sufficient resources are budgeted in a timely manner to accomplish the maintenance program's objective of providing DOE with the highest confidence in the reliable performance of structures, systems and components important to safety through proactive maintenance practices.
2. Ensuring that a cost-effective and efficient maintenance program is developed and implemented for all DOE property that is consistent with DOE's mission, safety and health, reliability, quality, and environmental protection objectives.
3. Ensuring that the responsibility, authority, and accountability for maintenance are clearly defined, appropriately assigned and executed.
4. Ensuring that DOE operational awareness review and analysis capability exists for evaluation of maintenance program performance and effectiveness.
5. Ensuring that where maintenance requirements or accepted maintenance standards cannot be met, such instances are appropriately documented and acknowledged by DOE field elements including the granting of exemptions by DOE, as appropriate, when requested.
6. Ensuring that the requirements and standards for maintenance of nuclear facilities are incorporated into contracts and subcontracts, including support services contracts, as appropriate.
7. Ensuring resources must be effectively allocated to address safety, programmatic, and operational considerations. Protecting the public, the workers, and the environment must

DOE-STD-1181-2004

be a priority whenever activities are planned or performed.

Position-specific duties and responsibilities for Facility Maintenance Management personnel are contained in their Office/Facility-Specific Qualification Standard or Position Description.

EDUCATION AND EXPERIENCE

The U. S. Office of Personnel Management's Qualification Standards Handbook establishes minimum education, training, experience, or other relevant requirements applicable to a particular occupational series/grade level, as well as alternatives to meeting specified requirements.

The preferred education and experience for Facility Maintenance Management personnel is:

1. Education:

Bachelor of Science degree in engineering or a related physical science degree from an accredited institution or meet the alternative requirements specified in the Qualification Standard Handbook for the GS-0800 Professional Engineering Series. Facility Maintenance Management personnel should fulfill the educational requirements and the experience requirements.

2. Experience:

Industrial, military, Federal, State, or other directly related background that has provided specialized experience in Facility Maintenance Management. Specialized experience can be demonstrated through possession of the competencies outlined in this Standard.

REQUIRED TECHNICAL COMPETENCIES

The competencies contained in this Standard are distinct from those competencies contained in the General Technical Base Qualification Standard. All Facility Maintenance Management personnel must satisfy the competency requirements of the General Technical Base Qualification Standard prior to or in parallel with the competency requirements contained in this Standard. Each of the competency statements defines the level of expected knowledge and or skill that an individual must possess to meet the intent of this Standard. The supporting knowledge and/or skill statements further describe the intent of the competency statements.

Note: When regulations, Department of Energy directives, or other industry standards are referenced in the Qualification Standard, the most recent revision should be used.

GENERAL TECHNICAL

1. **Facility maintenance management personnel shall demonstrate a working level knowledge of the guidelines for maintaining maintenance facilities, equipment, and tools.**

Supporting Knowledge and/or Skills

- a. Discuss the importance of maintaining proper maintenance facilities.
- b. Describe the criteria used when designing the layout of a shop or satellite work area.

DOE-STD-1181-2004

- c. Discuss when temporary facilities are used, the factors to consider when approving, purchasing, designing and locating temporary facilities.
- d. Discuss the reasons for segregating tools, supplies and parts.
- e. Discuss the use of contaminated tools versus clean tools.
- f. Discuss the concerns affecting the selection and state of readiness of maintenance facilities.
- g. Describe the objective of maintenance facilities.
- h. Describe the types and levels of environmental controls and services included in shops and satellite work areas.
- i. Discuss the elements to consider when planning for the identification and use of maintenance laydown and staging areas.
- j. Discuss the issues addressed when determining storage facility needs.
- k. Discuss the requirements for storing, issuing, and maintenance of tools and equipment.
- l. Describe the requirements for office equipment to support the maintenance organization.
- m. Discuss the criteria of a program for the development of new or special tools and equipment.
- n. Discuss Suspect/Counterfeit Item (S/CI) controls and applicability to maintenance.

2. Facility maintenance management personnel shall demonstrate a working level knowledge of the application of the different types of maintenance.

Supporting Knowledge and/or Skills

- a. Discuss and compare the following:
 - Corrective maintenance
 - Preventive maintenance
 - Predictive maintenance
- b. Describe the purpose, use, and content of a master equipment list.
- c. Discuss the role of the types of maintenance in an effective and efficient maintenance program.
- d. Discuss the relationship between predictive maintenance and technical safety requirements.
- e. Discuss the importance of maintaining a proper balance of preventive, predictive, and corrective maintenance.
- f. Discuss the elements needed to successfully implement a maintenance program that balances the three types of maintenance.

DOE-STD-1181-2004

- g. Describe the relationship in scheduling between preventive and predictive maintenance.
- h. Discuss the relationship between the results of predictive maintenance and preventive maintenance.
- i. Discuss the considerations used when determining maintenance actions and their frequencies.
- j. Define the term "life limiting component" and its impact on facility operation.

3. Facility maintenance management personnel shall demonstrate a working level knowledge of the documentation used for controlling maintenance.

Supporting Knowledge and/or Skills

- a. Discuss the purpose, use, and content of a work package.
- b. Discuss the purpose, use, and contents of maintenance procedures including the following considerations:
 - Development, including human factor considerations
 - Verification
 - Validation
 - Approval
 - Actions taken when procedures cannot be followed as written or when unexpected results occur
- c. Discuss the considerations for developing maintenance procedures.
- d. Describe the control, review, and revision of maintenance procedures.
- e. Discuss the minimum items addressed in effective work control procedures.

4. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements for controlling maintenance activities.

Supporting Knowledge and/or Skills

- a. Discuss the elements of an effective work control program, including the following:
 - Adherence to facility procedures, practices, and policies
 - Work control procedures
 - Work requests
 - Review of completed work requests
 - Control of temporary repairs
 - Control of non-facility contractor and sub-contractor personnel
 - Work site cleanliness
 - Job briefings
 - Control of troubleshooting
 - Tagout/lockouts, radiological work permits, confined space permits
 - Independent verification requirements
 - Maintenance problem identification, correction, and evaluation
 - Deficiency identification and correction
 - Response to abnormal maintenance conditions

DOE-STD-1181-2004

- Configuration control
 - Work authorization to start and conduct work
 - Control of work conducted under emergency conditions
- b. Describe the maintenance supervisor's role and responsibilities in the supervision of maintenance activities and review of completed work requests.

5. Facility maintenance management personnel shall demonstrate a working level knowledge of planning, scheduling, and coordination of maintenance activities.

Supporting Knowledge and/or Skills

- a. Discuss the importance of planning, scheduling, and coordinating maintenance activities and the factors to be considered in scheduling maintenance work.
- b. Discuss the prioritization of maintenance activities.
- c. Describe the elements of a priority system used for maintenance planning.
- d. Define backlog.
- e. Discuss the use of backlog as a management tool (mission, goals, budget, and staff).
- f. Describe the elements of a system used to manage the maintenance backlog.
- g. Understand and describe the relationship between operations and maintenance organizations. Include a discussion on resource and time requirements.
- h. Discuss the role of planning meetings to coordinate activities.
- i. Describe the importance of pre-briefings and what should be included in a pre-brief.
- j. Discuss the relationship between normal maintenance and outage maintenance.
- k. Discuss the requirements for scheduling and coordinating planned outages.
- l. Discuss the requirements for scheduling and coordinating forced outages or other limitations to facility operations.

6. Facility maintenance management personnel shall demonstrate a working level knowledge of industrial property management practices as related to stores, spare parts, and essential materials.

Supporting Knowledge and/or Skills

- a. Discuss how component availability impacts plant reliability and safety.
- b. Discuss the concerns related to maintaining inventory of critical components that affect limiting conditions of operations.
- c. Describe the following terms as they relate to procurement:
 - Just-in-time
 - Shelf life
 - Long lead time

DOE-STD-1181-2004

- d. Describe the Department's procurement process.
- e. Describe controls that should be developed and maintained throughout the procurement process.
- f. Discuss S/CI concerns, issues, and controls.

7. Facility maintenance management personnel shall demonstrate a working level knowledge of the control and calibration of measuring and test equipment.

Supporting Knowledge and/or Skills

- a. Discuss the elements that are included in a comprehensive measuring and test equipment program.
- b. Describe the guidelines for the identification of measuring and test equipment.
- c. Discuss the following aspects of calibration as they relate to measuring and test equipment:
 - Calibration standards
 - Calibration procedures
 - Calibration frequency
 - Functional checks
- d. Describe the four-to-one rule as it relates to the accuracy of calibrating instrumentation.
- e. Discuss the requirements for the control of measuring and test equipment.
- f. Discuss the storage, segregation, and labeling of measuring and test equipment.
- g. Describe the methods used for resolving out-of-calibration equipment.
- h. Discuss the issuance and recall of measuring and test equipment.
- i. Describe the actions taken for contaminated measuring and test equipment.
- j. Discuss the guidelines for the evaluation of measuring and test equipment.

8. Facility maintenance management personnel shall demonstrate a working level knowledge of modification work.

Supporting Knowledge and/or Skills

- a. Describe the difference between temporary and permanent repairs/work.
- b. Discuss the restrictions associated with temporary modifications.
- c. Explain who can authorize temporary modifications.
- d. Describe the process for temporary modifications.
- e. Discuss the requirements and controls in place to prevent unapproved modifications.

DOE-STD-1181-2004

- 9. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements of post-maintenance testing.**

Supporting Knowledge and/or Skills

- a. Discuss the importance of post-maintenance testing.
- b. Describe the elements of an effective post-maintenance testing program.
- c. Describe the scope, such as equipment, systems, or activities, of a post-maintenance testing program.
- d. Describe the control of a post-maintenance testing program.
- e. Discuss the requirements of test performance, documentation, and acceptance of post-maintenance testing.

- 10. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements for material receipt, inspection, handling, storage, retrieval, and issuance.**

Supporting Knowledge and/or Skills

- a. Discuss the requirements for the receipt and inspection of parts, materials, and equipment.
- b. Discuss the requirements for establishing a procedure for items requiring special handling instructions.
- c. Discuss the requirements for storing material and equipment.
- d. Describe examples of items that should be observed and corrected during periodic general inspections of stores.
- e. Discuss the requirements for retrieving and issuing of parts, materials, or equipment.
- f. Discuss S/CI concerns and safety impacts.
- g. Discuss the requirements to specify material inspection and verification.
- h. Describe field inspection techniques available to verify the adequacy of parts.

- 11. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements of maintenance tools and equipment control.**

Supporting Knowledge and/or Skills

- a. Discuss the criteria of a program for the development of new or special tools and equipment.
- b. Discuss the guidelines for storing and issuing maintenance tools and equipment.
- c. Discuss the guidelines for tool and equipment maintenance.

- 12. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements for facility condition inspections.**

DOE-STD-1181-2004

Supporting Knowledge and/or Skills

- a. Explain the purpose of a Facility Condition and Housekeeping Program.
- b. Discuss the elements of an effective inspection program.
- c. Describe indicators of good facility conditions and housekeeping standards.
- d. Discuss the elements of an effective procedure addressing facility condition inspections.
- e. Describe the importance of training personnel in inspection techniques.
- f. Describe the elements of routine inspections.
- g. Discuss the requirements for reporting deficiencies and deficiency follow-up.

13. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements for management involvement.

Supporting Knowledge and/or Skills

- a. Discuss the importance of management's involvement in maintenance.
- b. Discuss the role and responsibilities of maintenance managers.
- c. Discuss the guidelines for management involvement, objective results, and feedback in relation to a maintenance program.
- d. Discuss the elements of a maintenance program evaluation.

14. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements of maintenance history and configuration control.

Supporting Knowledge and/or Skills

- a. Discuss the importance of maintaining a maintenance history.
- b. Describe the guidelines for the following elements of a maintenance history program development:
 - Equipment identification
 - Data identification
- c. Describe the guidelines for data collection.
- d. Discuss common uses of a maintenance history.
- e. Describe configuration control and its relationship to the maintenance work control process and the maintenance history file.
- f. Discuss the process by which new equipment is incorporated into maintenance history

DOE-STD-1181-2004

15. **Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the principles and concepts of natural phenomena hazards and their effect on systems and structures.**

Supporting Knowledge and/or Skills

- a. Discuss the potential impact on systems and structures at defense nuclear facilities from the following natural hazards:
 - Flooding
 - Wind
 - Tornado
 - Earthquake and/or other seismic events
 - Fire
 - Lightning
- b. Briefly describe the safety measures and design features commonly used as safeguards against natural hazards.

DOCUMENTATION AND REGULATIONS

16. **Facility maintenance management personnel shall demonstrate a working level knowledge of the Department of Energy's requirements for facility maintenance management as outlined in DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities.**

Supporting Knowledge and/or Skills

- a. Explain the Department of Energy's role in the oversight of contractor maintenance operations.
- b. Explain the intent of DOE Order 433.1, Maintenance Management Program.
- c. Discuss the Department's policy and objectives for maintenance management.
- d. Describe responsibilities and authorities for maintenance management programs.
- e. Describe the purpose, scope and requirements of Maintenance Implementation Plans (MIPs).
- f. Describe the provisions to allow nuclear facility program elements to include non-nuclear equipment.
- g. Discuss the requirements for the control of Management & Operating (M&O) contractor and subcontractor personnel.
- h. Describe the relationship between 10CFR830.120, DOE Order 5700.6C Chg 1, Quality Assurance, and DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities, in relation to work processes and maintenance activities.
- i. Describe the relationship between DOE Order 430.1B, Real Property Asset Management, and DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities, in relation to condition assessment surveys.

DOE-STD-1181-2004

- j. Describe the relationship between DOE Order 4320.1B Chg 1, Site Development Planning and DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities.
 - k. Describe the relationship between DOE Order 4330.2D, In-House Energy Management, and DOE Order 433.1, Maintenance Management Program.
 - l. Describe maintenance backlog work and identify criteria used to establish a proper magnitude of maintenance backlog.
 - m. Discuss the graded approach process by which Department line management determines an appropriate level of coverage by facility maintenance management personnel. Include in this discussion factors that may influence the level of coverage.
- 17. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the requirements for training and qualification program as identified in the following Department of Energy (DOE) Orders:**
- **DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities**
 - **DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities**

Supporting Knowledge and/or Skills

- a. Discuss the meaning of qualification and its importance to maintenance personnel.
- b. Describe the purpose and scope of DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities.
- c. Discuss why certain skills or proficiencies should be demonstrated periodically by maintenance personnel.
- d. Using DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities as a reference, describe the general requirements to which a Management and Operating (M&O) contractor is held at Category 1, 2, and 3 facilities in the following areas:
 - Qualification and certification of maintenance personnel
 - Training and qualification of sub-contractors
 - Continuing training and requalification of maintenance personnel
 - Exceptions and alternatives to requirements of DOE Order 5480.20A for maintenance personnel
 - Maintenance Personnel selection
- e. Using DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities as a reference, state the entry level requirements for various facility positions.
- f. Describe the purpose and scope of Chapter II, Section 3, of DOE Order 433.1, Training and Qualification of Maintenance Personnel.
- g. Discuss the responsibility of the maintenance organization in the training and qualification of their personnel.

DOE-STD-1181-2004

- h. Discuss the requirements of Chapter II, Section 3, DOE Order 433.1, Training and Qualification of Maintenance Personnel, regarding training facilities.
- i. Describe the elements of an effective on-the-job training program.
- j. Discuss the maintenance manager's responsibilities in the approval, effectiveness, and feedback cycles of the maintenance training program.

18. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the facility maintenance management-related sections and/or requirements of the following related Department of Energy (DOE) Orders:

- DOE Order 430.1B, Real Property Asset Management
- DOE Order 5480.4 Chg 4, Environmental Protection, Safety, and Health Protection Standards
- DOE Order 5480.10, Contractor Industrial Hygiene Program
- DOE Order 5480.11, Radiation Protection for Occupational Workers
- DOE Order 5483.1A, Occupational Safety and Health Program for DOE Contractor Employees at Government-Owned Contractor-Operated Facilities
- DOE Order 6430.1A, General Design Criteria
- DOE O 440.1A, Worker Protection Management for DOE Federal and Contractor Employees
- DOE G 440.1-6, Implementation Guide for Use with Suspect/Counterfeit Items Requirements of DOE O 440.1

Supporting Knowledge and/or Skills

- a. Describe the purpose, scope, and application of the requirements detailed in the Orders above listed.
- b. Discuss the impact and/or relationship of the Orders listed above to the facility maintenance management functional area.

19. Facility maintenance management personnel shall demonstrate a working level knowledge of the following maintenance management-related Department of Energy Technical Standard and Maintenance Management Program Guide:

- DOE-STD-1150-2002, Quality Assurance Functional Area Qualification Standard
- DOE G 433.1-1, Nuclear Facility Maintenance Management Program Guide for Use with DOE O 433.1

Supporting Knowledge and/or Skills

- a. Describe the purpose, scope, and application of the requirements detailed in the Technical Standards listed above.
- b. Discuss the impact and/or relationship of the above referenced Technical Standards to the facility maintenance management functional area.

20. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the Department of Energy, DOE Order 231.1A, Environment, Safety and Health Reporting

Supporting Knowledge and/or Skills

DOE-STD-1181-2004

- a. State the purpose of DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information.
 - b. Define the following terms:
 - Event
 - Condition
 - Facility
 - Notification report
 - Occurrence report
 - Reportable occurrence
 - c. Discuss the Department's policy regarding the reporting of occurrences as outlined in the DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information.
 - d. State the different categories of reportable occurrences and discuss each.
 - e. Discuss the role of facility maintenance personnel in maintenance-related reportable occurrences.
- 21. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of DOE Order 414.1A Chg 1, Quality Assurance, as it pertains to facility maintenance.**
- **10CFR830 Subpart A, Quality Assurance Requirements**
- Supporting Knowledge and/or Skills
- a. Describe the types of documents related to facility maintenance that should be controlled by a document control system.
 - b. Discuss the requirements for revision and distribution of controlled documents.
 - c. Discuss the determination of calibration frequency for measurement and test equipment.
 - d. Describe the effect of using inappropriate calibration standards on test equipment.
 - e. Discuss the key elements of the procurement process for facility maintenance as described in DOE Order 5700.6C, Quality Assurance.
- 22. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of 10 CFR 830.203, Unreviewed Safety Question Process.**
- Supporting Knowledge and/or Skills
- a. Discuss the reasons for performing an Unreviewed Safety Question determination.
 - b. Define the following terms:
 - Accident Analyses
 - Safety Evaluation
 - Technical Safety Requirements

DOE-STD-1181-2004

- c. Describe the situations in which a safety evaluation is required to be performed.
- d. Define the conditions for an Unreviewed Safety Question.
- e. Describe the responsibilities of contractors authorized to operate defense nuclear facilities regarding the performance of safety evaluations.
- f. Describe the actions to be taken by a contractor upon identifying information that indicates a potential inadequacy of previous safety analyses or a possible reduction in the margin of safety as defined in the Technical Safety Requirements.

23. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the Technical Safety Requirements as described in 10 CFR 830.205, Technical Safety Requirements.

Supporting Knowledge and/or Skills

- a. Discuss the purpose of the Technical Safety Requirements.
- b. Describe the responsibilities of contractors authorized to operate defense nuclear facilities regarding the Technical Safety Requirements.
- c. Define the following terms and discuss the purpose of each:
 - Safety limit
 - Limiting control settings
 - Limiting conditions for operation
 - Surveillance requirements
- d. Describe the general content of each of the following sections of the Technical Safety Requirements:
 - Use and application
 - Safety limits
 - Operating limits
 - Surveillance requirements
 - Administrative controls
 - Basis
 - Design features

24. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of Nuclear Safety Analysis Reports as described in 10 CFR 830.204, Documented Safety Analysis Reports.

Supporting Knowledge and/or Skills

- a. Discuss the basic purposes and objectives of Nuclear Safety Analysis Reports.
- b. Describe the responsibilities of contractors authorized to operate defense nuclear facilities regarding the development and maintenance of a Nuclear Safety Analysis Report.
- c. Define the following terms and discuss the purpose of each:
 - Design basis
 - Authorization basis

DOE-STD-1181-2004

- Engineer safety features
 - Safety analysis
- d. Describe the requirements for the scope and content of a Nuclear Safety Analysis Report and discuss the general content of each of the required sections of a Nuclear Safety Analysis Report.
- e. Discuss the ways that contractor management makes use of Nuclear Safety Analysis Reports.

25. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of Department of Energy Technical Standard DOE-STD-1073-93, Configuration Management.

Supporting Knowledge and/or Skills

- a. Describe the purpose and objectives of the Operational Configuration Management Program.
- b. Discuss what constitutes acceptable contractor compliance consistent with the requirements of DOE-STD-1073-93, Configuration Management, for the following elements of the contractor's Configuration Management Plan:
- Program planning
 - Equipment scope criteria
 - Concepts and terminology
 - Interfaces
 - Databases
 - Procedures
- c. Discuss the following elements of the Configuration Management Program:
- Design requirements
 - Document control
 - Change control
 - Assessments
 - Design reconstitution adjunct
 - Material condition and aging adjunct
- d. Discuss the purpose, concepts, and general process for applying the graded approach to operational configuration management.

26. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets.

Supporting Knowledge and/or Skills

- a. Discuss the purpose, scope, and application of DOE Order 4700.1, Project Management System. Include in this discussion the key terms, essential elements, and personnel responsibilities and authorities.
- b. Discuss the project management terminology for which definitions are provided in DOE Order 4700.1.

DOE-STD-1181-2004

- c. Discuss in detail the roles played by various management levels within the Department as they relate to the project management system.
- d. Discuss the purpose of "critical decisions." Include in this discussion the responsible authorities for critical decisions.
- e. Describe the process by which projects are designated.

27. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the following Department of Energy Technical Standards and Order related to natural phenomena hazards:

- **DOE-STD-1020-2002, Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities**
- **DOE-STD-1021-93, Natural Phenomena Hazards Performance Categorization Guidelines for Structures, Systems, and Components**
- **DOE-STD-1022-94, Natural Phenomena Hazards Characterization Criteria**
- **DOE Order 5480.28, Natural Phenomena Hazards Mitigation**

Supporting Knowledge and/or Skills

- a. Describe the purpose, scope, and application of the requirements detailed in the listed Standards and Order.
- b. Discuss the graded approach process that Department line management uses to determine an appropriate level of coverage by facility maintenance systems personnel. Include in this discussion the factors that may influence the level of coverage.
- c. Determine contractor compliance with the listed documents as they apply to contract design requirements and facility maintenance management system activities at a defense nuclear facility.

ADMINISTRATIVE

28. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of methods to maintain communication with Headquarters, Field elements, and the public.

Supporting Knowledge and/or Skills

- a. Describe the Department's organization and discuss the procedures for communicating between elements.
- b. Describe the Department's procedures and policy for communicating with the Environmental Protection Agency and other regulatory agencies.

29. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of facility maintenance management-related data management requirements.

Supporting Knowledge and/or Skills

- a. Describe the local file plan and procedure and the authorized disposition requirements for facility maintenance management-related records contained in DOE Order 1324.2A Chg 1, Records Disposition.

DOE-STD-1181-2004

- b. Describe the reporting requirements for occurrence reports categorized as Personnel Safety and Health Occurrence Reports per DOE Manual 231.1-2, Occurrence Reporting and Processing of Operations Information.
- c. Describe the reporting requirements outlined in DOE Order 231.1A , Environment, Safety and Health Reporting.
- d. Discuss the recordkeeping requirements of DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities.

30. Facility maintenance management personnel shall demonstrate a working level knowledge of contractor and Department organization and structure as they relate to maintenance management responsibilities and authority.

Supporting Knowledge and/or Skills

- a. Define the maintenance organizational structure.
- b. Describe the responsibilities of individuals in the organization and their authority.
- c. Describe the relationship and interface of the maintenance organization with other organizational structures.

MANAGEMENT, ASSESSMENT, AND OVERSIGHT

31. Facility maintenance management personnel shall demonstrate a working level knowledge of assessment techniques (such as the planning and use of observations, interviews, and document reviews) to assess facility performance, report results of assessments, and follow-up on actions taken as the result of assessments.

Supporting Knowledge and/or Skills

- a. Describe the role of facility maintenance management personnel with respect to oversight of Government-Owned Contractor-Operated (GOCO) facilities.
- b. Describe the assessment requirements and limitations associated with the interface with contractor employees.
- c. Discuss the essential elements of a performance-based assessment including:
 - Investigation
 - Fact finding
 - Exit interview
 - Reporting
 - Follow-up
 - Closure

DOE-STD-1181-2004

- d. Describe the following assessment methods and the advantages or limitations of each method:
 - Document review
 - Observation
 - Interview
- e. Describe the action(s) to be taken if the contractor challenges the assessment findings and explain how such challenges can be avoided.

32. Facility maintenance management personnel shall demonstrate a working level knowledge of lessons learned and problems impacting the Department's maintenance activities across complex.

Supporting Knowledge and/or Skills

- a. Describe the documentation of the Department's and industry's "lessons learned" and current events.
- b. Discuss recent events that impact maintenance management activities.
- c. Discuss current efforts by the Department and the contractor to address issues and recent events.
- d. Discuss recent issues identified by external groups (e.g., Defense Nuclear Facilities Safety Board, Environmental Protection Agency, Occupational Safety and Health Act) and Department oversight groups (Environmental Health and Operational Readiness Reviews) that impact facility maintenance.
- e. Explain the intent of a Maintenance Problem Analysis Program and discuss a maintenance problem where this program has recently been employed.

33. Facility maintenance management personnel shall demonstrate a working level knowledge of the requirements of a maintenance management program.

Supporting Knowledge and/or Skills

- a. Describe the structures, systems, and components included in a maintenance management program.
- b. Discuss line management's responsibilities for the maintenance management program.
- c. Define the term "graded approach" and discuss its application to a maintenance management program.
- d. Discuss the application of Technical Safety Requirements in a maintenance management program.
- e. Discuss the management systems that control maintenance activities.
- f. Describe the mechanisms for feedback of relevant information, such as trend analysis and instrumentation performance/reliability data, to identify necessary program modifications.
- g. Discuss the role of configuration management as it relates to maintenance management.

DOE-STD-1181-2004

- 34. Facility maintenance management personnel shall demonstrate the ability to conduct independent assessments of a contractor's compliance with the requirements of DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities.**

Supporting Knowledge and/or Skills

- a. Establish the criteria to be used as a basis for conducting the evaluation.
 - b. Establish the points of contact with the field organization being evaluated.
 - c. Gather information pertinent to the evaluation by interviewing personnel, observing maintenance activities and reviewing maintenance records.
 - d. Document the results of data collection in field notes.
 - e. Compare the results of the review phase with the criteria established for the evaluation and determine if deficiencies exist.
 - f. Document the results of the overall evaluation in a formal written report which includes the status of meeting the established criteria, identifies deficiencies or good practices, and suggests recommendations for improvement.
 - g. Resolve conflicting or inconclusive observations or findings obtained from other evaluators on an evaluation team.
 - h. Verbally report the results of the evaluation to contractor facility management and Department management.
 - i. Perform follow-up activities as applicable to ensure implementation of corrective actions, including tracking and close-out.
- 35. Facility maintenance management personnel shall demonstrate a working level knowledge of problem analysis principles and techniques necessary to identify maintenance problems, determine potential causes of problems, and identify corrective action(s).**

Supporting Knowledge and/or Skills

- a. Discuss the elements of an analysis program.
- b. Discuss the guidelines for information collecting.
- c. Discuss event causal factors for human performance problems.
- d. Discuss event causal factors for equipment performance problems.
- e. Describe and explain the application of problem analysis techniques including the following:
 - Root cause analysis
 - Causal factor analysis
 - Change analysis
 - Barrier analysis
 - Management Oversight Risk Tree analysis

DOE-STD-1181-2004

- f. Describe and explain the application of the following root cause analysis processes in the performance of occurrence investigations:
 - Events and causal factors charting
 - Root cause coding
 - Recommendation generation
- g. Compare and contrast immediate, short term, and long term actions taken as the result of a problem identification or an occurrence.
- h. Describe various data gathering techniques and the use of trending/history when analyzing problems.

36. Facility maintenance management personnel shall demonstrate the ability to apply problem analysis techniques necessary to identify maintenance problems, determine potential causes, and identify corrective action(s).

Supporting Knowledge and/or Skills

- a. Given an event and/or occurrence data, apply problem analysis techniques and identify the problems and how they could have been avoided.
- b. Participate in a contractor or Departmental problem analysis and critique the findings and results.
- c. Using appropriate data, interpret two fault tree analyses.

37. Facility maintenance management personnel shall demonstrate the ability to trend facility maintenance management-related data.

Supporting Knowledge and/or Skills

- a. Discuss the key processes used in the trending and analysis of operations information and its relationship to facility maintenance management activities.
- b. Discuss the importance and key items of a maintenance history.
- c. Given appropriate data, demonstrate the ability to analyze the data.
- d. Given DOE Order 5480.26, Trending and Analysis of Operations Information Using Performance Indicators, discuss the key elements of the Order and how they are applied.
- e. Given incident/occurrence report data for a specified period, analyze the information for safety trends or compliance problems.

38. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of financial management practices and the application of contractor resources to meet commitments to the quality, safety, cost, and schedule of systems.

Supporting Knowledge and Skills

- a. Describe the process for preparing cost estimates and budgets.

DOE-STD-1181-2004

- b. Describe and contrast direct and indirect costs and list ways to reduce indirect costs.
- c. Define and explain the relationship between the following terms:
 - Budgeted cost of work scheduled (BCWS)
 - Budgeted cost of work performed (BCWP)
 - Actual cost of work performed (ACWP)
 - Earned value (EV)
- d. Describe the types of earned value, and how they are measured.
- e. Describe the types of data required to forecast cost and schedule performance.
- f. Define the term "estimate at completion" (EAC).
- g. Discuss the importance of formal change control in relation to project management.

39. Facility maintenance management personnel shall demonstrate the ability to perform project management duties as required to provide facility maintenance management technical support to a project.

Supporting Knowledge and/or Skills

- a. Support the preparation of a Project Execution Plan.
- b. Evaluate a Work Breakdown Structure (WBS).
- c. Evaluate a project's critical path schedule.
- d. Using the results from an analysis of contractor noncompliance, determine the potential implications and describe how to communicate the results to contractor and Department management.

40. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the Department of Energy (DOE) project management system including the application of contractor resources to meet commitments to quality, safety, cost, and schedule.

Supporting Knowledge and/or Skills

- a. Explain the purpose of project management and describe the phases of a typical project.
- b. Describe typical documents and data sources utilized by facility maintenance management personnel in project management.
- c. Identify and explain the major elements of a project and discuss their relationship.
- d. Explain the purpose and use of a project execution plan.
- e. Discuss the role of configuration management as it relates to project management.
- f. Explain the use of safety plans in the management of projects.

DOE-STD-1181-2004

- g. Discuss the relationship between work breakdown structure (WBS) and cost and schedule.
- h. Describe the purpose and use of work packages and/or planning packages.
- i. Describe the purpose of schedules, and discuss the use of milestones and activities.
- j. Describe the critical path method of scheduling.
- k. Explain the concept of a project management baseline and describe the four baselines used in project management.

41. Facility maintenance management personnel shall demonstrate a familiarity level knowledge of the Department of Energy/facility contract provisions necessary to provide oversight of a contractor's performance.

Supporting Knowledge and/or Skills

- a. Describe the role of facility maintenance management personnel in contractor oversight.
- b. Compare and contrast the following:
 - The Department of Energy's expectations of an Management and Operating (M&O) contractor
 - Management and Operating (M&O) contractor's expectations of the Department of Energy
- c. Discuss the key elements and features of an effective Department of Energy and Management and Operating (M&O) contractor relationship.

42. Facility maintenance management personnel shall demonstrate the ability to conduct independent assessments of the contractor's maintenance training and qualification program(s) in accordance with DOE Order 433.1, Maintenance Management Program for DOE Nuclear Facilities, and DOE Order 5480.20A, Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities.

Supporting Knowledge and/or Skills

- a. Conduct an evaluation of a contractor training and qualification program to verify that qualification requirements have been specified for job categories.
- b. Given a work activity that requires special skills or abilities, verify that personnel are qualified prior to performing the work.
- c. Assess a work activity requiring specific qualifications to verify that sub-contractors performing the work are qualified to the same level as contractor personnel.
- d. Assess the instructor qualifications for a selected maintenance training program to verify that instructors have the necessary credentials and skills to provide the training.

INTENTIONALLY BLANK

DOE-STD-1181-2004

APPENDIX A CONTINUING TRAINING AND PROFICIENCY REQUIREMENTS

The following list represents suggested continuing education, training, and other opportunities that are available for DOE personnel after completion of the competency requirements in this technical Functional Area Qualification Standard. It is extremely important that personnel involved with this program maintain their proficiency through 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 Functional Area Qualification Standard and is not all-inclusive.

LIST OF CONTINUING EDUCATION, TRAINING, AND OTHER ACTIVITIES

Facility maintenance management personnel shall participate in an Office/facility/position-specific continuing training and qualification program that includes the following elements:

- Continuing technical education and/or training covering topics directly related to the Facility Maintenance Management area as determined appropriate by management. This may include courses/training provided by Department of Energy, 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
- Actively perform the duties of Facility Maintenance Management specialist at a Department of Energy facility a minimum of 1,020 hours per year
- Attend seminars, symposia, or technical meetings related to Facility Maintenance Management
- Engage in self-study of new regulations, requirements, or advances related to Facility Maintenance Management
- Participation in practical exercises such as emergency or operational drills, simulations, or laboratory-type exercises
- Specific continuing training requirements shall be documented in Individual Development Plans

INTENTIONALLY BLANK

DOE-STD-1181-2004

CONCLUDING MATERIAL

Review Activity:

EM
NNSA
EH
NE
SC

Preparing Activity:

DOE-EH-22

Project Number:

TRNG-0042

Field and Operations Offices

CBFO
CH
ID
OH
OR
ORP
RFFO
RL
SR

Area and Site Offices

Argonne Area Office
Brookhaven Area Office
Fermi Area Office
Kansas City Site Office
Livermore Site Office
Los Alamos Site Office
Nevada Site Office
Pantex Site Office
Princeton Area Office
Savannah River Site Office
Sandia Site Office
Y-12 Site Office