National Nuclear Security Administration

Technical Program Manager
Qualification Standard

DOE-STD-1178-2004

May 2013 | Reference Guide

The Functional Area Qualification Standard References Guides are developed to assist operators, maintenance personnel, and the technical staff in the acquisition of technical competence and qualification within the Technical Qualification Program.

Please direct your questions or comments related to this document to the Office of Leadership and Career Manager, Technical Qualification Program (TQP), Albuquerque Complex.

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ACRONYMS	
AC	actual cost
ACGIH	American Conference of Governmental Industrial Hygienists
ACWP	actual cost of work performed
AIB	accident investigation board
ALARA	as low as reasonably achievable
ALI	annual limit on intake
ANSI	American National Standards Institute
ARARs	applicable or relevant and appropriate requirements
ASME	American Society of Mechanical Engineers
ASQ	American Society for Quality
ASQC	American Society for Quality Control
BA	barrier analysis
BCWS	budgeted cost of work scheduled
BCWP	budgeted cost of work performed
BIO	basis for interim operations
CAIRS	computerized accident/incident reporting system
CAP	corrective action program
CATS	corrective action tracking system
CD	critical decision
CE	categorical exclusion
CEMP	code of environmental management principles
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFO	Chief Financial Officer
CFR	Code of Federal Regulation
CM	configuration management
CMMS	computerized maintenance management software
CRD	contractor requirements document
CSE	cognizant system engineer
CV	cost variance
CWA	Clean Water Act
CWBS	contract work breakdown structure
CX	categorical exclusion
DART	days away, restricted, or transferred
D&D	decontamination and decommissioning
DEAR	Department of Energy Acquisition Regulations
DoD	Department of Defense
DOE	Department of Energy
DSA	documented safety analysis
EA	environmental assessment
EAC	estimated cost at completion
ECP	employee concerns program
EH	Office of Environment, Safety, and Health
EIA	Electronic Industries Alliance

ACRONYMS	
EID	environmental information document
EIS	environmental impact statement
EMS	environmental management system
EO	Executive Order
EPA	Environmental Protection Agency
ES&H	environment, safety, and health
EV	earned value
EVMS	earned value management system
FAQS	functional area qualification standard
FAR	Federal Acquisition Regulations
FDO	Fee Determining Official
FEOSH	Federal Employee Occupational Safety and Health
FFCA	Federal Facilities Compliance Act
FM-50	Office of Infrastructure Acquisition
FOIA	Freedom of Information Act
FONSI	finding of no significant impact
G	guide
GOCO	government-owned, contractor operated
HDBK	handbook
HE	high explosive
HLW	high-level waste
HQ	headquarters
HSS	Office of Health, Safety and Security
IA	change impact analysis
IAEA	International Atomic Energy Agency
ICE	independent cost estimates
ICRP	International Commission on Radiological Protection
IDPs	individual development plans
mrem	millirem
ISM	integrated safety management
ISMS	integrated safety management system
ISO	International Organization for Standardization
KSA	knowledge, skill, and ability
LA	Los Alamos
LCC	life cycle costs
M	manual
M&O	management and operating
MORT	management oversight risk tree
N&S	necessary and sufficient
NARA	National Archives and Records Administration
NCP	National Contingency Plan
NCS	nuclear criticality safety
NELAs	nuclear explosive-like assemblies
NEOs	nuclear explosive operations

ACRONYMS	
NEPA	National Environmental Policy Act
NES	nuclear explosive safety
NEWS	Nuclear Explosive and Weapon Surety
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
NQA	National Quality Assurance
NPDES	National Pollutant Discharge Elimination System
NPL	national priorities list
NRC	Nuclear Regulatory Commission
N&S	necessary and sufficient
NTS	noncompliance tracking system
O	Order
OE	operating experience
OMB	Office of Management and Budget
ONMI	Office of Nuclear Materials Integration
ORPS	occurrence reporting and processing system
ORRs	operational readiness reviews
OSHA	Occupational Safety and Health Act
PAAA	Price-Anderson Amendment Act
PBIs	performance based incentives
PEP	performance evaluation plan
PER	performance evaluation report
PHF	procedure history file
PIP	program implementation planning
P.L.	Public Law
PMB	performance measurement baseline
POs	Performance objectives
PPBE/E	planning, programming, budgeting, and execution/evaluation
PRPs	potentially responsible parties
PSO	project secretarial officer
PSWBS	project summary work breakdown structure
QA	quality assurance
QAP	quality assurance program
QC	quality control
RCA	root cause analysis
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RD/RA	remedial design/remedial action
rems	roentgen equivalent in man/mammal
REMS	Radiation Exposure Monitoring System
RI/FS	remedial investigation/feasibility study
RMP	risk management plan
ROD	record of decision
RPP	radiation protection program

ACRONYMS	
RR	readiness review
SARs	safety analysis reports
S/CI	suspect/counterfeit item
SDDs	system design descriptions
SERs	safety evaluation reports
SOW	scopes of work
S/RIDs	standards/requirements identification documents
SSCs	safety-significant structures, systems, and components
STD	standard
Sv	Sievert
SV	schedule variance
TLVs	threshold limit values
TPC	total project cost
TQP	Technical Qualification Program
TRUW	transuranic waste
TSRs	technical safety requirements
U.S.	United States
U.S.C.	United States Code
USQ	unreviewed safety question
USQD	unreviewed safety question determination
USSR	United Soviet Socialist Republic
VPP	voluntary protection program
WAD	work authorization document
WBS	work breakdown structure
WQBEL	water quality-based effluent limitation
WSRC	Washington Savannah River Company
WSSs	work smart standards

PURPOSE

The purpose of this reference guide is to provide a document that contains the information required for a Department of Energy (DOE)/National Nuclear Security Administration (NNSA) technical employee to successfully complete the Technical Program Manager Functional Area Qualification Standard (FAQS). Information essential to meeting the qualification requirements is provided; however, some competency statements require extensive knowledge or skill development. Reproducing all the required information for those statements in this document is not practical. In those instances, references are included to guide the candidate to additional resources.

SCOPE

This reference guide addresses the competency statements in the February 2004 edition of DOE-Standard (STD)-1178-2004, *Technical Program Manager Functional Area Qualification Standard*. The qualification standard for the quality assurance functional area contains 23 competency statements.

PREFACE

Competency statements and supporting knowledge and/or skill statements from the qualification standard are shown in contrasting bold type, while the corresponding information associated with each statement is provided below it.

A comprehensive list of acronyms is provided at the beginning of this document. It is recommended that the candidate review the list prior to proceeding with the competencies, as the acronyms, abbreviations, and symbols may not be further defined within the text unless special emphasis is required.

The competencies and supporting knowledge, skill, and ability (KSA) statements are taken directly from the FAQS. Most corrections to spelling, punctuation, and grammar have been made without remark. Only significant corrections to errors in the technical content of the discussion text source material are identified. Editorial changes that do not affect the technical content (e.g., grammatical or spelling corrections, and changes to style) appear without remark. When they are needed for clarification, explanations are enclosed in brackets.

Every effort has been made to provide the most current information and references available as of May 2013. However, the candidate is advised to verify the applicability of the information provided. It is recognized that some personnel may oversee facilities that utilize predecessor documents to those identified. In those cases, such documents should be included in local qualification standards via the Technical Qualification Program (TQP).

In the cases where information about an FAQS topic in a competency or KSA statement is not available in the newest edition of a standard (consensus or industry), an older version is referenced. These references are noted in the text and in the bibliography.

This reference guide includes streaming videos to help bring the learning experience alive. To activate the video, click on any hyperlink under the video title. Note: Hyperlinks to video are shown in entirety, due to current limitations of eReaders.

TECHNICAL COMPETENCIES

1. **A technical program manager shall have a working level knowledge of the roles and responsibilities for the Integrated Safety Management System (ISMS) and the department's philosophy and approach to implementing integrated safety management (ISM).**

   a. **Describe the overall objective of the Department-wide Functions and Responsibilities Manual and the similar lower-tier organization-level manuals developed by Headquarters (HQ) offices and field elements.**

   [Note: DOE Manual (M) 411.1-1C, Safety Management Functions, Responsibilities, and Authorities Manual, has been cancelled by DOE O 450.2, Integrated Safety Management.]

   b. **Explain the objective of integrated safety management.**

   The following is taken from DOE O 450.2.

   The objective of integrated safety management is to ensure that the DOE, including the NNSA, systematically integrates safety into management and work practices at all levels, so that missions are accomplished efficiently while protecting the workers, the public, and the environment. Throughout DOE O 450.2, "safety" is used synonymously with environment, safety, and health (ES&H).

   Video 1. Integrated safety management
   http://www.bing.com/videos/search?q=integrated+safety+management&view=detail&mid=AE344F05008A6D6C19A3AE344F05008A6D6C19A3&first=0

   c. **Describe how the seven guiding principles in the ISM Plan are used to implement an ISM philosophy.**

   The following is taken from DOE G 450.4-1C, attachment 1.

   Line Management Responsibility for Safety
   Line management is directly responsible for the protection of the public, workers, and the environment.

   Clear Roles and Responsibilities
   Clear and unambiguous lines of authority and responsibility for ensuring safety are established and maintained at all organizational levels within the Department and its contractors.

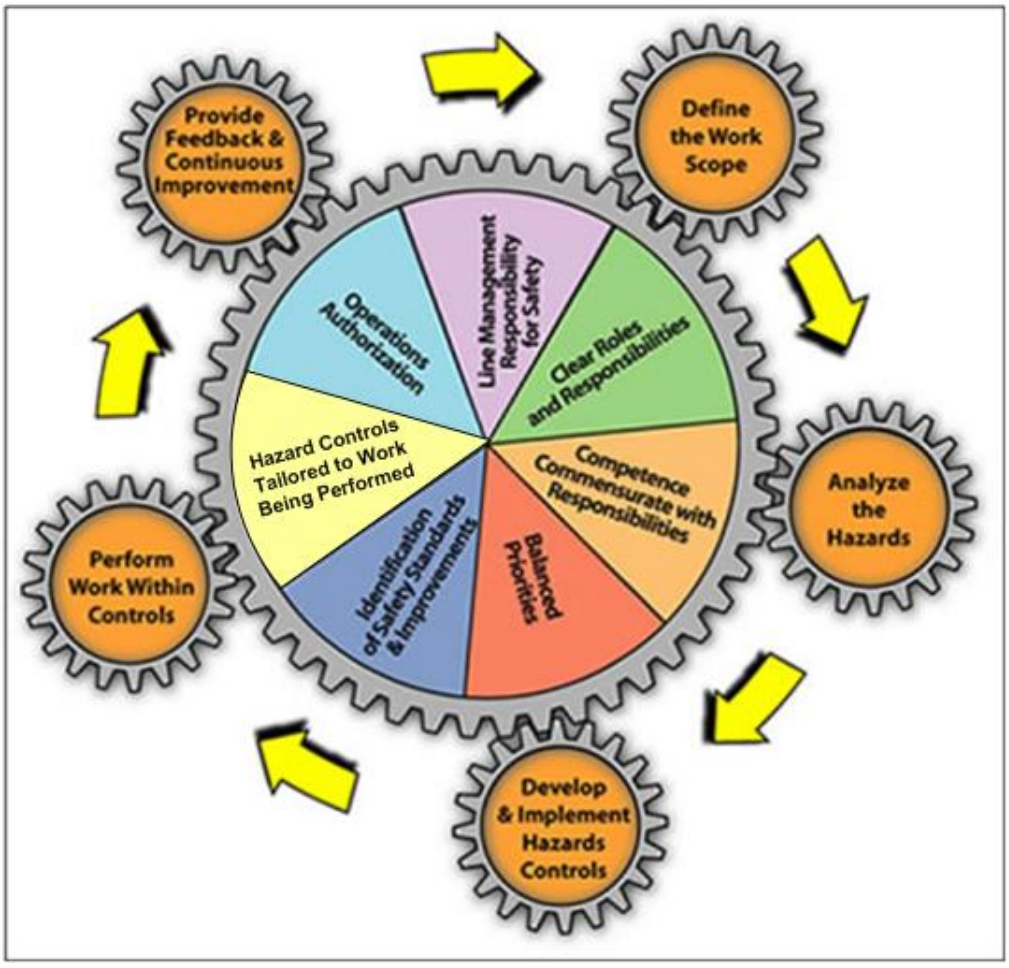
   Competence Commensurate with Responsibilities
   Personnel possess the experience, knowledge, skills, and abilities that are necessary to discharge their responsibilities.

Balanced Priorities
Resources are effectively allocated to address safety, programmatic, and operational considerations. Protecting the workers, the public, and the environment is a priority whenever activities are planned and performed.

Identification of Safety Standards and Requirements
Before work is performed, the associated hazards are evaluated and an agreed-upon set of safety standards and requirements is established which, if properly implemented, will provide adequate assurance that the workers, the public, and the environment are protected from adverse consequences.

Hazard Controls Tailored to Work Being Performed
Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards.

Operations Authorization
The conditions and requirements to be satisfied for operations to be initiated and conducted are clearly established and agreed upon.



Source: U.S. Department of Energy Oak Ridge Training and Development Group Training On-Line

Figure 1. The seven guiding principles in the ISM plan

d. Describe the five core safety management functions in the ISM plan and discuss how they provide the necessary structure for work activities.

The following is taken from DOE G 450.4-1C, attachment 6.

The five core functions provide the necessary structure for any work activity that could potentially affect the public, workers, or the environment. The core functions are applied as a continuous cycle. These functions are not independent, sequential functions, but instead a linked, interdependent collection of functions that often occur concurrently. The output of each function can affect the results of each of the other functions and, potentially, the whole system.

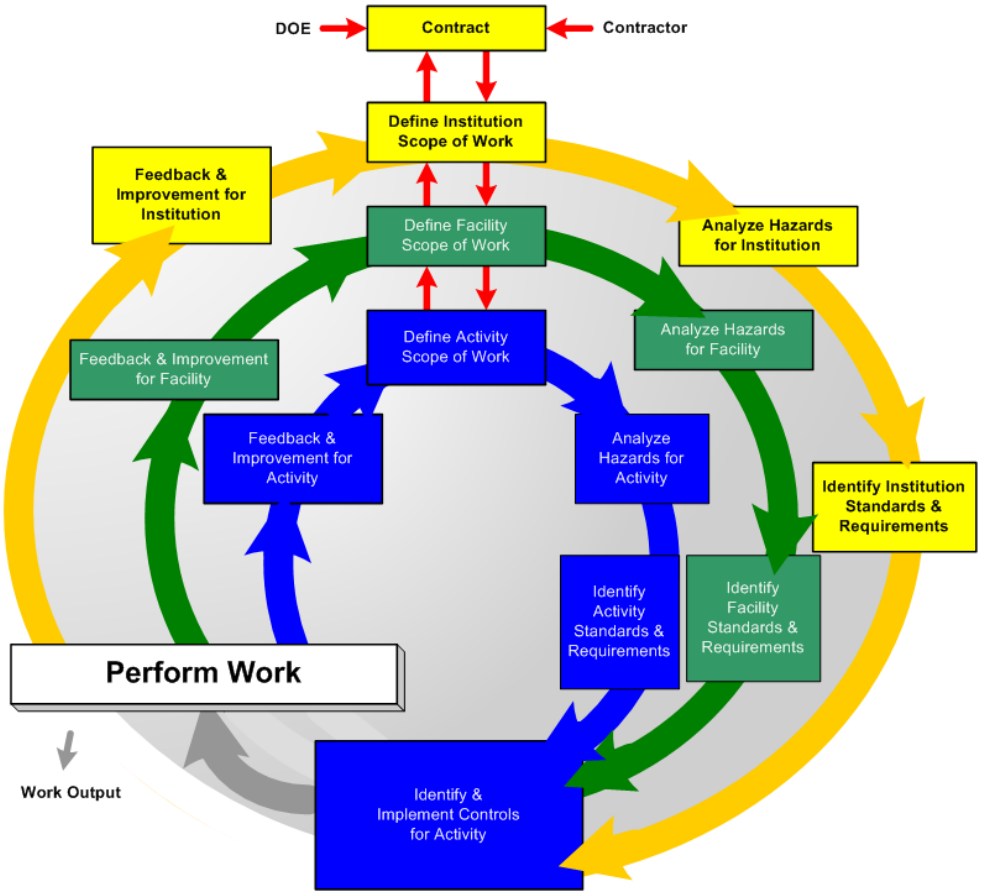
Define the Scope of Work
Missions are translated into work, expectations are set, tasks are identified and prioritized, and resources are allocated.

Analyze the Hazards
Hazards associated with the work are identified, analyzed, and categorized.

Develop and Implement Hazard Controls
Applicable safety standards and requirements are identified and agreed-upon, controls to prevent/mitigate hazards are identified, the safety envelope is established, and controls are implemented.

Perform Work Within Controls
Readiness is confirmed and work is performed safely.

Provide Feedback and Continuous Improvement
Feedback information on the adequacy of controls is gathered; opportunities for improving the definition and planning of work are identified and implemented.



Source: DOE G 450.4-1C

Figure 2. Major interactions between organizational levels for the five ISM core functions

e. Identify and discuss existing departmental programs and initiatives that lead to successful implementation of ISM such as

- **standards/requirements identification documents (S/RIDs) and work smart standards**
- **contract reform and performance-based contracting**
- **research and development laboratory activities related to safety management**
- **operational readiness reviews (ORRs)**
- **nuclear explosive safety and surety program**
- **voluntary protection**
- **International Organization for Standardization (ISO) 14000**
- **environmental laws and regulations**

Standards/Requirements Identification Documents (S/RIDs) and Work Smart Standards

The following is taken from WSRC-RP-94-1268.

The S/RIDs define the applicability of requirements on a facility basis according to the work conducted and hazards present at each facility. From the S/RID, the applicable requirements flow down to policies and procedures established and maintained by the integrated ISMS.

These policies and procedures include controls tailored to the work/activity and the type and level of hazards present.

The following is taken from DOE- HDBK-1148-2002.

For many routine activities, experience has been codified in formally promulgated standards and procedures. For other non-routine activities, guidance documents identify best practices that, while not prescriptive requirements, communicate what is known at the edge of formalized consensus standards. The result is a set of tailored ES&H standards. This set is called the work smart standards set to emphasize the importance that the actual work definition plays in resolving safety uncertainty.

Video 2. NRC consensus standards
http://www.bing.com/videos/search?q=consensus+standards&view=detail&mid=DFA0789C68114F0792AADFA0789C68114F0792AA&first=0

Contract Reform and Performance-Based Contracting

The following is taken from 48 Code of Federal Regulations (CFR) 970.1100-1.

It is DOE policy to use, to the maximum extent practicable, performance-based contracting methods in its management and operating contracts. The Office of Federal Procurement Policy's seven steps to performance-based acquisition provide guidance concerning the development and use of performance-based contracting concepts and methodologies that may be generally applied to management and operating contracts. Performance-based contracts describe performance requirements in terms of results rather than methods of accomplishing work; use measurable performance standards and objectives and quality assurance surveillance plans; provide performance incentives where appropriate; and specify procedures for award or incentive fee reduction when work activities are not performed or do not meet contract requirements.

The use of performance-based statements of work is the preferred method for establishing work requirements. Such statements of work and other documents used to establish work requirements should describe performance requirements and expectations in terms of outcome, results, or final work products, as opposed to methods, processes, or design.

Contract performance requirements and expectations should be consistent with the Department's strategic planning goals and objectives, as made applicable to the site or facility through departmental programmatic and financial planning processes. Measurable performance criteria, objective measures, and where appropriate, performance incentives will be structured to correspond to the performance requirements established in the statement of work and other documents used to establish work requirements.

Research and Development Laboratory Activities Related to Safety Management

The following is taken from DOE G 450.4-1C.

The objective of ISM is to integrate safety into management and work practices at all levels, addressing all types of work and all types of hazards to ensure safety for workers, the public, and the environment. To achieve this objective, DOE has established guiding principles and

core safety management functions. An effective ISM system addresses these DOE-wide principles and core functions while considering site-specific factors, conditions, and processes, including the types of potentially hazardous work at the site, including but not limited to operations, maintenance, construction, decontamination and decommissioning (D&D), laboratory activities, and research and development.

Organizations with safety management responsibilities should establish and maintain implementing mechanisms, including processes, policies, protocols, procedures, documentation, and training, to translate ISM system expectations into implementation activities and desired human behaviors. These mechanisms need to consider all active and applicable program and facility life-cycle phases, including design, construction, operation, maintenance, research and development, and D&D.

ISO 14000

The following is taken from Wikipedia, *ISO 14000*.

ISO 14000 is a family of standards related to environmental management that exists to help organizations

- minimize how their operations negatively affect the environment;
- comply with applicable laws, regulations, and other environmentally oriented requirements; and
- continually improve in the above.

Video 3. ISO 14000
http://www.youtube.com/watch?v=N6T2z5obMrA

Operational Readiness Reviews (ORRs)

The following is taken from DOE G 413.3-16A.

An ORR is a disciplined, systematic, documented, performance-based examination of facilities, equipment, personnel, procedures, and management control systems for ensuring that a facility can be operated safely and securely within its approved safety and security envelope as defined by the facility safety basis and security plan. A tailored approach should be used in defining the depth of the ORR based on core requirements and should be documented in the ORR implementation plan approved by the ORR team leader. The ORR is effectively the mechanism for the project organization to demonstrate that

- the facility/system/equipment is in a state of readiness to safely and securely conduct operations in accordance with the safety basis and security plan;
- management control programs are in place to ensure safe and secure operations can be sustained; and
- user/operating organization personnel are trained and qualified.

Nuclear Explosive Safety and Surety Program

The following is taken from DOE O 452.1D.

A primary target of nuclear explosives surety controls is to protect the nuclear explosive main charge high explosive (HE) from environments capable of initiating it, including those environments where main charge detonator cable assemblies are exposed. Adequacy of

controls must be established through application of the concept of defense-in-depth in all stages of nuclear explosive operations. First standard controls prevent or interrupt accidents before environments are created that could initiate detonation/deflagration of main charge HE. Second standard controls protect the main charge HE from initiating environments or mitigate the environment to a level that is incapable of initiating the main charge.

Two of the programs used by the DOE Nuclear Explosive and Weapon Surety (NEWS) Program are as follows:

- Nuclear Weapon Surveillance Program—involves routine periodic examination, evaluation, and testing of stockpile weapons and weapon components to ensure they meet design requirements and are performing effectively—must include safety and use control components.
- Training and Qualification of Personnel—involves each organization responsible for and/or involved in nuclear explosive operations (NEOs) and activities that may affect the safety and use control of a nuclear explosive or nuclear weapon must implement training and qualification programs for personnel.

Voluntary Protection

The following is taken from DOE G 450.4-1C.

DOE voluntary protection program (DOE-VPP) promotes safety and health excellence through cooperative efforts among labor, management, and government at DOE contractor sites.

The Department adopts and encourages DOE secretarial offices, field offices, and contractors to implement the principles and functions of a variety of processes and initiatives aimed at improving organizational and individual performance. Many tools and mechanisms are available, and most have been or are being used in one form or another in DOE and contractor organizations. A non-inclusive list of performance improvement programs or processes follows:

- Human performance improvement
- VPP
- Behavior based safety
- Enhanced work planning
- Safety conscious work environment
- Conservative decision making
- NRC risk-informed inspection and decision making
- ISO 9001, *Quality Management System*
- Total quality management
- Six sigma quality programs
- ISO 14001, *Environmental Management System*

All of these tools, processes, or approaches can be an integral aspect of ISM or can be adapted to complement ISM. They share many common principles that affect organizational and individual worker, supervisor, and management behavior and performance.

Video 4. Voluntary Protection Program (VPP)
http://www.youtube.com/watch?v=gQV7p1vwqA4

Environmental Laws and Regulations

The following is taken from DOE G 450.4-1B, volume 1 (archived).

The following techniques and methods for dealing with environmental risks are consistent with the guiding principles and core functions to be addressed in ISMS. Threats to the environment are generally addressed through environmental assessments (EAs) or environmental impact statements (EISs) that are required by the National Environmental Policy Act (NEPA), 10 CFR 1021.

In addition, environmental management systems (EMSs) used by the Federal government should be integrated with the ISMS. An environmental management system (EMS) is that part of the overall management system that includes organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the environmental policy. A discussion of EMSs is provided in DOE/Office of Environment, Safety, and Health (EH)-0573, *Environmental Management System Primer for Federal Facilities*.

An EMS provides the structure by which specific activities can be carried out efficiently and in a manner consistent with key organizational goals, and it allows an organization the flexibility to adapt the system to its needs and priorities. The EMS approach has its genesis in the same movement that created the "quality management" systems traditionally applied to manufacturing. The two predominant EMS documents are the code of environmental management principles for Federal agencies (CEMP) and ISO 14001, *Environmental Management Systems*.

CEMP was developed by the Environmental Protection Agency (EPA) in response to Executive Order (EO) 12856, *Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements*, signed on August 3, 1993. The EPA patterned the CEMP on the common critical elements of a comprehensive management system tailored to the environmental activities of an organization. CEMP uses a construct of five broad principles and underlying performance objectives as the basis for Federal agencies to move toward responsible environmental management. CEMP principles help ensure environmental performance that is proactive, flexible, cost-effective, integrated, and sustainable.

f. Discuss the purpose, content, and application of DOE Policy 450.4, *Safety Management System Policy*.

[Note: DOE P 450.4 has been superseded by DOE P 450.4A.]

The following is taken from DOE P 450.4A.

The purpose of DOE P 450.4A is to establish DOE's expectation for safety, including ISM that will enable the Department's mission goals to be accomplished efficiently while ensuring safe operations at all departmental facilities and in all departmental activities.

It is the Department's policy that work be conducted safely and efficiently, and in a manner that ensures protection of workers, the public, and the environment. To achieve this policy, effective safety requirements and goals are established; applicable national and international

consensus standards are adopted; and where necessary to address unique conditions, additional standards are developed and effectively implemented. ISM requirements for Federal organizations are established through directives, and for contractor organizations through contract clauses.

The Department's ultimate safety goal is zero accidents, work-related injuries and illnesses, regulatory violations, and reportable environmental releases. The Department expects that for all activities and phases in the lifecycle of missions, appropriate mechanisms are in place to ensure that exposures of workers, the public, and the environment to radiological and nonradiological hazards are maintained below regulatory limits. DOE expects that deliberate efforts are taken to keep exposures to radiation as low as reasonably achievable (ALARA).

The Department will implement ISMS to systematically integrate safety into management and work practices at all levels in the planning and execution of work. All organizations will develop, maintain, and implement ISMS for their operations and work practices, based upon the ISM guiding principles and core functions. To improve effectiveness and efficiency, organizations are expected to tailor their safety management system to the hazards and risks associated with the work activities supporting the mission; including using established mechanisms to tailor requirements. Decisions impacting safety are made by technically qualified managers with knowledge of the operations and after consideration of hazards, risks, and performance history. To complement these systems and mechanisms, the Department expects all organizations to embrace a strong safety culture where safe performance work and involvement of workers in all aspects of work performance are core values that are deeply, strongly, and consistently held by managers and workers. The Department encourages a questioning attitude by all employees and a work environment that fosters such an attitude.

The ultimate responsibility and accountability for ensuring adequate protection of the workers, the public, and the environment from the operation of DOE facilities rests with DOE line management. The Department will meet this responsibility by

- establishing functions and clear lines of responsibilities, authorities, and appropriate accountabilities;
- measuring safety management performance, with special emphasis on work related to high consequence activities by
  - evaluating incident reports;
  - using environment, safety, and health performance measures; and
  - assessing performance; and
- holding itself and its contractors accountable at all organizational levels for safety performance through codified safety regulations, contract clauses, DOE directives, and the use of contractual and regulatory enforcement tools.

g. Explain the basis upon which the safety management functions could differ from facility to facility, and the basis to be used for applying ISM on a graded approach.

The following is taken from DOE G 450.4-1C.

DOE ISMSs often support many different kinds of work, from the operation of nuclear and non-nuclear facilities, to laboratory experimentation and environmental restoration activities. To accomplish the work safely and to protect workers, the public, and the environment, the system should function to identify and control all types of hazards, from commonly encountered workplace hazards to rare or one-of-a kind process hazards, in existing, newly designed, and old, non-operating facilities. The system should function to deal flexibly with the uncertainties associated with natural phenomena, uncharacterized wastes, and experiments involving emergent technologies, as well as those associated with new missions and new designs. The system should be able to accommodate existing methods, processes, and infrastructures from a variety of domains inside and outside of DOE, including standards and requirements, nuclear safety authorization bases, Occupational Safety and Health Act (OSHA) standards, and EPA Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)/Superfund requirements.

Tailoring is planning and applying work management functions to accomplish work at hand within the established contract and project agreements. When applied to the five core functions of ISM, tailoring allows for a work management system that handles all types of work and performs efficiently, effectively, and seamlessly. Tailoring includes selecting hazards analysis teams that are familiar with the work and the hazards, selecting appropriate hazards analysis methods, and assuring a robust analysis.

Incident reviews are conducted promptly after an incident to ensure data quality and to identify improvement opportunities. Causal analysis expertise is applied effectively to examine events and improve safe work performance. High-quality causal analysis using multidisciplinary analytical perspectives is the norm. Causal analysis is performed on a graded approach for major and minor incidents, and near-misses, to identify causes and follow-up actions. Even small failures are viewed as windows into the system that can spur learning.

h. Discuss the underlying safety management issues affecting the design, construction, operation, and maintenance of the Department's facilities, activities, and assets.

The following is taken from DOE G 450.4-1C.

Documented procedures and practices do not inherently produce the integration that is expected by DOE directives and the Department of Energy Acquisition Regulations (DEAR) ISM clauses. This is true for sites that have many diverse facilities performing work for several DOE program offices. It is true that site-wide programs usually exist to address safety, environmental and waste minimization activities that need to be integrated with specific programmatic work. A number of mechanisms may be incorporated into the ISM system to encourage integration. Specific business and work procedures may be used to support the integration. Some organizations use regularly scheduled subject area meetings at

various levels of the organization to encourage integration and information exchange. Such councils can be part of the documented business practices in the ISM system. Other integration mechanisms may include site-wide maintenance manuals, site-wide safety meetings and safety boards. Reviews and assessments, programmatic and site-wide, and feedback of lessons learned to all programs are mechanisms that contribute to integration. For example, although DOE-STD-1120, volumes 1 and 2, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, is specifically written for disposition activities, it also provides guidance and examples for integrating planning, hazards analysis, and controls, with methodology that is generally applicable to other parts of the facility life cycle.

Typical site-wide programs that should be integrated into work activities include engineering support, fire protection, emergency preparedness, maintenance, environmental protection, waste management, industrial hygiene, occupational safety, chemical safety, radiological protection, training, and conduct of operations.

An ISM system description should identify the integration of environment, safety, and health into the contractor's business processes for work planning, budgeting, authorization, execution, and change control. This requires integration within the line organizations and integration with the organizations supporting the line. The ISM system description should address the flow-down of safety management to subcontractors. The development of procedures and practices for prioritization of programmatic and site-wide work activities important to safety is an important integration activity that should be documented and integrated with interfacing DOE procedures and practices.

2. A technical program manager shall have a working level knowledge of nuclear safety management standards and documentation, including their applications.

a. Discuss the purpose, content, and philosophy, as appropriate to the position, of the following safety management standards for nuclear facility safety authorization basis:

- **DOE G 424.1-1A, *Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements***
- **DOE O 420.1A, *Facility Safety***
- **DOE O 425.1C, *Startup and Restart of Nuclear Facilities***
- **DOE-STD-1027-92, *Guidance on Preliminary Hazard Classification and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports***
- **DOE-STD-3006-2000, *Planning and Conduct of Operational Readiness Reviews (ORRs)***
- **DOE-STD-3009-94, Change 3, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports***
- **DOE-STD-3011-2002, *Guidance for Preparation of Basis for Interim Operations (BIO) Document*; and**
- **DOE P 410.1A, *Promulgating Nuclear Safety Requirements***

[Note: DOE G 424.1-1A has been superseded by DOE G 424.1-1B; DOE O 420.1A has been superseded by DOE O 420.1C; DOE O 425.1C has been superseded by DOE O 425.1D, *Verification of Readiness to Startup or Restart of Nuclear*

***Facilities*; DOE-STD-1027-92 has been superseded by DOE-STD-1027-92 chg 1; DOE-STD-3006-2000 has been superseded by DOE-STD-3006-2010, *Planning and Conducting Readiness Reviews* (ORRs); and DOE P 410.1A has been cancelled.]**

DOE G 424.1-1B, Implementation Guide for Use in Addressing Unreviewed Safety Question Requirements.

DOE G 424.1-1B, including its attachments, provides information to assist in the implementation of 10 CFR 830.203, "Unreviewed Safety Question Process," of the nuclear safety management rules for category 1, 2, and 3 nuclear facilities owned or operated by DOE, including NNSA.

10 CFR 830.203 allows contractors to make physical and procedural changes and to conduct tests and experiments without prior DOE approval if the proposed change can be accommodated within the existing safety basis. The contractor must evaluate any proposed change to ensure that it will not affect the safety basis of the facility either explicitly or implicitly. The unreviewed safety question (USQ) process is primarily applicable to the documented safety analysis (DSA). The rule references only the DSA, and includes conditions of approval in safety evaluation reports and facility-specific commitments made in compliance with DOE rules, Orders, or policies.

Because application of the USQ process depends on facility-specific information, results of an unreviewed safety question determination (USQD) in one facility generally cannot be extrapolated to other facilities. DOE approves procedures to implement the USQ process as required by 10 CFR 830.203. Where site level and facility level procedures are used, site and facility level procedures are approved by DOE.

10 CFR 830.203 is implemented using contractor procedures for ensuring that proposed changes to physical characteristics or technical procedures are evaluated relative to the approved safety basis and that those proposed changes determined to involve USQs are brought to the attention of DOE for review and approval before changes are made.

The applicability of 10 CFR 830.203 is broad. Non-safety-related structures, systems, and components (SSCs) are not excluded by the scope of 10 CFR 830.203 if they could affect the proper operation of equipment important to safety that is relied on in the safety basis or create the possibility of an accident or malfunction of a different type than previously evaluated in the DSA. For example, losses of certain non-safety-related systems may represent critical operational occurrences identified as initiators in the accident analysis. Therefore, changes to non-safety-related SSCs are evaluated and may be determined to involve a USQ.

Physical interactions may fall under the purview of 10 CFR 830.203. For example, the installation of a non-seismically supported piece of equipment above a seismically qualified component designed to perform a safety function, explicitly or implicitly assumed in the existing safety analyses, may constitute a USQ and need to be evaluated.

DOE O 420.1B chg 1, Facility Safety

The objective of DOE O 420.1B, chg 1, is to establish facility and programmatic safety requirements for DOE, including the NNSA, for nuclear and explosives safety design

criteria, fire protection, criticality safety, natural phenomena hazards mitigation, and the system engineer program.

Each chapter of DOE O 420.1C defines facility or programmatic safety requirements. In complying with DOE O 420.1C, DOE and contractors must ensure that any work done is consistent with any other safety, design, or other analyses or requirements applicable to the affected facility. In particular, work must be performed in accordance with the ISM requirements of 48 CFR 970.5223-1, "Integration of Environment, Safety, and Health into Work Planning and Execution," and the quality assurance requirements of either 10 CFR 820, subpart A, "General," or DOE O 414.1D, *Quality Assurance*, or successor documents as applicable. All new construction, as a minimum, must comply with national consensus industry standards and the model building codes applicable for the state or region, supplemented in a graded manner with additional safety requirements for the associated hazards in the facility that are not addressed by the codes.

DOE O 425.1D, Verification of Readiness to Startup or Restart Nuclear Facilities

The purpose of DOE O 425.1D is to establish the requirements for DOE, including NNSA, for verifying readiness for startup of new hazard category 1, 2, and 3 nuclear facilities, activities, and operations, and for the restart of existing hazard category 1, 2, and 3 nuclear facilities and operations that have been shut down.

DOE O 425.1D is applicable to DOE within the provisions and restrictions of the National Nuclear Security Administration Act, found at Title XXXII of Public Law (P.L.) 106-65, *National Defense Authorization Act for Fiscal Year 2000*. DOE O 425.1D applies to all nuclear facilities, activities, and operations as defined in 10 CFR 830, "Nuclear Safety Management," that are classified as hazard category 1, 2, or 3 nuclear facilities.

DOE-STD-3006-2010 provides guidance on approaches and methods approved as acceptable for implementing the requirements of DOE O 425.1D. Other approaches and methods may be used, provided they are documented and approved by DOE line management as being in accordance with the requirements of DOE O 425.1D. The readiness review process must, in all cases, demonstrate that there is reasonable assurance for adequate protection of workers, the public, and the environment from adverse consequences from the start, or restart, of a hazard category 1, 2, or 3 nuclear facility, activity, or operation.

DOE-STD-1027-92 chg 1, Guidance on Preliminary Hazard Classification and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports

The purpose of DOE-STD-1027-92, chg 1, is to establish guidance for the preparation and review of hazard categorization and accident analysis techniques as required by DOE Order 5480.23, *Nuclear Safety Analysis Reports*, (archived). DOE-STD-1027-92, chg 1, focuses on the definition of the standard identifying nuclear facilities required to have safety analysis reports (SARs) in order to comply with DOE Order 5480.23, the SAR implementation plan and schedule, the hazard categorization methodology to be applied to all facilities, and the accident analysis techniques appropriate for the graded approach addressed in DOE Order 5480.23. [Note: DOE Order 5480.23 has been cancelled.]

DOE-STD-3006-2010, Planning and Conducting Readiness Reviews (ORRs)

The purpose of DOE-STD-3006-2010 is to describe acceptable methods and approaches for meeting the readiness review (RR) requirements of DOE O 425.1D. Specifically, DOE-STD-3006-2010 describes methods and approaches for

- determining the type of RR that is appropriate to the specific facility startup consistent with the history, hazards, and complexity of the facility being started up or restarted;
- developing the startup notification report that documents the results of the process for determining the type of readiness;
- conducting the RR, including development of the plan of action, the implementation plan, selection of team members, and performance and documentation of the RR;
- achieving readiness; and
- providing examples of process deliverables to include a writing guide and suggested processes for achieving readiness.

The requirements of DOE O 425.1D are only applicable to startup or restart of a hazard category 1, 2, or 3 nuclear facility, activity, or operation. DOE-STD-3006-2010 provides acceptable methods and approaches for meeting the specific requirements of DOE O 425.1D.

DOE-STD-3009-94 change 3, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports

DOE-STD-3009-94, chg 3, describes a DSA preparation method that is acceptable to DOE. It was developed to assist hazard category 2 and 3 facilities in preparing SARs that will satisfy the requirements of 10 CFR 830. Hazard category 1 facilities are typically expected to be category A reactors for which extensive precedents for SARs already exist.

Guidance provided by DOE-STD-3009-94, chg 3, is generally applicable to any facility required to document its safety basis in accordance with 10 CFR 830. For new facilities where conceptual design or construction activities are in progress, elements of this guidance may be more appropriately handled as an integral part of the overall design requirements process. The methodology provided by DOE-STD-3009-94, chg 3, focuses more on characterizing facility safety with or without well-documented information than on the determination of facility design. Accordingly, contractors for facilities that are documenting conceptual designs for preliminary documented safety analysis should apply the process and format of DOE-STD-3009-94, chg 3, to the extent it is judged to be of benefit.

Beyond conceptual design and construction, the methodology in DOE-STD-3009-94, chg 3, is applicable to the spectrum of missions expected to occur over the lifetime of a facility. As the phases of facility life change, suitable methodology is provided for use in updating an existing DSA and in developing a new DSA if the new mission is no longer adequately encompassed by the existing DSA. This integration of the DSA with changes in facility mission and associated updates should be controlled as part of an overall safety management plan.

DOE-STD-3009-94, chg 3, addresses the following tasks related to implementing the requirements of 10 CFR 830:

- Ensure consistent and appropriate treatment of all DSA requirements for the variety of DOE nonreactor nuclear facilities.
- Provide final facility hazard categorization and consider and incorporate the categorization into programmatic requirement measures to protect workers, the public, and the environment from hazardous and accident conditions. Technical safety requirements (TSRs) and SSCs that are major contributors to work safety and defense-in-depth are identified in the hazard analysis.
- Designate safety-class SSCs and safety controls as a function of the evaluation guideline.
- Provide a consistent and measured treatment of this concept, including guidance on the minimum acceptable DSA content.

DOE-STD-3011-2002, Guidance for Preparation of Basis for Interim Operations (BIO) Document

DOE-STD-3011-2002 provides a DOE approved methodology for preparing a BIO document. The BIO is an acceptable form of DSA in accordance with 10 CFR 830, subpart B, "Safety Basis Requirements," appendix A, "General Statement of Safety Policy," table 2. It supplements the information in DOE G 421.1-2A, *Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830*.

Contractors with facilities having existing DOE-approved BIOs may wish to continue operations under those BIOs. In evaluating the viability of this approach, contractors must assess whether or not those BIOs reflect the current facility status and operations and whether the guidance of DOE-STD-3011-94, chg 3, was followed in their development.

b. Discuss the purpose, content, and philosophy, as appropriate to the position, of the following safety management standard for nuclear explosive safety:

- **DOE O 452.1C, *Nuclear Explosive and Weapon Surety***
- **DOE O 452.2C, *Nuclear Explosive Safety***
- **DOE Order 5610.13, *Joint Department of Energy/Department of Defense Nuclear Weapon System Safety, Security, and Control Activities***
- **DOE Order 5660.1B, *Management of Nuclear Materials***

[Note: DOE O 452.1C has been superseded by DOE O 452.1D, *Nuclear Explosive and Weapon Surety Program*; DOE O 452.2C has been superseded by DOE O 452.2D; DOE Order 5610.13 has been replaced with DOE O 452.6A, *Nuclear Weapon Surety Interface with the Department of Defense*; and DOE Order 5660.1B has been replaced with DOE O 410.2, *Management of Nuclear Materials*.]

DOE O 452.1D, Nuclear Explosive and Weapon Surety Program

All nuclear explosives and nuclear explosive operations require special safety, security, and use control consideration because of the potentially unacceptable consequences of an accident or unauthorized act; therefore, a NEWS Program is established to prevent unintended/unauthorized detonation and deliberate unauthorized use of nuclear explosives. The NEWS Program is implemented through DOE O 452.1D and the following directives:

- DOE O 452.2D, *Nuclear Explosive Safety*, 4-19-09

- DOE O 452.4B, *Security and Use Control of Nuclear Explosives and Nuclear Weapons*, 1-22-10
- DOE O 452.6A, *Nuclear Weapon Surety Interface with the Department of Defense*, 4-14-09
- DOE M 452.2-1A, *Nuclear Explosive Safety Manual*, 4-14-09
- DOE M 452.2-2, *Nuclear Explosive Safety Evaluation Processes*, 4-14-09

The objectives of the NEWS program are to

- prevent accidents involving United States (U.S.) nuclear weapons and nuclear explosives;
- prevent inadvertent or unauthorized use of U.S. nuclear weapons and nuclear explosives;
- protect the public health and safety, in conjunction with the Department of Defense (DoD), by providing dual-agency judgment and responsibility for the safety, security, and use control (surety) of nuclear weapons;
- establish nuclear explosive surety standards and nuclear weapon design surety requirements;
- address surety vulnerabilities during all phases of the nuclear weapon life cycle and to upgrade surety during weapon stockpile refurbishments and/or new weapon development; and
- establish requirements and responsibilities for planned NEOs.

DOE O 452.2D, Nuclear Explosive Safety

The purpose of DOE O 452.2D is to establish requirements to implement the nuclear explosive safety (NES) elements of DOE O 452.1D for routine and planned NEOs.

NEOs require special consideration because of the potentially unacceptable consequences of an accident or unauthorized act. The NES program outlined in DOE O 452.2D supports the requirements that NEOs must be designed and conducted in a manner that meets the NES standards of DOE O 452.1D or successor directives. It includes the following: NES rules, formal NES evaluations, fundamental NEO process requirements, requirements for onsite and offsite transportation, sustaining requirements, requirements for nuclear explosive-like assemblies (NELAs), and permanent marking of nuclear explosives and NELAs.

DOE O 452.6A, Nuclear Weapon Surety Interface with the Department of Defense

The objectives of DOE 452.6A are to

- establish DOE and NNSA requirements and responsibilities for addressing joint nuclear weapon and nuclear weapon system surety activities in conjunction with DoD;
- establish and implement a systematic process to ensure that nuclear weapon surety is adequately addressed throughout all phases of each nuclear weapon's life cycle; and
- provide support to DoD using the development, staffing, and implementation of safety rules that govern all nuclear weapon system operations throughout the stockpile-to-target sequence.

NNSA, in conjunction with DoD, has an obligation to protect public health, safety, and the environment from potential adverse consequences of nuclear weapon operations. To ensure

dual-agency judgment and responsibility, nuclear weapon system safety, security, and use control (surety) must be evaluated continually throughout the entirety of each nuclear weapon system's life cycle.

Nuclear weapon system surety must include a combination of administrative controls and design measures sufficient to prevent deliberate unauthorized nuclear detonation and to minimize the possibility of deliberate unauthorized acts that could lead to nuclear detonation.

Nuclear weapon system surety must include design features, safety rules, procedures, accident prevention/mitigation measures, or other controls used collectively or individually to reduce the likelihood, severity, or consequences of an accident or unauthorized act.

DOE O 410.2, Management of Nuclear Materials

The purpose of DOE O 410.2 is to establish requirements for the life-cycle management of DOE-owned and/or managed accountable nuclear materials.

DOE O 410.2 outlines procedural requirements and responsibilities that apply to all DOE elements involved in the oversight, use, and/or life-cycle management of accountable nuclear materials. Nuclear materials management must be performed in compliance with DOE O 410.2.

c. Describe the process for determining the applicable set of standards for operation such as S/RIDs and WSSs.

The following is taken DOE-HDBK-1148-2002.

Work and its hazards are dynamic. Static sets of requirements—even when carefully developed and fully complied with—cannot be relied upon indefinitely to provide assurance of safety. A number of conditions may indicate a need to revise the work smart standard (WSS) set or some portion thereof. Such conditions could include

- changes in mission and work, or work conditions, resulting in a different set of hazards;
- discovery of new hazards or better understanding of existing hazards;
- input from stakeholders, interested parties, or departmental lessons learned that suggests the existing standards set may not be necessary and sufficient to adequately address all hazards;
- changes to laws, regulations, standards, or DOE directives that are included in the WSS set; or
- changes in contract or contractor.

Change control for a WSS set should preserve or renew the integrity of the original necessary and sufficient (N&S) process determination of adequacy and feasibility. By design, the N&S process uses the collective expertise of carefully selected teams to reach a thorough understanding of the work and its associated hazards, and to identify and confirm a set of standards that can be implemented to provide reasonable assurance of adequate protection from those hazards. If changes to the resulting WSS set are not made with fidelity to the N&S process, then the integrity of the entire standards set, and the assurance of protection that it represents, may be compromised. Replacement parts for the WSS set must be

identified and considered with the same rigor that went into the original set. When changes to the WSS set are made, the WSS documentation should be revised to reflect the changes and the bases for those changes.

An effective change control process should be characterized by the following:

- The change control process should be a part of the organization's ISMS, as is the N&S process.
- The change control process should be implemented at an appropriate point in the N&S process, typically after approval of the initial WSS set.
- The change control process should provide for screening of new inputs to determine the need and appropriate mechanism for further action. Not all changes will require the same degree of attention.
- The standards bases described in the documentation of the approved WSS set should be used as the principal configuration control reference.
- When changes to the WSS set are made, the WSS documentation should be revised to reflect the changes and the bases for those changes.
- The change control process should replicate the N&S process, with roles and responsibilities that correlate to those in the N&S process, to ensure that changes to the WSS set are made deliberately and are adequately justified.
- The change control process should be well-defined, so that potential changes can be handled routinely, within a framework of defined tasks and responsibilities.
- The change control process should be managed by a single organization to ensure consistency and comprehensiveness in addressing potential changes.
- The change control process should be integrated with existing site mechanisms for documenting and promulgating standards so that changes can be communicated in a timely fashion to those who use the standards.
- The change control process should be integrated with existing processes and personnel responsibilities for contract modification, since some changes to the WSS set may be required.

d. Discuss the application and implementation of the standards listed above in the development of site and facility safety management documents.

DOE O 452.1C (archived)

Before a NEO can begin, the following documentation and activities must be completed and approved: (Normally these activities should be completed in sequence, and the authorization agreement must be last.)

- A DSA as defined in 10 CFR 830
- An operation hazard analysis report in compliance with 10 CFR 830
- A system for the implementation of documented controls to ensure acceptably safe NEOs and associated activities
- An RR in accordance with the requirements of DOE O 425.1D
- A nuclear explosive safety study report
- A certification that all nuclear explosive surety standards have been met
- An approved site safeguards and security plan
- An approved human reliability program implementation plan
- An authorization agreement

DOE O 452.2D

Contractors responsible for NEOs and associated activities and facilities must establish and implement an NES change evaluation process in accordance with DOE M 452.2-2 or successor directive. This NES evaluation is separate and independent from the USQ process required by 10 CFR 830, and must be completed before approval and implementation of the change.

Contractors must ensure that their change control process captures all proposed changes to approved NEOs including the following:

- Proposals that may have direct NES implications (e.g., procedural, equipment, or facility changes to an approved NEO)
- Proposals that may have indirect NES implications (e.g., changes or new activities that could impact the foundation established by previous NES master studies)
- Changes in knowledge affecting an approved NEO (e.g., new understanding of a potential threat to NES or new data regarding the response of a nuclear explosive to a stimulus)

DOE O 452.6A

Contractors operating national laboratories with design responsibilities must

- ensure that use control design features allow timely authorized use of a nuclear weapon while precluding or delaying unauthorized nuclear detonation;
- conduct research and development on a broad range of safety and control methods and devices to significantly improve the surety of nuclear weapons and the nuclear weapon system; and
- evaluate the criticality safety of a nuclear weapon in normal and abnormal environments to document the intrinsic safety of the design.

DOE O 410.2

The Office of Nuclear Materials Integration (ONMI) is established to facilitate greater integration of nuclear material management activities within DOE/NNSA. ONMI must implement change control procedures for restricted use materials through DOE field elements in coordination with the appropriate DOE HQ organization and in compliance with applicable agreements or obligations.

e. Identify the conditions and procedures used to maintain and modify safety documents.

The following is taken from DOE O 452.2D.

Records (documentation) must be maintained in accordance with National Archives and Records Administration (NARA)-approved DOE or site-specific records retention and disposition schedules in accordance with DOE O 243.1A, *Records Management Program*.

The following is taken from DOE-STD-1029-92.

Because procedures are a critical element of maintaining a safety envelope, they must be based on the same facility design basis, design verification, and functional test results, safety

analysis, and operating limits and surveillance requirements used to establish the safety envelope.

The process of establishing the bases involves activities used to research and plan the content of a procedure. The procedure writer develops procedure bases by either updating the bases of a current procedure or creating bases for a new procedure. The bases provide a researched compilation and analysis of the engineering and design, safety, operations, regulatory, vendor, and administrative information necessary to develop a comprehensive and usable procedure.

The bases are working documents and are a part of the procedure history file (PHF). The PHF is a compilation of all pertinent information used to develop the procedure and any subsequent revisions. The bases are used to analyze the requirements that must be included in a procedure or revision. The contents of the bases may be revised during procedure preparation to ensure that the final product contains accurate and relevant information.

The revision history provides a history of the procedure and specifies its effective date. The revision history cannot be completed until the procedure is approved. The following information should be included in the revision history:

- Revision level
- Effective date
- Affected pages
- Revision description
- A specific statement of the reason for the revision
- A list of the procedure(s) that the new procedure replaces or requirements that the procedure implements
- Citation of the old number in the revision history to provide appropriate history and cross-referencing if the number of the procedure changes
- The approval date in the description of the revision for use in tracking periodic reviews
- Any temporary changes implemented since the last revision
- The procedure basis documentation, maintained and updated to ensure that a complete history of the procedure is available each time the procedure is revised

3. A technical program manager shall have a familiarity level knowledge of DOE O 231.1A, *Environment, Safety, and Health Reporting*, and DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*.

[Note: DOE O 231.1A has been superseded by DOE O 231.1B and DOE M 231.1-2 has been cancelled by DOE O 232.2.]

a. State the purpose of the Order.

The following is taken from DOE O 231.1B.

The purpose of DOE O 231.1B is to ensure DOE, including NNSA, receives timely and accurate information about events that have affected, or could adversely affect, the health, safety, and security of the public or workers, the environment, the operations of DOE

facilities, or the credibility of the Department. This will be accomplished through timely collection, reporting, analysis, and dissemination of data pertaining to environment, safety, and health issues as required by law, or regulations, or in support of U.S. political commitments to the International Atomic Energy Agency (IAEA).

The following is taken from DOE O 232.2.

The objectives of DOE O 232.2, *Occurrence Reporting and Processing of Operations Information*, are

- to ensure that the DOE and NNSA are informed about events that could adversely affect the health and safety of the public or the workers, the environment, DOE missions, or the credibility of the Department; and
- to promote organizational learning consistent with DOE's ISMS goal of enhancing mission safety, and sharing effective practices to support continuous improvement and adaptation to change.

b. Define the following terms:

- **Event**
- **Condition**
- **Facility**
- **Notification report**
- **Occurrence report**
- **Reportable occurrence**

The following is taken from DOE O 232.2.

Event

An event is something significant and that happens in real-time (e.g., pipe break, valve failure, loss of power, environmental spill, earthquake, tornado, flood, and injury).

Condition

A condition is any as-found state, whether or not resulting from an event, that may have adverse safety, health, quality assurance, operational, or environmental implications. A condition is usually programmatic in nature; for example, errors in analysis or calculation; anomalies associated with design or performance; or items indicating a weakness in the management process are all conditions.

Facility

A facility is defined as any equipment, structure, system, process, or activity that fulfills a specific purpose. Examples include accelerators, storage areas, fusion research devices, nuclear reactors, production or processing plants, coal conversion plants, magnetohydrodynamic experiments, windmills, radioactive waste disposal systems and burial grounds, environmental restoration activities, testing laboratories, research laboratories, transportation activities, and accommodations for analytical examinations of irradiated and unirradiated components.

Notification Report
A notification report is the initial documented report to the Department of an event or condition that meets the reporting criteria defined in DOE O 232.2.

Occurrence Report
An occurrence report is a documented evaluation of a reportable occurrence that is prepared in sufficient detail to enable the reader to assess its significance, consequences, or implications, and to evaluate the actions being proposed or employed to correct the condition or to avoid recurrence.

Reportable Occurrence
A reportable occurrence is an occurrence to be reported in accordance with the criteria defined in DOE O 232.2.

c. Discuss the Department's policy regarding the reporting of occurrences as outlined in DOE M 231.1-2.

[Note: DOE M 231.1-2 has been cancelled by DOE O 232.2.]

The following is taken from DOE O 232.2.

Occurrences resulting from activities performed by facility personnel and by subcontractors in support of facility operation must be reported by facility personnel in accordance with the provisions of DOE O 232.2.

For reportable occurrences, facility personnel must categorize the occurrences, notify other DOE elements as required, and prepare and submit occurrence reports. Local implementing procedures may specify additional learning and reporting requirements beyond those stated in DOE O 232.2, but must, at a minimum, include all of the requirements in DOE O 232.2.

d. State the different categories of reportable occurrences and discuss each.

The following is taken from DOE O 232.2.

Reportable occurrences are divided into the following six categories:

- Operational emergency as defined in DOE O 151.1C, *Comprehensive Emergency Management System*: major unplanned abnormal events or conditions that involve or affect DOE/NNSA facilities and activities by causing, or having the potential to cause, serious health and safety or environmental impacts; require resources from outside the immediate/affected area or local event scene to supplement the initial response; and require time-urgent notifications to initiate response activities at locations beyond the event scene. OEs are the most serious occurrences and require an increased alert status for onsite personnel and, in specified cases, for offsite authorities.
- Significance Category 1: non-DOE events that cause actual harm; pose the potential for immediate harm or mission interruption due to safety system failure and require prompt mitigative action; or constitute an egregious noncompliance with regulatory requirements that create the potential for actual harm or mission interruption.

- Significance Category 2: circumstances that reflect degraded safety margins—necessitating prompt management attention along with modified normal operations—to prevent an adverse effect on safe facility operations; worker or public safety and health, including significant personnel injuries; regulatory compliance; or public/business interests.
- Significance Category 3: events or circumstances with localized implications including personnel injury, environmental releases, equipment damage, or hazardous circumstances that are locally contained and do not immediately suggest broader systemic concerns.
- Significance Category 4: events or a circumstance that are mitigated or contained by normal operating practices, but where reporting provides potential learning opportunities for others.
- Significance Category R: recurring occurrences are those identified as recurring, either directly or through periodic analysis of occurrences and other non-reportable events.

e. Discuss the Department's policy regarding the reporting of occurrences as outlined in DOE O 231.1A, *Environment, Safety, and Health Reporting*, and DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*.

[Note: DOE O 231.1A has been superseded by DOE O 231.1B and DOE M 231.1-2 has been cancelled by DOE O 232.2.]

See element c of this competency for the policy according to DOE O 232.2.

Reporting Occupational Safety and Health Information

The following is taken from DOE O 231.1B, attachment 3.

Injury and illness recordkeeping and reporting includes the following:

- Work-related fatalities, injuries, and illnesses occurring to Federal employees must be recorded, reported, and maintained in accordance with the requirements contained in the current version of 29 CFR 1960, "Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matters," subpart I, "Recordkeeping and Reporting Requirements," and the requirements in DOE O 231.1B, attachment 3, "Reporting Occupational Safety and Health Information," paragraphs 1 and 2.
- A work-related incident that involves a fatality or hospitalization of three or more Federal employees must be reported to the Chief Health, Safety, and Security Officer in accordance with 29 CFR 1960.70, "Reporting of Serious Accidents," and 29 CFR 1904.39, "Reporting Fatalities and Multiple Hospitalization Incidents to OSHA." The designated Federal Employees Occupational Safety and Health (FEOSH) program manager for each HQ element must report incidents involving their Federal employees and Federal employees of DOE field elements under their cognizance to the Chief Health, Safety, and Security Officer.

Annual submission of fire protection information must be reported in accordance with DOE O 231.1B, attachment 3, paragraph 3.

DOE O 232.2 lists the criteria for all categories of occurrences in attachment 2, *Occurrence Reporting Criteria, DOE O 232.2*.

4. A technical program manager shall demonstrate a working level knowledge of 10 CFR 830.204, "Documented Safety Analysis," with respect to its impact on department nuclear safety.

a. Discuss the four basic purposes and objectives of a DSA.

The following is taken from 10 CFR 830, appendix A to subpart B.

The purpose of a DSA is described as follows:

- The safety basis requirements of 10 CFR 830 require the contractor responsible for a DOE nuclear facility to analyze the facility, the work to be performed, and the associated hazards, and to identify the conditions, safe boundaries, and hazard controls necessary to protect workers, the public, and the environment from adverse consequences. These analyses and hazard controls constitute the safety basis upon which the contractor and DOE rely to conclude that the facility can be operated safely. Performing work consistent with the safety basis provides reasonable assurance of adequate protection of workers, the public, and the environment.
- The safety basis requirements are intended to further the objective of making safety an integral part of how work is performed throughout the DOE complex. Developing a thorough understanding of a nuclear facility, the work to be performed, the associated hazards, and the needed hazard controls is essential to integrating safety into management and work at all levels. Performing work in accordance with the safety basis for a nuclear facility is the realization of that objective.

b. Describe the responsibilities of contractors authorized to operate defense nuclear facilities for the development and maintenance of a DSA.

The following is taken from 10 CFR 830.204.

The contractor responsible for a hazard category 1, 2, or 3 DOE nuclear facility must obtain approval from DOE for the methodology used to prepare the DSA for the facility unless the contractor uses a methodology set forth in 10 CFR 830.204, appendix A to subpart B, "General Statement of Safety Basis Policy," table 2.

The DSA for a hazard category 1, 2, or 3 DOE nuclear facility (as appropriate for the complexities and hazards associated with the facility) must

- describe the facility, including the design of safety structures, systems, and components, and the work to be performed;
- provide a systematic identification of both natural and man-made hazards associated with the facility;
- evaluate normal, abnormal, and accident conditions, including consideration of natural and man-made external events, identification of energy sources or processes that might contribute to the generation or uncontrolled release of radioactive and other hazardous materials, and consideration of the need for analysis of accidents that may be beyond the design basis of the facility;
- derive the hazard controls necessary to ensure adequate protection of workers, the public, and the environment, demonstrate the adequacy of these controls to eliminate, limit, or mitigate identified hazards, and define the process for maintaining the hazard controls current at all times and controlling their use;

- define the characteristics of the safety management programs necessary to ensure the safe operation of the facility, including quality assurance, procedures, maintenance, personnel training, conduct of operations, emergency preparedness, fire protection, waste management, and radiation protection; and
- define, with respect to a nonreactor nuclear facility with fissionable material in a form and amount sufficient to pose a potential for criticality, a criticality safety program that
  - ensures that operations with fissionable material remain subcritical under all normal and credible abnormal conditions;
  - identifies applicable nuclear criticality safety standards; and
  - describes how the program meets applicable nuclear criticality safety standards.

c. Define the following terms and discuss the purpose of each:

- **Design basis**
- **Engineering safety features**
- **Safety analysis**
- **Safety class**
- **Safety significant**
- **Defense in depth**

Design Basis

The following is taken from DOE Order 5480.30, chg 1.

Design basis is the design inputs, the design constraints, and the design analysis and calculations. It includes topical areas such as seismic qualification, fire protections, and safe shutdown. It encompasses consideration of such factors as plant availability, plant efficiency, costs, and maintainability, and that subset that relates to safety and the authorization basis.

Engineering Safety Features

The following is taken from DOE Order 5480.30, chg 1.

Engineered safety features means systems, components, or structures that prevent and/or mitigate the consequences of potential accidents described in the final safety analysis report including the bounding design basis accidents.

Safety Analysis

The following is taken from DOE Order 5480.30, chg 1.

Safety analysis means a documented process

- to provide systematic identification of hazards within a given DOE operation;
- to describe and analyze the adequacy of the measures taken to eliminate, control, or mitigate identified hazards; and
- to analyze and evaluate potential accidents and their associated risks.

Safety Class

The following is taken from DOE Order 5480.30, chg 1.

Safety class pertains to SSCs, including primary environmental monitors and portions of process systems, whose failure could adversely affect the environment, or safety and health of the public as identified by safety analysis.

Safety Significant

The following is taken from DOE N 411.1 (archived).

Safety significant pertains to SSCs that are not designated as safety-class SSCs, but whose preventive or mitigative function is a major contributor to defense-in-depth and/or worker safety as determined from safety analysis.

Defense-in-Depth

The following is taken from DOE G 450.4-1C.

Defense-in-depth is an approach to facility safety that builds in layers of defense against hazards so that no one layer by itself, no matter how good, is completely relied upon. To compensate for potential human mechanical failures, defense-in-depth is based on several layers of protection with successive barriers to prevent the hazard from becoming actualized. This approach includes protection of the barriers, and further measures to protect the public, workers, and the environment from harm in case these barriers are not fully effective.

d. Describe the requirements for the scope and content of a DSA and discuss the general content of each of the required sections of the analysis.

The following is taken from DOE-STD-3009-94, chg 3.

The safety basis emphasizes the controls needed to maintain safe operation of a facility. The level of detail provided in the DSA depends on numerous factors. Applying the guidance for the graded approach in DOE-STD-3009-94, chg 3, will assist the preparer in establishing an acceptable level of detail.

The process of developing a DSA is a process that may require numerous iterations depending on the complexity of the facility and the level of detail required. The hazard and accident analysis are the central elements of this process. The results of the hazard analysis form the basis for grading the level of detail necessary to ensure an acceptable DSA.

The results of the accident analysis specifically identify safety-significant SSCs and specific administrative controls for defense-in-depth and work safety, and TSR controls. The results of the accident analysis form the basis for determining additional safety controls imposed on the facility as a function of the evaluation guidelines.

The following explains the general content of each of the required sections of the DSA:

- Executive summary—provides an overview of the facility safety basis and presents information sufficient to establish a top-level understanding of the facility, its operations, and the results of the safety analysis. It summarizes the facility safety basis as documented in detail in the remainder of the DSA.
- Chapter 1, "Site Characteristics"—provides a description of site characteristics necessary for understanding the facility environs important to the safety basis. Information is provided to support and clarify assumptions used in the hazard and accident analyses to identify and analyze potential external and natural event accident indicators and accident consequences external to the facility.

- Chapter 2, "Facility Description"—provides descriptions of the facility and processes to support assumptions used in the hazard and accident analyses. These descriptions focus on all major facility features necessary to understand the hazard analysis and accident analysis, not just safety SSCs.
- Chapter 3, "Hazard and Accident Analyses"—describes the process used to systematically identify and assess hazards to evaluate the potential internal, man-made external, and natural events that can cause the identified hazards to develop into accidents; presents the results of this hazard identification and assessment process; and covers the topics of hazard identification, facility hazard categorization, hazard evaluation, and accident analysis.
- Chapter 4, "Safety Structures, Systems, and Components"—provides details on those facility SSCs that are necessary for the facility to protect the public, provide defense-in-depth, or contribute to work safety, and provides details on specific administrative controls that are significant to specific accident risk reduction.
- Chapter 5, "Derivation of Technical Safety Requirements"—builds upon the control functions determined to be essential in chapters 3 and 4 to derive TSRs. Supports and provides the information necessary for the separate TSR document required by 10 CFR 830.205, "Technical Safety Requirements."
- Chapter 6, "Prevention of Inadvertent Criticality"—provides information that will support the development of a safety basis in compliance with the provisions of 10 CFR 830.204 regarding the definition of a criticality safety program. If this information is available in a site-wide criticality safety program description, and it complies with the rule requirements, then it can be included by reference and summarized in this chapter.
- Chapter 7, "Radiation Protection"—summarizes provisions for radiation protection. Summaries focus on radiation protection based on facility hazards to provide a basic understanding of the scope of the radiation protection program (RPP).
- Chapter 8, "Hazardous Material Protection"—summarizes provisions for hazardous material protection other than radiological hazards. Summaries focus on hazardous material protection based on facility hazards to provide a basic understanding of the scope of the hazardous material protection program.
- Chapter 9, "Radioactive and Hazardous Waste Management"—describes the provisions for radioactive and hazardous waste management.
- Chapter 10, "Initial Testing, In-Service Surveillance, and Maintenance"—describes the essential features of the testing, surveillance, and maintenance programs.
- Chapter 11, "Operational Safety"—describes the bases for the conduct of operations programs and the fire protection program.
- Chapter 12, "Procedures and Training"—describes the processes by which the technical content of the procedures and training programs are developed, verified, and validated. These processes will ensure that the facility is operated and maintained by personnel who are well qualified and competent to carry out their job responsibilities, using procedures and training elements that have been well developed and are kept current by the use of feedback and continuous improvement.
- Chapter 13, "Human Factors"—focuses exclusively on human factors engineering.
- Chapter 14, "Quality Assurance"—describes the provisions for a quality assurance program.

- Chapter 15, "Emergency Preparedness Program"—summarizes the emergency preparedness functions and response at the facility.
- Chapter 16, "Provisions for Decontamination and Decommissioning"—describes provisions that facilitate future D&D of a facility. Design of significant modifications to an existing facility must consider provisions for D&D and this chapter contains guidance on the description of the conceptual D&D plan for existing facilities.
- Chapter 17, "Management, Organization, and Institutional Safety Provisions"—presents information on management, technical, and other organizations that support safe operations. It enumerates the requirements used to develop the safety management programs, includes descriptions of the responsibilities of and relationships between the non-operating organizations having a safety function and their interfaces with the line operating organization, and presents sufficient information on the safety management policies and programs to demonstrate that the facility operations are embedded in a safety conscious environment.

e. Discuss the approval requirements for a DSA for new facilities and subsequent changes to the analysis. Review and evaluate a chapter of a DSA. Discuss the approval requirements.

The following is taken from DOE G 421.1-2A.

DOE employs DSAs, TSRs, and safety evaluation reports (SERs) as the principal safety documentation in its decision to authorize operation of nuclear facilities. DOE-STD-1104-2009, *Review and Approval of Nonreactor Nuclear Facility Safety Basis and Safety Design Basis Documents*, provides guidance on the preparation of SERs. The SER is primarily a management document that provides the approval authority, the basis for the extent and detail of the DSA review, and the basis for any conditions of DSA approval.

[Note: The review and evaluation of a DSA is a performance-based competency. The Qualifying Official will evaluate the completion of this portion of this competency.]

f. Define who approves facility operations prior to achieving DSA upgrade approval.

The following is taken from DOE-STD-1104-2009.

Revisions of DSAs and TSRs, including DSA annual updates, undergo review and approval by DOE. Review and approval of revisions are a matter of endorsing the incorporation of changes in the safety basis since the last approval rather than performing a new assessment of the previously approved safety basis documents. Modifications to the facility operations not encompassed by the safety basis as documented in a DSA and TSRs invoke the USQ process. Therefore, revisions are generally administrative and/or editorial in nature in that they incorporate final disposition of USQs, conditions of approval stated in the existing SER, and/or minor changes that clarify the safety basis documentation. For this reason, administrative and editorial revisions determined not to involve a USQ can be performed by the facility contractor at any time without prior DOE approval. It is recommended that the facility contractor provide a copy of the revision, with a discussion of the changes, to the safety basis approval authority within 30 days of implementing the changes for subsequent DOE review and approval. Review and approval of revisions of DSAs and TSRs do not

typically warrant a significant new effort (e.g., detailed review plan, formal review team) and may be as simple as merely indicating the latest revision numbers for simple administrative and/or editorial changes.

g. Discuss the provisions for temporary and permanent exemptions from the requirements of DOE-STD-3009-94 (Change Notice No. 2, April 2002), *Preparation Guide for U.S. Department of Energy Nonreactor Facility Safety Analyses Reports,* and 10 CFR 830.204, "Documented Safety Analysis."

[Note: DOE-STD-3009-94, chg 2, has been superseded by DOE-STD-3009-94, chg 3.]

The following is taken from 10 CFR 820.64.

An exemption may contain appropriate terms and conditions including, but not limited to, provisions that

- limit its duration;
- require alternative action;
- require partial compliance; or
- establish a schedule for full or partial compliance.

The following is taken from 10 CFR 820.62.

The criteria for granting an exemption to a DOE nuclear safety requirement are determinations that the exemption

- would be authorized by law;
- would not present an undue risk to public health and safety, the environment, or facility workers;
- would be consistent with the safe operation of a DOE nuclear facility; and involves special circumstances, including the following:
  - Application of the requirement in the particular circumstances conflicts with other requirements
  - Application of the requirement in the particular circumstances would not serve or is not necessary to achieve its underlying purpose, or would result in resource impacts that are not justified by the safety improvements
  - Application of the requirement would result in a situation significantly different than that contemplated when the requirement was adopted, or that is significantly different from that encountered by others similarly situated
  - The exemption would result in benefit to human health and safety that compensates for any detriment that may result from the grant of the exemption
  - Circumstances exist that would justify temporary relief from application of the requirement while taking good faith action to achieve compliance
  - There is present any other material circumstance not considered when the requirement was adopted for which it would be in the public interest to grant an exemption

h. Discuss the requirements for the contractor to maintain the DSA current.

The following is taken from DOE G 421.1-2A.

In accordance with 10 CFR 830.202, "Safety Basis," contractors must ensure that information in a DSA is current and applicable. The safety basis rule applies to all facilities

that satisfy the criteria for category 3 or higher hazard nuclear facilities except those specifically excluded in 10 CFR 830.2, "Exclusions." Therefore, when a facility changes status, say from a production or mission-oriented status to inactive, transition surveillance and maintenance, deactivation activities, or decommissioning, the DSA and TSR associated with the facility or activity needs to be updated to describe the activities, consider the hazards associated with the new status, and the controls associated with these hazards. Any facility or activity DSA that does not reflect its current status is out of compliance with the safety basis rule. The annual update required by the rule applies to all DSAs. DOE contractors and DOE remain accountable for safety during the period those DSAs are being updated.

The USQ requirements have a primary role in preserving the DOE safety basis for each nuclear facility. The concept of the USQ allows contractors to make physical and procedural changes and to conduct tests and experiments without prior DOE approval as long as these changes do not affect the safety basis of the facility.

When a facility does not change status, but does have changes that affect the safety basis, the DSA and TSR should be updated to reflect those changes. Usually the changes will be the subject of a USQ determination. If there are no changes, notifying DOE of that fact is sufficient for the update. The rule is silent on a cutoff date for changes to the facility to be included in a DSA update. This can be determined on an ad hoc basis, but should be compatible with the annual report on USQ determinations. The USQ determinations and associated safety analyses as well as supporting safety analyses for any DOE-approved changes to a facility are considered part of the safety basis until incorporated in an annual update.

The contractor responsible for a facility can provide annual DSA updates by

- stating in a letter to DOE that the existing DSA remains fully applicable;
- providing supplements or amendments to make the DSA current, to DOE approval; or
- submitting, for DOE approval, a DSA that is proposed to supersede the current DSA.

Generally, depending upon the complexity of the facility, it may be impractical to incorporate the most recent USQ determinations and facility changes into the DSA annual update. However, at least those implemented six months or more before the submittal of the annual update should be included. In addition, 10 CFR 830.203, "Unreviewed Safety Question Process," requires that the contractor responsible for a hazard category 1, 2, or 3 DOE nuclear facility must annually submit to DOE a summary of the USQ determinations performed since the prior submission.

Consistent with the ISM requirements for feedback specified in the DEAR clause 48 CFR 970.5223-1, DOE expects that updates of DSA for facilities in operation for one year or more will address the results of the experience feedback program for that facility.

5. A technical program manager shall demonstrate a working level knowledge to determine the existence of a USQ in accordance with 10 CFR 830.203, "Unreviewed Safety Question Process."

a. Discuss the reasons for performing a USQ determination.

The following is taken from 10 CFR 830.203.

The contractor responsible for a hazard category 1, 2, or 3 DOE nuclear facility must implement the DOE-approved USQ procedure in situations where there is a

- temporary or permanent change in the facility as described in the existing DSA;
- temporary or permanent change in the procedures as described in the existing DSA;
- test or experiment not described in the existing DSA; or
- potential inadequacy of the DSA because the analysis may not be bounding or may be otherwise inadequate.

b. Define the following terms:

- **Accident analysis**
- **Safety evaluation**
- **TSRs**

Accident Analysis

The following is taken from DOE-STD-1027-92.

An accident analysis is used not only to provide insight into the vulnerabilities in the system, but to improve the system and reduce the consequences of accidents. Accident analysis consists of four distinct elements: release mechanism analysis, sequence selection, engineering analysis, and consequence analysis.

Safety Evaluation

The following is taken from DOE Order 5480.21 (archived).

A safety evaluation is that record required documenting the review of a "change." This document records the scope of the evaluation and the logic for determining whether or not a USQ exists.

TSRs

The following is taken from DOE-HDBK-1188-2006.

TSRs are the limits, controls, and related actions that establish the specific parameters and requisite actions for the safe operation of a nuclear facility and include, as appropriate for the work and the hazards identified in the DSA for the facility, safety limits, operating limits, surveillance requirements, administrative and management controls, use and application provisions, and design features, as well as a bases appendix.

c. Describe the situation in which a safety evaluation is required.

The following is taken from 10 CFR 830.203.

The situations in which a safety evaluation is required are the same as those for a USQ and are as follows:

- Temporary or permanent changes in the facility as described in the existing safety analyses
- Temporary or permanent changes in the procedures as described in existing safety analyses

- Tests or experiments not described in existing safety analyses

d. Define the conditions for a USQ.

The following was taken from 10 CFR 830.3.

An USQ refers to a situation where

- the probability of the occurrence or the consequences of an accident or the malfunction of equipment important to safety previously evaluated in the DSA could be increased;
- the possibility of an accident or malfunction of a different type than any evaluated previously in the DSA could be created;
- a margin of safety could be reduced; or
- the DSA may not be bounding or may be otherwise inadequate.

e. Describe the responsibilities of contractors authorized to operate DOE nuclear facilities for safety evaluations.

The following is taken from DOE G 421.1-2 (archived).

10 CFR 830.201, "Performance of Work"; 830.202; 830.204; 830.206, "Preliminary Documented Safety Analysis"; and 830.207, "Department of Energy Approval of Safety Basis," require that a contractor responsible for a DOE hazard category 1, 2, or 3 nuclear facility must

- establish and maintain a safety basis for the facility;
- perform work in accordance with the safety basis and, in particular, with the hazard controls that ensure adequate protection of workers, the public, and the environment; and
- perform work at an existing DOE nuclear facility in accordance with the facility safety basis in effect on October 10, 2000, or approved by DOE at a later date, and maintain the existing safety basis consistent with the rule requirement, pending issuance of an SAR in which DOE approves the safety basis.

In establishing the safety basis for a hazard category 1, 2, or 3 DOE nuclear facility, the contractor responsible for the facility must

- define the scope of the work to be performed;
- identify and analyze the hazards associated with the work;
- categorize the facility consistent with DOE-STD-1027, or successor document;
- prepare a DSA for the facility; and
- establish the hazard controls on which the contractor will rely to ensure adequate protection of workers, the public, and the environment.

f. Describe the actions to be taken by a contractor upon identifying information that indicates a potential inadequacy of a previous safety analysis or a possible reduction in the margin of safety as defined in the TSRs.

The following is taken from DOE G 424.1-1B.

Written USQDs are needed when a contractor identifies, or is informed of, a situation that indicates that the safety analyses that support the DOE-approved safety basis may not be binding or may otherwise be inadequate.

Because a safety analysis inadequacy has potential to call into question information on which authorization of operations is based, the contractor is to

- take action, as appropriate, to place or maintain the facility in a safe condition until an evaluation of the safety of the situation is completed;
- notify DOE of the situation;
- perform a USQD and notify DOE promptly of the results; and
- submit the evaluation of the safety of the situation to DOE prior to removing any operational restrictions that were initiated.

g. Discuss the actions to be taken if it is determined that a USQ is involved. Given a hypothetical situation, develop a USQ for review and evaluation.

The following is taken from DOE G 424.1-1B.

In performing USQDs of a proposed change, documented justification for the USQD should be developed. Consistent with the intent of 10 CFR 830.203, this documentation should be complete in the sense that a qualified independent reviewer could draw the same conclusion.

Contractors should develop procedures that provide detailed guidance for the performance of the USQ process, including any screening, and the USQDs. The procedures should

- define the purpose;
- set forth applicability;
- provide definitions of appropriate terms, screening criteria, and the bases for their application;
- include detailed guidance on what is to be considered and evaluated when performing or reviewing a USQD;
- define the qualifications and responsibilities of personnel performing and reviewing USQDs; and
- require documentation for each USQD.

DOE relies on contractor implementation of the USQ process to preserve the integrity of the safety basis while allowing flexibility in operation. The contractor responsible for DOE hazard category 1, 2, or 3 nuclear facilities must submit the procedure that defines its USQ process to DOE for approval as required by 10 CFR 830.203.

The second part of this KSA is performance based. The Qualifying Official will evaluate its completion.

h. Discuss the qualification and training requirements for personnel who perform safety evaluations.

The following is taken from DOE-STD-1135-99.

An important function of a criticality safety engineer is effective preparation of nuclear criticality safety (NCS) evaluations. NCS evaluations are performed to technically demonstrate the subcriticality of fissionable material processes, operations, and situations for transportation and storage under all normal and credible abnormal conditions. Evaluators should use configuration controlled, verified, and validated software and data sets; handbook

techniques and data shown to be valid; or direct comparisons with critical and subcritical experiment data. The NCS engineer will prepare NCS evaluations in accordance with the guidance in DOE-STD-3007-2007, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-reactor Nuclear Facilities*.

The results from the evaluations will be categorized as passive-engineered, active-engineered, or administrative controls. The preferred method of control is by passive engineered equipment design features. When engineered methods of control are not practical, administrative control methods may be used. When establishing NCS controls, the NCS engineer will consult with operations personnel and should be familiar with other programs that directly related to criticality safety such as human factors, fire safety, safeguards, and radiological control.

The training process for this competency is most effective when completed at the engineer's facility with the aid of a qualified NCS engineer.

The individual should be able to do the following:

- Develop contingency analysis, limits, and controls
- Describe key personnel needed to assist in preparation of criticality safety evaluations and determination of process upsets
- Describe how subcritical margins and limits are determined
- Describe when validation and bias estimates must be considered
- Describe typical criteria to consider when evaluating various fissile processes, including common process upsets: aqueous, metal, recovery, fabrication/foundry, mixed waste
- Describe criteria to consider for evaluating material storage: pits, waste, fuel elements, solutions, metal parts
- Discuss the industry reference material used in determination of critical mass: Los Alamos (LA)-10860-MS, *Critical Dimensions of Systems Containing ^{235}U, ^{239}Pu, and ^{233}U*; LA 12808, *Nuclear Criticality Safety Guide*; and Technical Information Document 7016, revision 2, *Nuclear Safety Guide*
- Describe elements to consider when preparing an SAR for packaging
- Discuss the effects and applications of the following factors relevant to criticality safety of operations: mass, interaction, geometry, moderation, reflection, concentration, volume, neutron absorbers, and enrichment
- Discuss the influence of the presence of non-fissionable materials mixed with, or in contact with, fissionable material on NCS
- Discuss the concept of contingencies for checking the validity of criticality safety limits and controls
- Discuss the methods used in the calculation of criticality safety, source term, environmental transport, and dose assessment activities including commonly used computer models
- Demonstrate familiarity with the published histories of criticality accidents with emphasis on the control failures, terminating mechanisms, and resulting radiation hazards/health consequences to nearby personnel

6. A technical program manager shall demonstrate the ability to trend and analyze safety-related performance data.

a. Discuss the key processes used in trending and analysis of performance information.

The following is taken from DOE G 120.1-5.

The performance measures should

- reflect the results of our efforts;
- enable continuous improvement of our programs processes;
- help move the performance measurement program to a successful conclusion; and
- provide critical information to foster accountability.

This can only happen if management receives timely, complete, and accurate reports. It is essential to analyze and interpret all performance data quickly and accurately.

Routine data analysis procedures have been established to allow quick look reports to be generated and loaded on the existing computer network. These reports overlay targets on the actual data so that managers will have up-to-date trending charts, data tables, and analytical comparisons. This approach of continuously visible results helps ensure that performance stays on track and that it facilitates continuous improvement.

In order to assure data quality and relevance, the performance measurement team will conduct formal reviews each quarter. They will assess the usefulness and validity of the measures, and propose changes to management as needed. In addition, the team has requested that the performance data be examined by the external auditors as part of their periodic visits.

Video 5. Trending and analysis
http://www.youtube.com/watch?v=e4VYiQbUj04

b. Discuss the key process to develop and implement metrics and performance measures, validate performance against metrics and performance measures, and trend/analyze data to establish a continuous improvement program.

The following was taken from DOE G 120.1-5.

The fundamental purposes of performance measurement are to provide insights into operations and to support planning (to make adjustments in organization goals, strategies, and programs that translate into improved products and services to customers and stakeholders). The approach outlined in DOE G 120.1-5, *Guidelines for Performance Measurement*, assumes that the organization already has a strategic plan. Development of performance measures relies on the description of the organization that comes from strategic planning.

Step 1: Use a Collaborative Process

Develop the measurements using collaborative processes and include the people whose work will be measured and the people who will implement important parts of the measurement

process (if they are different). Obtain commitment to the measures and measurement approach from the organization's top management. In order for the measures to be taken seriously, it is extremely important that top managers support the performance measurement process.

Step 2: Describe the Individual Organization Processes

The frameworks provide the most help in steps 2 and 3. If the measures are being developed for the first time, pick the one that makes the most sense and start. If there is already a system of measures in place, it is reasonable to look at other frameworks. They may help to improve the existing measures.

Develop a flow process model or input/output chart that defines the organization's main activities as follows:

- What are the main business processes?
- What are the inputs to the organization and their sources?
- What are outputs (e.g., products and services) from the organization?
- Who are the customers (e.g., the users of the products and services)?
- What are the desired outcomes for each business area?
- What are the critical support functions (e.g., resource management) within the organization?

This work may have already been done during the organization's strategic planning effort.

Step 3: Design the Measurements

When designing performance measures

- identify information requirements from strategic plans;
- understand the information requirements of organizations between the organization planner and the secretary;
- consider the impact of the measures defined on organizations that support the organization doing the planning;
- select a few balanced measurements; and
- avoid "yes/no" and milestone measures.

Design performance measures to demonstrate progress toward achieving the strategic and shorter-term goals laid out in the organization's strategic plan. This will identify the information needs. Make sure information is identified to measure inputs, outputs, and outcomes for each business area. Identify some long-term, multi-year measures, for purposes of monitoring long-term performance.

Consider the organization's location within the DOE hierarchy, measures needed for reporting upward, and measures defined by parallel organizations particularly those that use the same support organizations. Consider measures in use by "best in class" organizations. If they fill one of the organization's needs, adopt them.

Carefully consider the resource impact of measurement implementation on support organizations. Coordinate and establish standard definitions and reporting methods to ensure translation or integration of measures between and across multiple DOE organizations and organizational levels.

Be selective in defining the actual measures to be generated. It is quite easy to measure too much. The process by which performance measurement data will be obtained should be defined at the same time the performance measure is defined. Developing a few particularly relevant measures is a good conceptual goal and is not easy to do. Balance (i.e., measuring multiple facets of your organization) assures that no aspect of the organization will suffer while another part is improved.

Avoid "yes/no" performance measures, if possible. There is no valid calibration of the level of performance for this type of measure, and it does not motivate improvement. It is difficult to improve upon the "pass" in a pass or fail measure.

Designing measures involves up-front analytical considerations. Quantitative measures are preferred because they yield comparative data about trends that support continuous improvement. In some cases, milestone measurement may be all the planner can come up with. An example is progress on meeting NEPA milestones. Milestones may be acceptable measures when accompanied by an assessment of the organization's ability to meet the performance expectation.

Step 4: Collect the Data

Consider the information required and what data are needed to fill the requirement. Survey what data are available and determine what new data are necessary. Decide

- how data should be collected;
- how data should be normalized; i.e., how data can be expressed in relative terms such as a rate or percentage to make reporting more meaningful and to allow comparison with results from other sources; and
- how frequently data should be collected and information reported.

When collecting data for the first time, include data from the past, as well as the present, to the degree possible. This provides a baseline for assessing the current information and demonstrating future improvements. It is difficult to set realistic goals and determine trends before baseline information is available.

Measurements are only useful if the produced values are valid. Ensure data quality because it is crucial to delivering useful information. Data controls are a key facet of the data quality problem and involve standardizing data definitions and naming conventions as well as developing useful information. Be sure the individuals whose work is measured buy into the prescribed measures. Problems typically arise when the involved personnel view the measures as a threat (e.g., process owners who fear programmatic retribution may bias performance results).

Collection and reporting frequency are dictated by the type of information and its intended use. Collection and reporting frequency do not have to be the same. Monthly data may be examined once a year or monthly.

Balance the data needs against the costs. The demands for data collection should be driven by need considerations, not data collection conveniences. Convenient data may not measure what is needed.

Step 5: Use the Data

There is a difference between collecting data and translating data into useful information. Collected data should be processed and presented in meaningful ways:

- Communicate results internally and externally
- Feed performance results back into strategic planning, budget formulation, and budget justification including performance planning
- Evaluate the program's performance

Analyze, display, and publicize performance measures within the organization. Provide sufficient training so that all employees can understand what is being measured and why, and most important, how the organization is performing. Employees will want to know how they contribute to the measured activities. Use the information to identify needed improvements and set goals for the future. These activities assure that everyone understands the importance of measurement and supports the process.

Once the baseline data is developed and understood, compare the organization's performance to best in class organizations, if practical and possible. Determine current performance levels, compare the organization with organizations that embody the qualities that it is striving to achieve, and establish future performance expectations.

Step 6: Continually Improve the Measurement Process

Expect to change the measures and measurement process to respond to changing needs and priorities. Apply the concept of continuous improvement to the measurement system to make sure the measures make sense and measure the right things. Care should be taken not to change the measures without careful consideration as changes may make trend analysis impossible.

c. Discuss the importance and key elements of the following:

- **Maintenance history**
- **Operational incident/occurrence report data**
- **Security infractions**
- **Safety incidents**
- **Radiation exposure and incident reporting**
- **Schedule variances**
- **Counterfeit and suspect parts**

Maintenance History

The following is taken from DOE G 433.1-1A.

A maintenance history and trending program should be implemented to document maintenance performed, to provide historical information for maintenance planning, to support maintenance and performance trending of facility systems and components, and to improve facility reliability. The documentation of completed, detailed, and usable history will be increasingly important as plant-life extension becomes an issue. Maintenance history enables trending to identify improvements for the maintenance program and needed equipment replacements or modifications. This history should assist in ensuring that root causes of failures are determined, corrected, and used in future work planning.

The maintenance history program should clearly identify the SSCs for which a history is to be maintained, the data to be collected, methods for recording data, and uses for the data. Typically, maintenance history is maintained for all SSCs for which periodic maintenance is performed. The program should include the type of equipment, model, serial and identification numbers, location information, and other information.

At a minimum, each SSC included in the safety basis should have a separate maintenance history file. An essential element of the history file is a chronological record (beginning with the date of installation) of the completion data of each work order (for all types of work orders and service calls) including the date of completion, worker notes on completed work orders, labor hours expended, etc. The history file should include data on each review of the history including results of the review, date of review, and names of personnel who performed the review.

Currently, most maintenance history systems are contained in computerized maintenance management software (CMMS). Some CMMS systems are linked to electronic maintenance manuals created by scanning the paper manuals. The elements of maintenance history are the same for paper-based and software-based systems. For both types of systems, engineering review and analysis should be performed to ensure the overall maintenance history program contains all the necessary elements. Whether electronically or manually maintained, the historical data should be easy to access for all groups needing the information.

Operational Incident/Occurrence Report Data

The following is taken from DOE O 232.2.

For reportable occurrences, contractors must categorize the occurrences, notify DOE as required, and prepare and submit occurrence reports. At sites with more than one facility management contractor, contractors may make arrangements for one of the contractors to prepare and submit reports for the entire site. However, each contractor must ensure that occurrence reports are submitted properly for activities within their scope of work.

The documentation and distribution requirements must be satisfied by using DOE's centralized unclassified operational database, the computerized occurrence reporting and processing system (ORPS).

Local implementing procedures may specify additional learning and reporting requirements beyond those stated in DOE O 232.2, but must at a minimum include all requirements of DOE O 232.2.

Security Infractions

The following is taken from the *DOE Headquarters Security Overview Handbook*.

A security infraction is any knowing, willful, or negligent action contrary to regulatory requirements and DOE directives that does not constitute a violation. Committing a security infraction may result in administrative discipline, including loss of access authorization. The incidents listed in the following may be considered security infractions. Note that this list is not all-inclusive. If security personnel find these actions were intentional or caused by gross negligence, the action may constitute a violation, resulting in criminal prosecution or other administrative action.

Infractions include the following:

- Leaving classified documents or material exposed and unattended or unsecured, to include leaving a classified repository open and unattended
- Failing to properly safeguard classified documents or combinations to repositories
- Changing a document's classification marking without proper authority
- Destroying classified documents in other than the prescribed manner
- Improper transmission of classified documents or material
- Failing to report known or suspected incidents of security concern
- Failing to escort uncleared persons within security areas
- Failing to comply with cyber security policy
- Unauthorized possession of prohibited articles in HQ facilities

Safety Incidents

The following is taken from DOE O 231.1B.

All recordable, work-related employee fatalities, injuries, and illnesses must be recorded on OSHA Form 300, "Log of Work-Related Injuries and Illnesses," in accordance with 29 CFR 1904.29, "Forms," and must be updated in accordance with 29 CFR 1904.33, "Retention and Updating." An annual summary of the information contained on OSHA Form 300 must be compiled, certified, posted, and updated using OSHA Form 300A, "Summary of Work-Related Injuries and Illnesses," in accordance with 29 CFR 1904.29 and 29 CFR 1904.32, "Annual Summary," and 29 CFR 1903.33, "Enforcement of Nondiscrimination on the Basis of Handicap in Programs or Activities Conducted by the Department of Labor."

Injury and illness incident reports must be recorded in accordance with 29 CFR 1904.29 and submitted electronically using the computerized accident/incident reporting system (CAIRS), individual accident/incident report format to the CAIRS database by using either CAIRS bulk upload processing or CAIRS direct data entry. Each data field on the report must be complete when the report is submitted electronically. New reports must be submitted for receipt on or about the fifteenth and the last working day of the month. Initial reports must include the actual number of days away, restricted, or transferred (DART) as of the date of the report. Updates to the number of DART or other information previously reported for each case must be submitted quarterly until the case is closed or until the number of DART exceeds 180 days. Quarterly revisions to DART or revisions to other previously-reported information must be submitted for receipt by the tenth of the month following the end of the calendar quarter.

DOE Form 5484.4, "Tabulation of Work Hours," must be used to report total work-hours for all employees. Total work-hours must be submitted electronically on a quarterly basis to CAIRS using CAIRS direct data entry by the tenth of the month following the end of each quarter; i.e., April 10th, July 10th, October 10th, and January 10th.

Documented quality checks of injury and illness information reported to DOE through CAIRS must be conducted at least quarterly to ensure information is thorough, accurate, and consistent with information contained in local records. Occupational injury and illness information must be analyzed to identify adverse trends and lessons learned and develop corrective actions that prevent recurrence.

Discrepancies identified by DOE during periodic assessments or by other reviews of work-related injury and illness records must be corrected as directed by the DOE reviewing organization.

Radiation Exposure and Incident Reporting

The following is taken from DOE O 231.1B.

Annual radiation exposure records for the preceding monitoring year, required to be collected by 10 CFR 835.702, "Individual Monitoring Records," must be reported to the Radiation Exposure Monitoring System (REMS) repository by March 31. The records must include exposure records for special individuals as defined in DOE O 231.1B, attachment 4, "Reporting Ionizing Radiation Exposure Information."

Revisions to radiation exposure records for monitoring periods beginning on or after January 1, 1989, must be reported to the REMS repository. Revised records for prior monitoring years must be submitted by March 31. However, if the revised dose record results in a dose exceeding regulatory dose limits defined in 10 CFR 835.202, "Occupational Dose Limits for General Employees," revised records must be submitted within 30 days of the revision to the dose record. Revised records must be submitted to the REMS repository in a separate file in the same format as annual records. The transmittal documentation must identify the enclosed records as revised records.

Schedule Variances

The following is taken from DOE O 413.3B.

A variance is a deviation or departure from the approved scope, cost, or schedule performance. Variances must be tracked and reported. They should not be eliminated, but mitigated through corrective actions. Baseline changes, if needed, are submitted for changes in technical scope, funding, or directed changes.

The following is taken from DOE G 413.3-5A.

The process of allocation is used to distribute resources across multiple project activities within known limits and expected constraints. Some activities may be re-sequenced to compress the schedule and/or to obtain a more level distribution of resources.

Critical path computations performed during the network analysis determine the slack along each path in the project schedule. Based on the length and location of this slack, certain activities can be moved forward or backward in time without affecting the completion date of the project. Consequently, this movement can be used to develop a schedule that satisfies external constraints placed on the type and quantity of resources available during various phases of the project.

Counterfeit and Suspect Parts

The following is taken from DOE O 414.1D.

Suspect/counterfeit items (S/CIs) are items that are suspect when inspection or testing indicates that they may not conform to established government or industry-accepted specifications or natural consensus standards or whose documentation, appearance,

performance, material, or other characteristics may have been misrepresented by the vendor, supplier, distributor, or manufacturer.

A counterfeit item is one that has been copied or substituted without legal right or authority or whose material, performance, or characteristics have been misrepresented by the vendor, supplier, distributor, or manufacturer. Items that do not conform to established requirements are not normally considered S/CI if non-conformity results from one or more of the following conditions:

- Defects resulting from inadequate design or production quality control (QC)
- Damage during shipping, handling, or storage
- Improper installation
- Deterioration during service
- Degradation during removal
- Failure resulting from aging or misapplication
- Other controllable causes

The following is taken from DOE/EH-0674.

An item identified as S/CI may have one or more of the indications described above and not be fraudulent. If an item exhibits some of the indications listed above, it may warrant further investigation and be considered suspect. Contact with the supplier and/or manufacturer may help establish whether the item in question has a QC problem or is actually fraudulent.

d. Given an occurrence report, determine whether

- **review process is adequate**
- **causes are appropriately defined**
- **corrective actions address causes**
- **lessons learned are appropriate**
- **corrective actions are completed**

e. Given DOE G 231.1-1, *Occurrence Reporting and Performance Analysis Guide*, discuss key elements of this guide and how they might be applied. [Note: DOE G 231.1-1 has been replaced by DOE O 232.2.]

f. Given incident/occurrence report data for a specified period, analyze the information for contributing factors and safety trends.

Elements d through f are performance based KSAs. The Qualifying Official will evaluate their completion.

7. A technical program manager shall demonstrate a familiarity level knowledge of the Price-Anderson Amendment Act (PAAA) of 1988 and its impact on DOE activities.

a. Describe the purpose and scope of the PAAA.

The following is taken from American Nuclear Society, Background for Position Statement 54.

The Price-Anderson Act was enacted into law in 1957 and has been revised several times. It constitutes section 170 of the AEA. The latest revision was enacted through the Energy Policy Act of 2005, and extended it through December 31, 2025.

The main purpose of the PAAA is to ensure the availability of a large pool of funds to provide prompt and orderly compensation to members of the public who incur damages from a nuclear or radiological incident no matter who might be liable.

The PAAA provides omnibus coverage; that is, the same protection available for a covered licensee or contractor extends through indemnification to any persons who may be legally liable, regardless of their identity or relationship to the licensed activity. Because the PAAA channels the obligation to pay compensation for damages, a claimant need not sue several parties but can bring its claim to the licensee or contractor.

The following is taken from DOE Report to Congress on the Price-Anderson Act.

With respect to activities conducted for DOE, the PAAA achieves its objectives by requiring DOE to include an indemnification in each contract that involves the risk of a nuclear incident.

This DOE indemnification (1) provides omnibus coverage of a DOE contractor and all other persons who might be legally liable for injury or damage resulting from a nuclear incident; (2) indemnifies fully all legal liability up to the statutory limit on such liability; (3) covers any DOE contractual activity that might result in a nuclear incident in the United States; (4) is not subject to the availability of appropriated funds; and (5) is mandatory and exclusive. The DEAR sets forth standard nuclear indemnification clauses that are incorporated into all DOE contracts and subcontracts involving source, special nuclear, or by-product material.

Video 6. Price-Anderson Amendment Act
http://www.youtube.com/watch?v=zcP6Q1A-c1Q

b. Discuss the PAAA's applicability to the Department's activities and the regulations associated with its implementation.

The following is taken from 10 CFR 820, appendix A.

The PAAA provides DOE with the authority to compromise, modify, or remit civil penalties with or without conditions. In implementing the PAAA, DOE will carefully consider the facts of each case of noncompliance and will exercise appropriate discretion in taking any enforcement action. Part of the function of a sound enforcement program is to assure a proper and continuing level of safety vigilance. The reasonable exercise of enforcement authority will be facilitated by the appropriate application of safety requirements to nuclear facilities and by promoting and coordinating the proper contractor and DOE safety compliance attitude toward those requirements.

c. Discuss the civil and criminal penalties imposed on the Department, management, and operating contractors and subcontractors as the result of a violation of applicable rules and regulations.

The following is taken from 10 CFR 820, appendix A.

Section 17 of the PAAA makes most DOE contractors covered by the DOE Price-Anderson indemnification system, and their subcontractors and suppliers, subject to civil penalties for

violations of applicable DOE nuclear safety rules, regulations and orders. Furthermore, section 18 of the PAAA makes all employees of DOE contractors, and their subcontractors and suppliers, subject to criminal penalties, including monetary penalties and imprisonment, for knowing and willful violations of applicable DOE nuclear safety rules, regulations, and orders. Suspected, or alleged, criminal violations are referred to the Department of Justice for appropriate action. Therefore, DOE's enforcement authority and policy will apply only to civil penalties since decisions on criminal violations are the responsibility of the Department of Justice. However, referral of a case to the Department of Justice does not preclude DOE from taking civil enforcement action in accordance with this policy statement. Such actions will be coordinated with the Department of Justice to the extent practicable.

d. Discuss the general requirements associated with the topics below, as they are affected by the following rule-making aspects of PAAA:

- **Occupational radiation safety**
- **SARs**
- **USQs**
- **Quality assurance requirements**
- **Conduct of operations at DOE nuclear facilities**
- **TSRs**
- **Occurrences at DOE nuclear facilities**

The following is taken from 10 CFR 820, appendix A.

10 CFR 820 sets forth the general framework through which DOE will seek to ensure compliance with its enforceable nuclear safety regulations and Orders and, in particular, exercise the civil penalty authority provided to DOE in the PAAA. The policy set forth herein is applicable to violations of DOE nuclear safety requirements by DOE contractors who are indemnified under PAAA, and their subcontractors and suppliers.

Currently, four rules are enforced as nuclear safety rules. They are

- 10 CFR 820, "Procedural Rules for DOE Nuclear Activities";
- 10 CFR 830, "Nuclear Safety Management";
- 10 CFR 835, "Occupational Radiation Protection"; and
- 10 CFR 820.11, "Information Accuracy Requirements".

Occupational Radiation Safety

The objective of the occupational radiation safety cornerstone is to ensure adequate protection of worker health and safety from exposure to radiation from radioactive material during routine civilian nuclear reactor operation. This exposure could come from poorly controlled or uncontrolled radiation areas or radioactive material that unnecessarily exposes workers. Licensees can maintain occupational worker protection by meeting applicable regulatory limits and ALARA guidelines.

SARs

The following is taken from the DOE, Oak Ridge Operations Office, *Nuclear Facility Safety Basis Fundamentals Self-Study Guide*.

Some of the older terms applied to safety basis documents that may still be encountered include (a) the safety analysis report (SAR), which is now the DSA, and (b) the operational safety requirement, which is now the TSR.

Operations outside of the approved safety basis may reduce the margin of safety for a facility, could remove a barrier (assumed to be in place) that mitigates a release or accident, and could place the operation or facility in an unsafe or unanalyzed condition. Operation outside the safety basis places the facility outside of the risk envelope that DOE has accepted for the facility, and it may carry legal and financial penalties under PAAA.

The key ways to keep operations within the safety basis are as follows:

- Keep the systems, equipment, and components as they are described in the safety basis documents
- Operate within the constraints of the limits, procedures, tests, and experiments described in the safety basis documents
- Implement a change control process that determines if a proposed change, test, experiment, or discovery has an effect (explicitly or implicitly) on the safety basis

USQs

The following is taken from EM-HQ, *ISM Description*.

USQ evaluations are important in maintaining the integrity of safety basis documents. A USQ exists if one or more of the following conditions result:

- The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety as previously evaluated in the DSA could be measured.
- The possibility for an accident or malfunction of a different type than any previously evaluated in the DSA could be created.
- Any margin of safety as defined in the bases of the TSR could be reduced.

Inherent in an activity resulting in a USQ is the need for additional controls to be approved by EM, necessitating a change to the facility authorization basis. EM oversight of the USQ program ensures the authorization basis approved by DOE remains current and provides an adequate level of protection to workers, the public, and the environment.

Quality Assurance Requirements

The following is taken from DOE O 414.1D.

Each departmental element and associated field element(s) must identify and assign a senior manager to have responsibility, authority, and accountability to ensure the development, implementation, assessment, maintenance, and improvement of the quality assurance program (QAP). Using a graded approach, the organization must develop a QAP and implement the approved QAP. The QAP must do the following:

- Describe the graded approach used in the QAP.
- Implement quality assurance (QA) criteria as defined in DOE O 414.1D, attachment 2, "Quality Assurance Criteria," as well as the requirements in DOE O 414.1D,

attachment 3, "Suspect/Counterfeit Items Prevention," for all facilities, and for nuclear facilities, the requirements in DOE O 414.1D, attachment 4, "Safety Software Quality Assurance Requirements for Nuclear Facilities." Note: This requires that all software meets applicable QA requirements in DOE O 414.1D, attachment 2, using a graded approach.

- Describe how the criteria/requirements are met, using the documented graded approach.
- Flow down the applicable QA requirements and responsibilities throughout all levels of the organization.
- Use appropriate national or international consensus standards in whole or in part, consistent with regulatory requirements and secretarial officer direction. When standards do not full address these requirements, the gaps must be addressed in the QAP. Examples of currently acceptable standards include
  - American Society of Mechanical Engineers (ASME) National Quality Assurance (NQA)-1-2008 with the NQA-1a-2009 addenda, *Quality Assurance Requirements for Nuclear Facility Applications*;
  - American National Standards Institute (ANSI)/ISO/American Society for Quality (ASQ) Q9001-2008, *Quality Management System-Requirements*; and
  - ANSI/ASQ Z 1.13-1999, *Quality Guidelines for Research*.

Conduct of Operations at DOE Nuclear Facilities

The following is taken from DOE O 422.1.

The conduct of operations program is the formal documentation, practices, and actions implementing disciplined and structured operations that support mission success and ensure worker, public, and environmental protection.

The general approach to implementing conduct of operations is for contractors (or DOE organizations in the case of government-owned government-operated facilities) to develop, for DOE line management approval, documentation demonstrating implementation of the requirements in the contractor requirements document (CRD). DOE line management means the Federal officials such as secretarial officers and heads of field elements responsible for DOE facilities and operations. It is not necessary to develop new documents to demonstrate implementation, but at a minimum to provide a conduct of operations matrix, a list of CRD requirements, citing the specific documentation that implements each item, or providing justification for each item that is not implemented.

TSRs

The following is taken from 10 CFR 830.205.

A contractor responsible for a hazard category 1, 2, or 3 DOE nuclear facility must

- develop TSRs that are derived from the DSA;
- obtain DOE approval of TSRs and any change to TSRs prior to use; and
- notify DOE of any violation of a TSR.

A contractor may take emergency actions that depart from an approved TSR when no actions consistent with the TSR are immediately apparent, and when these actions are needed to

protect workers, the public, or the environment from imminent and significant harm. Such actions must be approved by a certified operator for a reactor or by a person in authority as designated in the TSRs for nonreactor nuclear facilities. The contractor must report the emergency actions to DOE as soon as practicable.

Occurrences at DOE Nuclear Facilities

For reportable occurrences, contractors must categorize the occurrences, notify DOE as required, and prepare and submit occurrence reports. At sites with more than one facility management contractor, contractors may make arrangements for one of the contractors to prepare and submit reports for the entire site. However, each contractor must ensure that occurrence reports are submitted properly for activities within its scope of work.

The documentation and distribution requirements must be satisfied by using DOE's centralized unclassified operation database the computerized ORPS.

Local implementing procedures may specify additional learning and reporting requirements beyond those stated in the CRD, but must, at a minimum, include all requirements of the CRD.

e. Describe the process for identifying a PAAA reportable noncompliance and explain which ones should be entered into the noncompliance tracking system (NTS).

The following is taken from 10 CFR 820, appendix A.

DOE strongly encourages contractors to self-identify noncompliance with DOE nuclear safety requirements before the noncompliances lead to a string of similar and potentially more significant events or consequences. When a contractor identifies a noncompliance through its own self-monitoring activity, DOE will normally allow a reduction in the amount charged for civil penalties, regardless of whether prior opportunities existed for contractors to identify the noncompliance. DOE will normally not allow a reduction in civil penalties for self-identification if significant DOE intervention was required to induce the contractor to report a noncompliance.

Self-identification of a noncompliance is possibly the single most important factor in considering a reduction in the civil penalty amount. Consideration of self-identification is linked to, among other things, whether prior opportunities existed to discover the violation, and if so, the age and number of such opportunities; the extent to which proper contractor controls should have identified or prevented the violation; whether discovery of the violation resulted from a conductor's self-monitoring activity; the extent of DOE involvement in discovering the violation or in prompting the contractor to identify the violation; and the promptness and completeness of any required report. Self-identification is considered by DOE in deciding whether to pursue an investigation.

DOE has established a voluntary NTS that allows contractors to elect to report non-compliances. In the guidance document supporting the NTS, DOE has established reporting thresholds for reporting items on noncompliance of potentially greater safety significance into the NTS. Contractors, may, however, use their own self-tracking systems to track non-

compliances below the reporting threshold. This self-tracking is considered to be acceptable self-reporting as long as DOE has access to the contractor's system and the contractor's system notes the item as a noncompliance with a DOE nuclear safety requirement. For non-compliances that are below the reportability thresholds, DOE will credit contractor self-tracking as representing self-reporting. If an item is not reported in NTS but only tracked in the contractor's system and DOE subsequently finds the facts and their safety significance have been significantly mischaracterized, DOE will not credit the internal tracking as representing appropriate self-reporting.

DOE expects contractors to demonstrate acceptance of responsibility for safety of the public, workers, and the environment and to proactively identify noncompliance conditions in their programs and processes. The key test is whether the contractor reasonably could have detected any of the underlying non-compliances that contributed to the event. Examples of events that provide opportunities to identify non-compliances include, but are not limited to

- prior notifications of potential problems such as those from DOE operational experience publications or vendor equipment deficiency reports;
- normal surveillance, QA assessments, and post-maintenance testing;
- readily observable parameter trends; and
- contractor employee or DOE observations of potential safety problems.

Failure to utilize these types of events and activities to address non-compliances may result in higher civil penalty assessments or a DOE decision not to reduce civil penalty amounts.

8. A technical program manager shall have a working level knowledge of formal configuration management as it relates to safety.

a. Using the guidance in DOE-STD-1073-2003, *Configuration Management*, DOE-STD-3024, *Content of System Design Descriptions*, and DOE O 420.1A, *Facility Safety*, discuss the system engineer concept as it applies to oversight of safety systems. Specifically address the areas of configuration management, assessment of system status and performance, and the technical support for operation and maintenance activities or for DSA reviews.

[Note: DOE O 420.1A has been superseded by DOE O 420.1B, chg 1 and DOE-STD-3024 is superseded by DOE-STD-3024-2011.]

The following is taken from DOE-STD-1073-2003.

DOE O 420.1B requires contractors to designate a cognizant system engineer (CSE) for each system for DOE category 1, 2, or 3 nuclear facilities. The qualifications for the CSE must be consistent with those defined in DOE O 420.1B. In addition, as stated in DOE O 422.1, *Maintenance Management Program for DOE Nuclear Facilities*, (archived), the CSE has the lead responsibility for the configuration management (CM) of design.

The CSE must be knowledgeable of the system and the related safety basis. The CSE must retain a working knowledge of the facility's operation and the existing condition of the system. Consequently, the CSE is responsible for overseeing the configuration of the assigned system to ensure that it continues to be able to perform its expected functions.

The CSE should

- be knowledgeable of the system safety functions, requirements, and performance criteria and their bases;
- understand how the system SSCs are designed, and how they function to meet the requirements and performance criteria;
- understand system operation;
- be knowledgeable of the testing and maintenance necessary to ensure the system continues to be able to perform its safety functions;
- be responsible for ensuring that documents related to the system are complete, accurate, and up-to-date, including system design descriptions (SDDs), technical drawings, diagrams, and procedures for surveillance, testing, and maintenance;
- be appropriately involved in the design, review, and approval of changes affecting/impacting system design, operation, and maintenance.

Because the CSEs are expected to have a thorough understanding of system design expectations, operating requirements, and current configuration, the CSEs should have a major role in identifying the CM SSCs. Each CSE should participate in the identification of the design requirements for their system and the SSCs within the system. Finally, the CSE should participate in the CM review of any changes that are made to the system for which the CSE has cognizance responsibility.

The following is taken from DOE-STD-3024-2011.

A major purpose of the SDD is to collect system information to facilitate efficient design, maintenance, operation, and training (because personnel will not have to review multiple documents in an effort to locate pertinent information). An SDD identifies the requirements associated with SSCs, explains why those requirements exist, and describes the features of the system design provided to meet those requirements. The SDD helps ensure consistency among the engineering requirements for systems, the actual installed physical configuration, and the associated documentation. The SDD often serves as the central coordination document. SDDs provide a key reference to facilitate design reviews when integrated early in the design. An SDD does not generate requirements or basis information, but rather collects that information into a usable form.

DOE-STD-1189, *Integration of Safety into the Design Process*, has been developed to show how project management, engineering design, and safety analyses can interact to successfully integrate safety into the design of a new facility or major modification of an existing facility early in the project. One of the design outputs of the safety-in-design process is an initial SDD developed during conceptual design to capture the functional and performance requirements of facility systems as they relate to the facility-level design basis accidents that provide necessary input to the identification and classification of important safety functions. The iterative and evolutionary nature of safety-in-design requires engagement of project operations, maintenance, engineering, and safety personnel throughout the process and design output to support project milestones and critical decisions (CDs) through final design and to reflect as-built configurations.

The following was taken from DOE O 420.1B, chg 1.

The functions of a system engineer program are required to maintain the integrity of a facility's safety basis. System engineer program functions are typically accomplished by various parts of a program's operating organization. This organization must designate one person as the CSE for each system to which the system engineer program applies. The CSE must maintain overall cognizance of the system and be responsible for system engineering support for operations and maintenance. The CSE must provide technical assistance in support of line management safety responsibilities and ensure continued system operational readiness.

The CSE must

- ensure that system configuration is being managed effectively;
- remain apprised of operational status and ongoing modification activities;
- assist operations review of key system parameters and evaluate system performance;
- initiate actions to correct problems;
- remain cognizant of system-specific maintenance and operations history and industry operating experience, as well as manufacturer and vendor recommendations and any product warnings regarding safety SSCs in their assigned systems;
- identify trends from operations;
- provide assistance in determining operability, correcting out-of-specification conditions, and evaluating questionable data;
- provide or support analysis when the system is suspected of inoperability or degradation;
- review and concur with design changes; and
- provide input to development of special operating/test procedures.

b. Discuss the concept of configuration management and its importance in ensuring operational safety.

The following is taken from DOE-STD-1073-2003.

CM is a disciplined process that involves management and technical direction to establish and document the design requirements and the physical configuration of the nuclear facility and to ensure that they remain consistent with each other and the documentation.

The size, complexity, and missions of DOE nuclear facilities vary widely and CM processes may need to be structured to individual facilities, activities, and operations. It would generally be inappropriate to apply the same CM standards to widely different facilities, for example, a reactor facility and a small, simple laboratory. The detailed examples and methodologies in this standard are provided to aid those developing their DM processes; however, they are provided for guidance only and may not be appropriate for application to all DOE nuclear activities.

The objectives of CM are to

- establish consistency among design requirements, physical configuration, and documentation (including analysis, drawings, and procedures) for the activity, and

- maintain this consistency throughout the life of the facility or activity, particularly as changes are being made.

Fulfilling the CM objective is accomplished through the following key CM elements:

- Design requirements
- Work control
- Change control
- Document control
- Assessments

The contractor must have a formal policy that endorses the use of CM and defines key roles and responsibilities. The contractor must ensure that sufficient resources are provided to adequately implement the CM process. The contractor should establish and document the CM requirements at the earliest practical time prior to facility operation or initiation of the activity. Configuration must be controlled for the life of the facility or the duration of the activity. Prior to the end of life of the facility or activity, the contractor, in coordination with DOE, must determine if CM should be applied to post-operation activities, such as D&D. If there is a contractor change at the end of operation, the operating contractor should work with the post-operation contractor to determine how the CM effort should be relayed to the new contractor. The contractor must formally document and implement the CM process to be used for the activity in a CM plan.

c. For the elements identified above, describe the possible effects on safe operations if they are ineffectively implemented.

The following are taken from DOE-STD-1073-2003.

CM should not be viewed as a program separate from other safety and management activities. The very nature of CM is that it is an integrating activity. For this reason, the individuals who implement CM must be knowledgeable about the various activities being implemented for the facility or activity and the impact proposed changes might have on that facility or activity. For example, it might be inappropriate to store a chemical with noxious fumes in an area where new maintenance activities would require frequent access for maintenance personnel. Another, less frequently occupied, area might be more appropriate. Individuals who are involved in the day-to-day work of a facility or activity, such as operations and maintenance supervisors, are likely to be more cognizant of the nearby activities and the impact of proposed changes. Therefore, they should directly participate in the CM process. In particular, where there is a CSE for a system, the CSE should be involved in the CM process for that system. In addition, as changes to a facility or activity impact the content of training programs, the training organization should be involved in the CM process.

d. Describe a typical configuration management process.

The following is taken from DOE-STD-1073-2003.

In addition to maintaining consistency among the design requirements, the physical configuration, and documentation for the activity, the CM process must

- support the ISMS;
- help to maintain the safety basis as required by 10 CFR 830, subpart B;

- meet the QA requirements for work processes and assessments in 10 CFR 830, subpart A, "Quality Assurance Requirements";
- meet the CM requirements of DOE O 420.1B;
- meet the CM and work control requirements of DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*;
- support the requirements for documentation, traceability, and accountability for pressure vessels in DOE O 440.1B, chg 1, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal and Contractor Employees*; and
- ensure changes to the design requirements, physical configuration, or documentation are reflected in procedures and training.

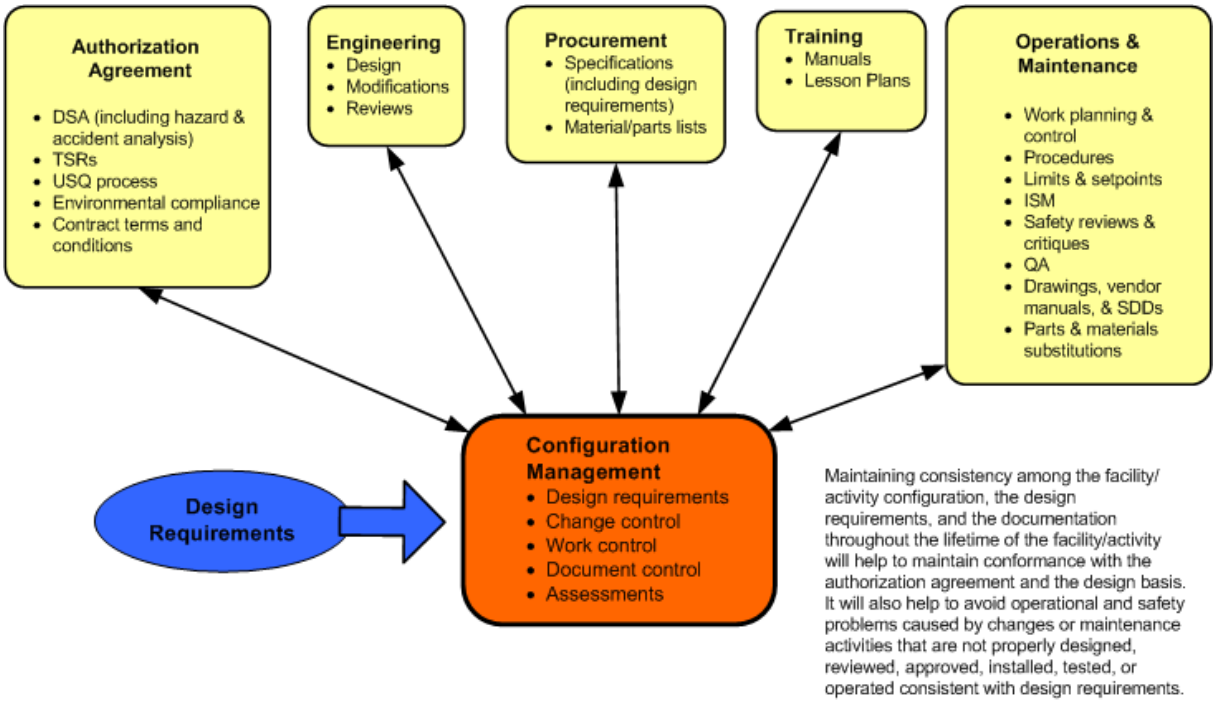
Where appropriate, a graded approach should be used to implement CM. The CM plan should identify how the graded approach will be applied. For example, if the contractor applies different schedules for updating documents through the document control process based on the importance of the document type to operations, the schedules should be recorded in the CM plan.

e. Given DOE-STD-1073-93, *Guide for Configuration Management Programs*, discuss the relationship between the standard and the DOE Orders.

[Note: DOE-STD-1073-93 has been superseded by DOE-STD-1073-2003, *Configuration Management*.]

The following was taken from DOE-STD-1073-2003.

CM supports a number of contractor organizations and initiatives by ensuring conformance with the established design requirements. While the provisions of DOE-STD-1073-2003 necessarily overlap other provisions such as those illustrated in figure 2, these are viewed as complementary, not conflicting requirements. The use of DOE-STD-1073-2003 does not preclude the use of other standards that address particular aspects of CM in greater detail, such as the application of CM during construction or control of equipment status. Contractors should use the ISMS process to integrate the work performed to meet the provisions in the CM process, as well as other processes. In particular, although some elements of the safety basis requirements can be met through CM processes, DOE-STD-1073-2003 is not intended to provide definitive guidance on the safety analysis or design basis processes.



Source: DOE-STD-1073-2003

Figure 3. Configuration management interfaces

The following discussions illustrate some of the interfaces between CM and other DOE requirements and guidance.

The CRD in DOE O 413.3B states, for a project management system for acquisition of capital assets

> a configuration management process must be established that controls changes to the physical configuration of project facilities, structures, systems, and components in compliance with ANSI/Electronic Industries Alliance (EIA)-649-B-2011, *Configuration Management Standard*. This process must also ensure that the configuration is in agreement with the performance objectives in the technical baseline.

DOE O 413.3B requires contractors to use ANSI/EIA-649-B-2011 for CM. Wherever the provisions of DOE O 413.3B apply, DOE and the contractor should determine whether to use ANSI/EIA-649 in lieu of DOE-STD-1073-2003 or to use DOE-STD-1073-2003 to supplement ANSI/EIA-649. In addition, DOE O 413.3B, chapter II, contains specific requirements for baseline change controls that may apply.

DOE-STD-1073-2003 recognizes the need for CM of software used to perform functions or analysis related to safe operations, but it does not provide detail on the special considerations related to software CM. For example, DOE-STD-1121-2008, *Internal Dosimetry*, states that dosimetry codes should be subject to CM, including records of the version of the code, the user's manual, instructions for running the code, limitations of the code, hardware requirements, acceptance testing records, and a copy of the code. Contractors should refer to

DOE G 200.1-1, Software Engineering Methodology, or other standards on software CM to supplement the guidance in DOE-STD-1073-2003 for software.

DOE O 430.1B, chg 2, *Real Property and Asset Management*, requires a CM process to ensure the integrity of physical assets and systems, and configuration integrity in designs and acquisitions. DOE G 430.1-5, *Transition Implementation Guide*, encourages the use of CM and configuration control during transition from the operational to the disposition phase of a facility/activity life to ensure accurate and up-to-date drawings are used in the transition process.

f. Discuss each of the following elements of configuration management and how they contribute to safety and an effective configuration management program.

- **Program Management**
- **Document control**
- **Change control**
- **Graded approach**
- **Design requirements**
- **Assessments**

Program Management

The following is taken from DOE-STD-1073-93, part 1, (archived).

The objective of the program management element is to direct and monitor the development and implementation of the overall CM program. The DOE CM program includes the program management element to manage overall program development and implementation. Program management is necessary because of a number of factors, including the size and complexity of the program, the number of organizations affected, the investment of resources, and the importance of the program to facility safety and mission. The CM program affects many organizations and disciplines, such as design engineering, operations, maintenance, testing, and procurement. To achieve CM program success, maintaining the CM program basic relationships should become a goal of each interfacing program and organization, and every person involved in these programs and organizations.

The program management element ensures that the various aspects of program development and implementation are integrated, complete, and effective. The program management element provides the leadership and management necessary to coordinate and integrate the many program functions and activities. This program element ensures that the efforts of the other elements are in balance and maintains sight of the overall program's objectives. This program element establishes the CM program scope and objectives, develops the program plan, and defines the appropriate program and organizational interfaces. To establish a consistent and common understanding throughout the affected organizations, the program management element communicates the program scope and activities through standard concepts and terminology, CM program orientations and general training, and top-level CM procedures. Terminology, definitions, procedures, and training associated with the CM program are very important to program success. This program element establishes and maintains certain controls that cross many organizational boundaries, such as technical vendor control and database control. In addition, this program element controls and monitors

CM program development and implementation activities to ensure adequate performance of the CM program.

Implementation of the most successful CM programs is initiated by

- instituting the program in a top-down manner, beginning with a top-level policy and plan;
- planning the initial scope of the CM program in broad enough terms to support overall design and operations activities; and
- determining at the outset the end products of the program.

Most facilities implementing CM programs have found that because of the size, complexity, and interfaces with existing programs, careful program planning is needed and should include identification of milestones, schedules, deliverables, and projected costs. Because the development of the CM program will likely extend over several years, intermediate deliverables are essential. In addition, due to staff and/or contract support turnover, long-term planning is necessary for continuity of implementation.

The program management element establishes and communicates program expectations through a number of formal policy documents, such as policy directives, program and action plans, and governing procedures. The program management element ensures that appropriate lower-level or implementing procedures are in place for each CM program function. These vehicles or mechanisms, used to implement the program management element, support program implementation by providing increasing levels of detail to communicate program direction and guidance. CM policy directives confirm management support for the CM program, establish program scope and terminology, and establish key roles and responsibilities. CM program plans define specific actions and program commitments. Action plans go into further detail, describing methods, procedures, staffing, and schedules to accomplish the program plan commitments. Governing procedures identify the specific implementing procedures for accomplishing the CM program functions, and correlate the implementing procedures to the CM program plan.

CM programs can be directed and managed at different organizational levels: the corporate level, the site or division level, and the facility level. Program management and direction need to be consistent through each level. Where possible, consistent corporate approaches should be pursued. Based on the structure of most of the operating/managing organizations at DOE facilities, a centralized approach to CM program development and implementation should be adopted for each site/division. In this top-down approach, general site/division program policy and criteria are established at the site/division level, with guidance on acceptable implementation variations allowed for different facilities within the site/division structure. These implementation variations would be based on individual situations and considerations. Upon receipt of the site/division CM policy directive, each facility manager should disseminate the information contained within the directive, and should adapt and expand CM program criteria, consistent with the site/division direction. Site/division directives should provide the expectations and guidance necessary for facility CM program planning. Recognizing that the structure of each operating/managing organization is different, an additional management level might exist between the site/division level and the facility level. In this case, site/division CM policy directives might be prepared at more than

one organizational level. Wherever the term site/division level is used, the appropriate interpretation should be applied.

Video 7. What is configuration management?
http://wn.com/Configuration_Management

Document Control

The following is taken from DOE-STD-1073-2003.

Document control ensures that only the most recently approved versions of documents are used in the process of operating, maintaining, and modifying the nuclear facility. Document control helps ensure that

- important facility documents are properly stored;
- revisions to documents are controlled, tracked, and completed in a timely manner;
- revised documents are formally distributed to designated users; and
- information concerning pending revisions is made available.

As controlled documents are updated to reflect changes to the requirements and/or physical installation, the contractor must ensure that

- each updated document is uniquely identified and includes a revision number and date; and
- each outdated document is replaced by the latest revision.

Video 8. Configuration management and document control
http://www.professormesser.com/n10-004/configuration-management-documentation/

Change Control

The following is taken from DOE-STD-1073-2003.

Contractors must establish and use a formal change control process as part of the CM process. The objective of change control is to maintain consistency among design requirements, the physical configuration, and the related facility documentation, even as changes are made. The change control process is used to ensure changes are properly reviewed and coordinated across the various organizations and personnel responsible for activities and programs at the nuclear facility.

Through the change control process, contractors must ensure that

- changes are identified and assessed through the change control process;
- changes receive appropriate technical and management review to evaluate the consequences of the change;
- changes are approved or disapproved;
- waivers and deviations are properly evaluated and approved or denied and the technical basis for the approval or the denial is documented;
- approved changes are adequately and fully implemented or the effects of the partial implementation are evaluated and accepted;
- implemented changes are properly assessed to ensure the results of the changes agree with the expectations; and

- documents are revised consistent with the changes and the revised documents are provided to the users.

The contractor must ensure that each proposed change to the facility, activity, or operation is considered for processing through the change control process. To ensure that all changes are controlled as appropriate, the contractor must identify all mechanisms that can lead to temporary or permanent changes in

- the design requirements
- the physical configuration
- the documentation

For any facility, activity, or operation there are typically multiple mechanisms for initiating change. Changes may be initiated through any of a variety of organizations, such as design, operations, maintenance, procurement, procedures, training, and security. Changes can include physical, document, procedural, operations, software, or design changes. Contractors should assess each type of change to determine the mechanisms for initiating changes and link them to the change control process. Contractors should integrate the change control process into the work processes for all potential mechanisms of changes by requiring workers and organizations to use the change control process, as appropriate, when a change is to be made. The identification of change mechanisms is often the most critical step to achieving effective change control. Change mechanisms that are not identified cannot be controlled.

Once change mechanisms are defined, contractors should ensure that the change control process is properly integrated into the procedures and other work processes for that change mechanism. Contractors should consider eliminating or combining change mechanisms to make changes easier to control.

Graded Approach

DOE defines graded approach as a process of ensuring that the level of analysis, documentation, and actions used to comply with a requirement are commensurate with

- the relative importance to safety, safeguards, and security
- the magnitude of any hazard involved
- the life cycle stage of a facility
- the programmatic mission of a facility
- the particular circumstances of a facility
- the relative importance of radiological and nonradiological hazards
- any other relative hazard

The main purpose of using a graded approach is to determine and apply a level of resources that is appropriate when implementing a program. The goal is to apply the highest level of resources to the most important equipment in the most important facilities and to avoid such expenditures where they are not warranted. For a highly hazardous facility such as a large nuclear reactor that could potentially have serious off-site personnel safety consequences, a significant investment of resources is appropriate for the systems that prevent, detect, or mitigate such consequences. At the other extreme, for a low-hazard facility—a glovebox operation, for example—where the greatest hazard is localized, the same investment of

resources may not be necessary. The grading system should take into account facility grades and SSC grades in determining the appropriate level of resources to be applied.

Design Requirements

The objective of the design requirements element of CM is to document the design requirements. The design requirements define the constraints and objectives placed on the physical and functional configuration. The design requirements to be controlled under configuration management will envelope the safety basis and, typically, the authorization basis. Consequently, proper application of the CM process should facilitate the contractor's efforts to maintain the safety basis and the authorization basis. Contractors must establish procedures and controls to assess new facilities and activities, and modifications to facilitate and activities to identify and document design requirements.

Design output documents identify the design requirements that dictate the physical configuration of the facility. Design output requirements best support the CM process objectives when they are documented in a format practical for proper use by the various user organizations, including procurement, construction, operations, maintenance, and testing, as well as design engineering. Examples of design output documents are design change packages, drawings, specifications, load lists, valve lists, design (stress) reports, one-line electrical drawings, and setpoint lists.

Design inputs consist of those specific criteria, limits, bases, or other initial requirements that the detailed final design is based on. In comparison to design constraints, design inputs are specific in nature; i.e., they are specific to one design activity. For example, a design input for a given air-operated valve might be that it needs to open in ten seconds against a differential pressure of 100 pounds per square inch gauge. Design inputs should consider the effects of the operating environment, material condition, and aging. For example, the design requirements should consider the effects of radiation exposure and aging on elastomeric materials, such as rubber O-rings and Teflon tape.

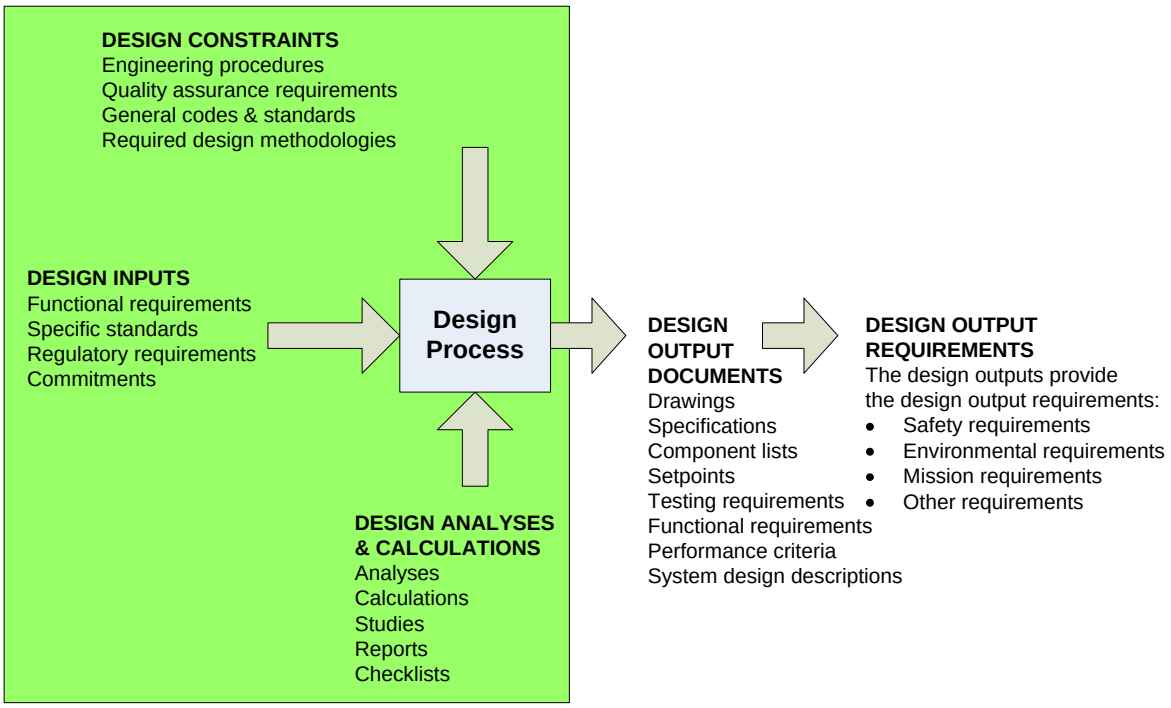
Design constraints are those general restrictions and limits to the engineering design process that ensure consistency and quality of design (such as general codes and standards, general regulatory commitments, QA requirements, engineering procedures and good practices, and adopted design methodologies). In comparison to design inputs, design constraints are general in nature; they apply to multiple classes and categories of designs and, therefore, to many designs. For example, a design constraint for a safety system might be that it will be able to accomplish its assigned safety function in the event of a single failure.

Design analysis and calculations are those intermediate design products that are necessary to convert the design inputs and constraints into appropriate and complete design outputs. Design analysis and calculations consist of a wide variety of engineering analyses, calculations, studies, reports, and technical review checklists necessary to perform complete engineering design. Design analyses and calculation capture the design assumptions and identify the available design margin. The design margin is the conservatism between the specified design requirement and the minimum requirement that could be developed from the design basis. Examples of design analysis and calculations are

- transient analyses
- criticality analyses
- seismic stress calculations and analyses

- equipment sizing calculations
- net positive suction head calculations
- engineering evaluations of equipment qualifications and fire protection

Design output requirements are the composite result of the engineering organization's consideration of the design inputs, design constraints, and design analysis and calculations. Design output requirements specify that which is essential to support the design basis; e.g., the necessary functions, capabilities, capacities, physical sizes and dimensions, and limits and setpoints. The design output requirements include the functional requirements, as well as procurement requirements, QA requirements, construction/installation specifications and instructions, post-installation testing, post-maintenance testing, and periodic surveillance/testing requirements. In some cases, the design output requirements are referred to as the "as designed conditions." The design output documents identify the design requirements that dictate the physical configuration of the facility. Figure 3, "Design requirements," shows a diagram.



Source: DOE-STD-1073-2003

Figure 4. Design requirements

g. Discuss approved/recommended compensatory actions where inadequate configuration management exists and work is ongoing or to be initiated.

The following is taken from DOE-STD-1073-2003.

Installation instructions identify prerequisites for field installation, such as compensatory measures, operating modes, equipment required to be operable, work permits, etc. Installation instructions identify precautions to be taken, such as lockout/tagout and other personnel safety precautions; situations to avoid; special instructions; QC hold points; and

steps that require independent verifications, sign-off, or initials. The individual site's CM program should be checked for information on how to complete this competency.

9. A technical program manager shall have a working level knowledge of quality assurance policies, programs, and processes.

a. Describe the general requirements, purpose, interrelationships, and importance of DOE O 414.1B, *Quality Assurance*, and 10 CFR 830.120, subpart A, "Quality assurance."

[Note: DOE O 414.1B has been superseded by DOE O 414.1D.]

The following is taken from DOE O 414.1D.

The purpose of DOE O 414.1D is as follows:

- To ensure that DOE, including NNSA, products and services meet or exceed customers' requirements and expectations.
- To achieve quality for all work based on the following principles:
  - All work as defined in DOE O 414.1D, is conducted through an integrated and effective management system.
  - Management support for planning, organization, resources, direction, and control is essential to QA.
  - Performance and quality improvement require thorough, rigorous assessments and effective corrective actions.
  - All personnel are responsible for achieving and maintaining quality.
  - Risks and adverse mission impacts associated with work processes are minimized while maximizing reliability and performance of work products.
- To establish additional process-specific quality requirements to be implemented under a QAP for the control of S/CIs, and nuclear safety software as defined in DOE O 414.1D.

Each departmental element and associated field element(s) must identify and assign a senior manager to have responsibility, authority, and accountability to ensure the development, implementation, assessment, maintenance, and improvement of the QAP. Using a graded approach, the organization must develop a QAP and implement the approved QAP.

The following is taken from 10 CFR 830.120.

10 CFR 830.120, "Scope," subpart A, establishes QA requirements for contractors conducting activities, including items or services, that affect, or may affect, nuclear safety of DOE nuclear facilities.

b. Describe DOE's and the management and operating contractor's responsibilities and requirements for implementing a QAP.

The following is taken from DOE O 414.1D.

Each DOE organization must develop and implement a QAP that does the following:

- Describes the graded approach used in the QAP.
- Implements QA criteria as defined in DOE O 414.1D, attachment 2, "Quality Assurance Criteria," as well as the requirements in attachment 3, "Suspect/Counterfeit Items Prevention," for all facilities, and for nuclear facilities, the

requirements in attachment 4, "Safety Software Quality Assurance Requirements for Nuclear Facilities." Note: This requires that all software meet applicable QA requirements in attachment 2, using a graded approach that

- describes how the criteria/requirements are met, using the documented graded approach;
- flows down the applicable QA requirements and responsibilities throughout all levels of the organization; and
- uses appropriate national or international consensus standards in whole or in part, consistent with regulatory requirements and secretarial officer direction. When standards do not fully address these requirements, the gaps must be addressed in the QAP. Examples of currently acceptable standards include:
  - ASME NQA-1-2008 with the NQA-1a-2009 addenda
  - ANSI/ISO/ASQ Q9001-2008
  - ANSI/ASQ Z1.13-1999

- Clearly identifies the standards, or parts of the standards, that are used.

DOE O 414.1D, attachment 2, give the following contractor requirements:

- Describe the graded approach used in the QAP.
- Implement QA criteria as defined in DOE O 414.1D, attachment 2, as well as the requirements in attachment 3 for all facilities, and the requirements in attachment 4 for nuclear facilities, and describe how the criteria/requirements are met, using the documented graded approach. Note: this requires that all software meet applicable QA requirements in attachment 2, using a graded approach.
- Use appropriate national or international consensus standards consistent with contractual and regulatory requirements, and secretarial officer direction. Clearly identify the standards, or parts of the standards, that are used. When standards do not fully address the CRD requirements, the gaps must be addressed in the QAP. Select and document the appropriate choice from the following:
  - For hazard category 1, 2, and 3 nuclear facilities:
    - Existing facilities, or new facilities and major modifications to existing facilities achieving critical decision (CD)-1 prior to the issuance of the DOE O 414.1D CRD, continue to use the consensus standard cited in the DOE-approved QAP consistent with secretarial officer direction.
    - New facilities and major modifications to existing facilities achieving CD-1 after the DOE O 414.1D CRD has been issued use ASME NQA-1-2008 with the NQA-1a-2009 addenda, part I, and applicable requirements of part II. Note: where NQA-1, part II language uses the terms "nuclear power plant" or "nuclear reactor," these terms are considered equivalent to the term "nuclear facility" used in the DOE O 414.1D CRD.
    - Consensus standard(s) that provide an equivalent level of quality requirements as required in DOE O 414.1D may be used in lieu of those specified to implement the requirements of the DOE O 414.1D CRD. The QAP must document how this consensus standard is used, as well as how it is equivalent to the consensus standard listed in DOE O 414.1D.
  - For other activities and facilities, use in whole or in part appropriate standards. Examples of appropriate standards include

- ASME NQA-1-2008 with the NQA-1a-2009 addenda
- ASME NQA-1-2008, part I and applicable requirements of part II
- ANSI/ISO/ASQ Q9001-2008
- ANSI/ASQ Z1.13-1999

The contractor must

- submit a QAP to DOE for approval within 90 days of being awarded a DOE contract;
- implement the QAP as approved by DOE;
- review the QAP annually, and update as needed. Submit a summary of the annual review of the QAP and, if necessary, submit the modified QAP to the DOE approval authority. (Editorial changes that do not reduce or change commitments do not require approval);
- regard a QAP as approved by DOE, 90 calendar days after receipt by DOE, unless approved or rejected by DOE at an earlier date. (Receipt includes acknowledgement by the receiving organization, and every official submittal to DOE restarts the 90 day clock); and
- evaluate the program to ensure it meets applicable QA requirements (in the case of subcontractor, vendor, and supplier activities that are not governed by the contractor's DOE-approved QAP).

Video 9. Development and implementation of the QAP
http://www.youtube.com/watch?v=oAc5B4SmCr8

c. Discuss the role of the technical manager with respect to DOE O 414.1B, *Quality Assurance*, and 10 CFR 830.120, subpart A, "Quality Assurance."

This is a site-specific KSA. The Qualifying Official will evaluate it after completion.

d. Discuss the process of obtaining an exemption to the listed documents.

The following is taken from 10 CFR 830.2.

The only exemptions to the activities in the listed documents are

- activities that are regulated through a license by the Nuclear Regulatory Commission (NRC) or a state under agreement with the NRC, including activities certified by the NRC under the Atomic Energy Act, section 1701;
- activities conducted under the authority of the Director, Naval Nuclear Propulsion, pursuant to EO 12344, *Naval Nuclear Propulsion Program*, as set forth in Public Law 106-65, *National Defense Authorization Act for Fiscal Year 2000*;
- activities related to transportation that are regulated by the U.S. Department of Transportation;
- activities conducted under the Nuclear Waste Policy Act of 1982, as amended, and any facility identified under the Energy Reorganization Act of 1974, section 202(5), as amended; and
- activities related to the launch approval and actual launch of nuclear energy systems into space.

e. Describe the quality assurance criteria of DOE O 414.1C, *Quality Assurance*, which addresses the following:

- **Management**
- **Performance**
- **Assessment**

[Note: DOE O 414.1C has been superseded by DOE O 414.1D.]

The following is taken from DOE O 414.1D.

The QAP must address the following management, performance, and assessment criteria:

- Criterion 1—Management/Program
  - Establish an organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing the work
  - Establish management processes, including planning, scheduling, and providing resources for the work
- Criterion 2—Management/Personnel Training and Qualification
  - Train and qualify personnel to be capable of performing their assigned work
  - Provide continuing training to personnel to maintain their job proficiency
- Criterion 3—Management/Quality Improvement
  - Establish and implement processes to detect and prevent quality problems
  - Identify, control, and correct items, services, and processes that do not meet established requirements
  - Identify the causes of problems, and include prevention of recurrence as a part of corrective action planning
  - Review item characteristics, process implementation, and other quality related information to identify items, services, and processes needing improvement
- Criterion 4—Management/Documents and Records
  - Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design
  - Specify, prepare, review, approve, and maintain records
- Criterion 5—Performance/Work Processes
  - Perform work consistent with technical standards, administrative controls, and other hazard controls adopted to meet regulatory or contract requirements using approved instructions, procedures, or other appropriate means
  - Identify and control items to ensure proper use
  - Maintain items to prevent damage, loss, or deterioration
  - Calibrate and maintain equipment used for process monitoring or data collection
- Criterion 6—Performance/Design
  - Design items and processes using sound engineering/scientific principles and appropriate standards
  - Incorporate applicable requirements and design bases in design work and design changes
  - Identify and control design interfaces
  - Verify or validate the adequacy of design products using individuals or groups other than those who performed the work
  - Verify or validate work before approval and implementation of the design

- Criterion 7—Performance/Procurement
  - Procure items and services that meet established requirements and perform as specified
  - Evaluate and select prospective suppliers on the basis of specified criteria
  - Establish and implement processes to ensure that approved suppliers continue to provide acceptable items and services
- Criterion 8—Performance/Inspection and Acceptance Testing
  - Inspect and test specified items, services, and processes using established acceptance and performance criteria
  - Calibrate and maintain equipment used for inspections and tests
- Criterion 9—Assessment/Management Assessment
  - Ensure that managers assess their management processes, and identify and correct problems that hinder the organization from achieving its objectives
- Criterion 10—Assessment/Independent Assessment
  - Plan and conduct independent assessments to measure item and service quality, to measure the adequacy of work performance, and to promote improvement
  - Establish sufficient authority and freedom from line management for independent assessment teams
  - Ensure persons who perform independent assessments are technically qualified and knowledgeable in the areas to be assessed

f. Referring to DOE G 414.1-2, *Quality Assurance Management System Guide for Use with 10 CFR 830.120, subpart A, Quality Assurance*, and DOE O 414.1, discuss the implementation of an effective QAP. Conduct a QA assessment of an ongoing project or work activity, and then review the results with a qualified QA individual.

[Note: DOE G 414.1-2 has been superseded by DOE G 414.1-2B Admin Chg 1, *Quality Assurance Program Guide* and DOE O 414.1 has been superseded by DOE O 414.1D.]

The following was taken from DOE O 414.1D, attachment 1.

The contractor must

- submit a QAP to DOE for approval within 90 days of being awarded a DOE contract;
- implement the QAP as approved by DOE;
- review the QAP annually, and update as needed. Submit a summary of the annual review of the QAP and, if necessary, submit the modified QAP to the DOE approval authority. (Editorial changes that do not reduce or change commitments do not require approval);
- regard a QAP as approved by DOE, 90 calendar days after receipt by DOE, unless approved or rejected by DOE at an earlier date. (Receipt includes acknowledgement by the receiving organization, and every official submittal to DOE restarts the 90 day clock); and
- evaluate the program to ensure it meets applicable QA requirements (in the case of subcontractor, vendor, and supplier activities that are not governed by the contractor's DOE-approved QAP).

The following was taken from DOE G 414.1-2B, admin chg 1.

A graded approach to implementing the QAP complies with requirements, rules, and regulations, and cannot compromise public, employee, or facility safety or adversely impact the environment. The graded application of facility/activity requirements is dependent on the hazards and/or level of risk associated with the activity or SSCs under consideration. The scope, depth, and rigor of the QAP's application of requirements should be determined by the use of a grading process, before performing the activity. The purpose of grading is to select the controls and verifications to be applied to various items and activities consistent with their importance to safety, cost, schedule, and success of the program. Care should be taken to not double grade. Once the requirements are specified in the technical procurement documents, the grading should be done; this becomes the set of requirements that should be met.

The second part of this KSA is performance based. The Qualifying Official will evaluate its completion.

g. Discuss other relevant quality standards such as those from the American National Standards Institute (ANSI), American Society for Quality Control (ASQC), etc.

The following was taken from the ASME webpage, www.asme.org.

ASME NQA-1-2008 provides requirements and guidelines for the establishment and execution of QA programs during siting, design, construction, operation, and decommissioning of nuclear facilities. ASME NQA-1-2008 reflects industry experience and current understanding of the QA requirements necessary to achieve safe, reliable, and efficient utilization of nuclear energy, and management and processing of radioactive materials. ASME NQA-1-2008 focuses on the achievement of results, emphasizes the role of the individual and line management in the achievement of quality, and fosters the application of these requirements in a manner consistent with the relative importance of the item or activity.

The following was taken from the ISO webpage, www.iso.org.

ANSI/ISO/ASQ Q9001-2000 has been revised by ISO 9001:2008. ISO 9001:2008 specifies requirements for a quality management system where an organization needs to demonstrate its ability to consistently provide product that meets customer and applicable regulatory requirements, and aims to enhance customer satisfaction through the effective application of the system, including processes for continual improvement of the system and the assurance of conformity to customer and applicable regulatory requirements.

The following is taken from the ASQ webpage, www.asq.org.

ANSI/ASQ Z1.13-1999 can be used in the development of a quality system for basic and applied research. This includes fields like the biological, physical, and applied sciences, using methods such as field investigation, laboratory experimentation, computer modeling, and theory formulation.

10. A technical program manager shall have a working level knowledge of the Occupational Safety and Health Act (OSHA) requirements in the following documents:

- **DOE G 440.1-1, *Worker Protection Management for DOE Federal and Contractor Employees—Guide for Use with DOE O 440.1***
- **29 CFR 1910, "Occupational Safety and Health Standards"**
- **29 CFR 1926, "Safety and Health Regulations for Construction"**

[Note: DOE G 440.1-1 has been replaced by DOE G 440.1-1B, *Worker Safety and Health Program for DOE (Including the National Nuclear Security Administration) Federal Employees*.]

a. Discuss the application and impact of OSHA on department projects.

The following is taken from DOE G 440.1-1B.

It is DOE's policy to provide a safe and healthful workplace for its Federal and contractor employees. This provision closely parallels OSHA's general duty clause established in OSHA. In implementing this provision, DOE and its contractors should consider criteria similar to those established by OSHA for the implementation of the general duty clause. Specifically, in determining whether a workplace condition presents a recognized hazard that is causing, or has the potential to cause, death or serious physical harm to workers, contractors should consider whether

- the condition presents a hazard to which workers are exposed;
- the hazard is a recognized hazard;
- the hazard is causing, or is likely to cause, death or serious physical harm; and
- feasible and useful methods exist to correct the hazard.

b. Identify the requirements in OSHA that form the basis of authority for project management personnel in the oversight and management of a project.

The following is taken from DOE G 440.1-1B.

The manager should include a system for communicating with employees about matters relating to work protection, including provisions designed to encourage employees to inform the employer of hazards at the worksite without reprisal.

Managers are expected to post the DOE Worker Protection Poster (FEOSH version for Federal employees) in a sufficient number of places to permit workers the opportunity to observe the information en route to or from their work place. The poster is available at http://www.hss.doe.gov/healthsafety/wshp/rule851/safeworkplace6-07-final.pdf for contractor employees and at http://www.hss.energy.gov/CSA/CSP/feosh/reports.html for Federal employees. In addition to the poster, managers should take other actions to provide relevant information to workers. In areas where non-compliance with a DOE-prescribed worker protection standard is identified during an oversight inspection, information about the non-compliance should be conveyed to worksite employees. This can be achieved by posting non-compliance information in such areas for five working days or until the non-compliance is corrected. Other worker protection posting requirements may be applicable to special situations in specific workplaces.

c. Discuss the project manager responsibilities set forth in DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*

[Note: DOE O 440.1A has been replaced with DOE O 440.1B, chg 1, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*.]

The following is taken from DOE O 440.1B, chg 1.

The responsibilities of the construction project manager are

- determining the necessity for requiring dedicated construction contractor safety and health personnel on project workplaces;
- ensuring that construction project acquisition documents provide information or reference to existing documentation that describes known hazards to which project workers may be exposed;
- ensuring that a pre-work safety meeting is conducted with the construction contractor to review project safety and health requirements;
- ensuring that the project safety and health plan is approved prior to any on-site project work and that required hazard analyses are completed and approved prior to start of work on affected construction operations;
- ensuring that project safety and health plans and hazard analyses are revised, as necessary, to address identified deficiencies in project safety and health performance or changes in project operations, contractors, or personnel;
- performing frequent and regular documented on-site reviews of construction contractor safety and health program effectiveness through personal on-site involvement and/or formal delegation to support staff and/or the construction manager; and
- ensuring documentation exists for all formal contract actions taken to enforce construction contractor compliance with project safety and health requirements.

d. Discuss the following construction contractor's responsibilities under DOE O 440.1A, *Worker Protection Management for DOE Federal and Contractor Employees*:

- **Establishing a safety program**
- **Worksite presence during work activities**
- **Compliance by subcontractors**

[Note: DOE O 440.1A has been replaced with DOE O 440.1B, chg 1, Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees.]

The following is taken from DOE O 440.1A (archived).

The contractor will comply with the following requirements:

- Implement a written worker protection program that
  - provides a place of employment free from recognized hazards that are causing or are likely to cause death or serious physical harm to employees; and

- Integrates all requirements contained in DOE O 440.1A, attachment 1, "Functional Area Requirements," and other related site-specific worker protection activities.

- Establish written policy, goals, and objectives for the worker protection program.
- Use qualified worker protection staff to direct and manage the worker protection program.
- Assign worker protection responsibilities, evaluate personnel performance, and hold personnel accountable for worker protection performance.
- Encourage employee involvement in the development of program goals, objectives, and performance measures, and in the identification and control of hazards in the workplace.
- Provide workers the right, without reprisal, to
  - accompany DOE worker protection personnel during workplace inspections;
  - participate in activities provided for herein on official time;
  - express concerns related to worker protection;
  - decline to perform an assigned task because of a reasonable belief that, under the circumstances, the task poses an imminent risk of death or serious bodily harm to that individual, coupled with a reasonable belief that there is insufficient time to seek effective redress through the normal hazard reporting and abatement procedures established in accordance with the requirements herein;
  - have access to DOE worker protection publications, DOE-prescribed standards, and the organization's own worker protection standards or procedures applicable to the workplace;
  - observe monitoring or measuring of hazardous agents and have access to the results of exposure monitoring;
  - be notified when monitoring results indicate they were overexposed to hazardous materials; and
  - receive results of inspections and accident investigations upon request.
- Implement procedures to allow workers, through their supervisors, to stop work when they discover employee exposures to imminent danger conditions or other serious hazards. The procedure will ensure that any stop work authority is exercised in a justifiable and responsible manner.
- Inform workers of their rights and responsibilities by appropriate means, including posting the appropriate DOE worker protection poster in the workplace where it is accessible to all workers.
- Identify existing and potential workplace hazards and evaluate the risk of associated worker injury or illness.
  - Analyze or review
    - designs for new facilities and modifications to existing facilities and equipment;
    - operations and procedures; and
    - equipment, product, and service needs.
  - Assess worker exposure to chemical, physical, biological, or ergonomic hazards through appropriate workplace monitoring, biological monitoring, and observation.
  - Evaluate workplaces and activities.

    - Report and investigate accidents, injuries, and illnesses and analyze related data for trends and lessons learned.
- Implement a hazard prevention/abatement process to ensure that all identified hazards are managed through final abatement or control.
- Provide workers, supervisors, managers, visitors, and worker protection professionals with worker protection training.
- Comply with the following worker protection requirements:
    - 29 CFR 1910, "Occupational Safety and Health Standards"
    - 29 CFR 1915, "Shipyard Employment"
    - 29 CFR 1917, "Marine Terminals"
    - 29 CFR 1918, "Safety and Health Regulations for Longshoring"
    - 29 CFR 1926, "Safety and Health Regulations for Construction"
    - 29 CFR 1928, "Occupational Safety and Health Standards for Agriculture"
    - American Conference of Governmental Industrial Hygienists (ACGIH), *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, when ACGIH threshold limit values (TLVs) are lower than OSHA permissible exposure limits. The TLVs for exposure to laser emissions in the ACGIH indices are excluded from this requirement.
    - ANSI Z136.1, *Safe Use of Lasers*
    - ANSI Z88.2, *Practices for Respiratory Protection*
    - ANSI Z49.1, *Safety in Welding, Cutting and Allied Processes*
    - National Fire Protection Association (NFPA) 70, *National Electrical Code*
    - NFPA 70E, *Electrical Safety Requirements for Employee Workplaces*
- Ensure that subcontractors performing work on DOE-owned or -leased facilities comply with this CRD and the contractor's own site worker protection standards, where applicable.

For each construction operation presenting hazards not experienced in previous project operations or for work performed by a different subcontractor, the construction contractor will prepare a hazard analysis and have it approved prior to commencement of affected work.

During periods of active construction, the construction contractor will have a designated representative onsite at all times. The construction contractor will prepare and have approved, prior to commencement of any onsite project work, a written project safety and health plan that provides a proposal for implementing the requirements. The construction contractor will designate the individual(s) responsible for onsite implementation of this plan, specify qualifications for those individuals, and provide a list of those project operations for which a hazard analysis is to be performed.

e. Discuss the requirements for the performance of a hazard analysis and a hazard abatement/prevention program. Include in the discussion each of the following elements:
- **Responsibility for implementation**
- **Purpose and content of the hazard analysis**
- **Worker awareness of the hazards and hazard abatement/prevention**

Responsibility for Implementation

The following is taken from DOE O 440.1B, chg 1.

The construction manager will

- Identify existing and potential workplace hazards and evaluate the risk of associated worker injury or illness
  - Analyze or review
    - designs for new facilities and modifications to existing facilities and equipment;
    - operations and procedures; and
    - equipment, product, and service needs.

For each construction operation presenting hazards not experienced in previous project operations or for work performed by a different subcontractor, the construction contractor will prepare a hazard analysis and have it approved prior to commencement of affected work.

Purpose and Content of the Hazard Analysis

The following is taken from DOE-STD-3009-94, chg 3.

The purpose of the hazard analysis is to present a comprehensive evaluation of potential process related natural events, and man-made external hazards that can affect the public, workers, and the environment due to single or multiple failures.

Consideration will be given to all modes of operation, including startup, shutdown, and abnormal testing or maintenance configurations. As is standard industrial practice, examination of all modes of operation considers the potential for equipment failure and human error.

Hazard identification and evaluation provide a thorough, predominantly qualitative evaluation of the spectrum of risks to the public, workers, and the environment due to accidents involving any of the hazards identified. The evaluation identifies preventive and mitigative features, including identification of expected operator response to incidents and provisions for operator protection in the accident environment.

Worker Awareness of the Hazards and Hazard Abatement/Prevention

The following is taken from DOE G 440.1-1B.

Beyond the specific training requirements contained in DOE-prescribed worker protection standards, the requirement does not specify curricula or duration of required employee worker safety and health training but emphasizes the need to formally communicate information concerning foreseeable project hazards and required protective measures prior to commencement of work on the affected construction operation. The approved hazard analysis for the respective construction operation is ideally suited to communicate this information to the worker.

Generally, it is desirable and practical to demand immediate abatement of identified hazards on a construction project because they are mostly of the construction contractor's making (and contract terms generally call for immediate abatement with provisions for

uncompensated work stoppages if this is not achieved). However, there are instances where it may be either impossible or impractical to demand immediate abatement of a hazard, or where abatement of a particular hazard may fall outside of project scope.

The requirement provides specific steps that should be taken in such instances. It is not, however, the intent of the requirement to provide a vehicle or a requirement for priority treatment of abatement actions outside of project scope (with project funds) above other pending, and possibly more crucial, site abatement actions.

f. Discuss the contractor's responsibility for providing necessary training to employees in the area of safety and health at the worksite.

The following is taken from DOE O 440.1B, chg 1.

The contractor must develop and implement a work safety and health training and information program to ensure that all Federal workers exposed or potentially exposed to hazards are provided with the training and information on that hazard in order to perform their duties in a safe and healthful manner.

The contractor will provide the following:

- Training and information for new Federal workers, before or at the time of initial assignment to a job involving exposure to a hazard
- Periodic training as often as necessary to ensure that Federal workers are adequately trained and informed
- Additional training when safety and health information or a change in workplace indicates that a new or increased hazard exists

DOE must provide to Federal workers (who have worker safety and health program responsibilities) training and information that is necessary for them to carry out those responsibilities.

g. Discuss the project manager's responsibility for on-site safety and health inspections.

The following was taken from DOE G 440.1-1B.

The requirement of 29 CFR 1926.20, "General Safety and Health Provisions," calls for frequent and regular inspections of the job site by each employer (i.e., the construction contractor and all subcontractors). Consistent with requirements of the Federal Acquisition Regulation that calls for the onsite presence of a superintendent during the performance of any project work activities, the requirement calls for daily inspections of the job site by the construction contractor during periods of active work.

It should be noted that the frequency of required job site inspections by the project manager or his/her designee (i.e., support staff or construction manager) is given as frequent and regular as opposed to any specific frequency (such as weekly or monthly). The desired frequency of project inspections, consistent with project size, complexity, and risk level should be addressed within local implementation guidance.

The safety and health inspections required for construction projects may be accomplished concurrent with other onsite activities. There is no specific requirement for standalone project safety and health inspections by the safety and health staffs of the construction or project managers if project personnel have the requisite skills to perform these functions.

However, in cases where project staff lacks the necessary skills or experience, or where particularly hazardous or complex work is ongoing, it may be that these requirements are best fulfilled by safety and health professionals duly tasked by the construction or project managers.

h. Discuss the contractor's required response to an identified safety and/or health hazard.

The following is taken from DOE G 440.1-1B.

For existing hazards identified in the workplace, abatement actions that are prioritized according to risk to the worker should be promptly implemented and interim protective measures must be implemented pending final abatement of the hazards. Workers should be protected immediately from dangerous safety and health conditions. Hazards must be systematically managed and documented through final abatement or control.

For existing hazards identified in the workplace, contractors must prioritize and implement abatement actions according to the risk to workers. The relative level of risk must be assessed for each identified hazard to ensure that hazard abatement efforts and resources are focused first on addressing the most serious workplace hazards. Conversely, low risk hazards may warrant only minimal abatement efforts and resources, and if determined to either be, or have become, sufficiently low, should be removed from the category of actively managed hazards. Risk assessment is an essential element of effective risk management. The assignment of risk levels provides a relatively simple and consistent method of expressing the risk associated with worker exposures to identified hazards.

For existing hazards identified in the workplace, workers must be protected from imminent dangerous safety and health conditions. In the event a dangerous condition is discovered, immediate action must be taken either to correct the condition or to remove all employees from exposure to the condition until the danger has been abated. An effective hazard abatement program is essential to ensure that workers are protected from exposure to current and future workplace hazards. The focus of this program must be the immediate control of identified workplace hazards. Where this is not possible, the program must ensure the protection of workers while awaiting final abatement action and it must provide an efficient mechanism to ensure that all identified hazards are abated as quickly as possible.

11. A technical program manager shall demonstrate a working level knowledge of hazardous waste and the development, review, and assessment of the following Resource Conservation and Recovery Act (RCRA) documentation:

- **Notice of violation**
- **RCRA facility investigation—corrective measures study**
- **Consent Order and settlement agreement**

a. Define the term "hazardous waste."

The following is taken from U.S. DOE Office of Health, Safety and Security, *Resource Conservation and Recovery Act.*

The statutory definition of a hazardous waste is provided in RCRA as follows:

> . . . a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Furthermore, a solid waste is a hazardous waste if it is not excluded by regulation and if it is listed as a hazardous waste, is a waste mixture containing one or more listed hazardous wastes, or exhibits one or more characteristics of hazardous waste. Listed wastes meet the definition of hazardous waste regardless of the concentration level of hazardous constituents in them. When listed wastes are mixed with nonhazardous wastes or materials, the mixture must be managed as hazardous waste.

b. Using the decision tree in 40 CFR 260, relate RCRA solid waste to hazardous waste and identify the applicable RCRA regulations for each.

The following is taken from 40 CFR 260, appendix 1, (archived).

The first question that should be asked is: "Is this material handled a solid waste"? If the answer to this question is "No," then the material is not subject to control under the RCRA and there is no need to worry about whether to comply with the subtitle rules. 40 CFR 260.2 provides a definition of "solid waste" that expands the statutory definition of that term.

If it is determined that the material is a solid waste, the next question that should be asked is, "Is the solid waste handled a hazardous waste?" 40 CFR 261.3, "Definition of Hazardous Waste," provides that, in general, a solid waste is a hazardous waste if

- it is, or contains, a hazardous waste listed in 40 CFR 261, subpart D, "Lists of Hazardous Wastes;" or
- the waste exhibits any of the characteristics defined in 40 CFR 261, subpart D.

However, 40 CFR 260, "Hazardous Waste Management System: General," and 261, "Identification and Listing of Hazardous Waste," contain provisions that exclude certain solid wastes from the definition of hazardous waste, even if they are listed in 40 CFR 261, subpart D or exhibit one or more of the characteristics defined in 40 CFR 261, subpart D.

It should now be possible to determine if the solid waste handled is a hazardous waste. For additional information regarding solid and hazardous waste, see 40 CFR 260.41, "Procedure for Case-by-Case Regulation of Hazardous Waste Recycling Activities."

c. Identify the kinds of hazardous wastes generated within the department and their sources.

This is a site-specific KSA. The Qualifying Official will evaluate its completion.

d. Describe the combination of facilities used to manage hazardous wastes at a site.

The following is taken from DOE G 435.1-1.

The RCRA requires the EPA to distribute regulations for management of hazardous waste. RCRA provides for states to distribute and implement hazardous waste regulatory programs that are at least as protective as the Federal programs. The hazardous waste requirements that personnel must follow in managing mixed transuranic waste and in closing affected facilities are primarily in 40 CFR 260 through 40 CFR 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program," or authorized state regulations. A variety of guidance manuals and information relevant to the management of the hazardous component of mixed transuranic waste has been prepared by the state regulatory agencies and the EPA. These guidance documents should be consulted when developing management programs for mixed transuranic waste.

Hazardous waste regulations distributed by the states with RCRA authority may be more restrictive than the Federal regulations. The more restrictive requirements may include more waste than the Federal requirements, or may impose another state's definition of hazardous waste when waste is received from that state. Waste management personnel, therefore, need to be aware of the requirements of the regulations in their own state as well as the implications of the regulations in states to which they intend to transfer waste.

e. Discuss the current methods of disposing of hazardous wastes.

The following is taken from Wikipedia, *Radioactive Waste*.

Radioactive waste is hazardous to most forms of life and the environment, and is regulated by government agencies in order to protect human health and the environment. Radioactivity diminishes over time, so waste is typically isolated and stored for a period of time until it no longer poses a hazard. The period of time waste must be stored depends on the type of waste. Low-level waste with low levels of radioactivity per mass or volume may need to be stored only hours or days while high-level wastes (HLW) must be stored for a year or more. Current major approaches to managing radioactive waste are segregation and storage for short-lived wastes, near-surface disposal for low and some intermediate level wastes, and deep burial or transmutation for the high-level wastes.

Nuclear waste requires sophisticated treatment and management to successfully isolate it from interacting with the biosphere. This usually necessitates treatment, followed by a long-term management strategy involving storage, disposal, or transformation of the waste into a non-toxic form. Governments around the world are considering a range of waste management and disposal options, though there has been limited progress toward long-term waste management solutions. Several methods of disposal of radioactive wastes were investigated by nuclear nations; they are

- long term above ground storage (not implemented)
- disposal in outer space (not implemented)

- deep borehole disposal (not implemented)
- rock-melting (not implemented)
- disposal at subduction zones (not implemented)
- ocean disposal (done by the United Soviet Socialist Republic (USSR), Great Britain, Switzerland, U.S., Belgium, France, Netherlands, Japan, Sweden, Russia, Germany, Italy, and South Korea from 1954-1993, but not currently permitted by international agreements).
- sub seabed disposal (not implemented, not permitted by international agreements)
- disposal in ice sheets (rejected in Antarctic Treaty)
- direct injection (done by USSR and U.S.)

Long-term storage of radioactive waste requires the stabilization of the waste into a form that will neither react nor degrade for extended periods of time. One way to do this is through verification. Currently some high-level waste is mixed with sugar and then calcined which involves passing the waste through a heated, rotating tube. The purpose is to evaporate the water from the waste, and de-nitrate the fission products to assist the stability of the glass produced. The calcine is fed continuously into an induction heated furnace with fragmented glass. The resulting glass is a new substance: a glass matrix that, when solid, bonds with the waste products. This matrix is poured into stainless steel cylindrical containers. When cooled, the fluid solidifies into glass. After filling a cylinder, a seal is welded onto the cylinder; the cylinder is washed, inspected for external contamination, and then stored in an underground repository. In this form, the waste products are immobilized for a long period of time (many thousands of years).

It is common for medium active wastes in the nuclear industry to be treated with ion exchange or other means to concentrate the radioactivity into a small volume. The much less radioactive bulk is often then discharged. For example, it is possible to use a ferric hydroxide floc to remove radioactive metals from aqueous mixtures; the resulting sludge can be placed in a metal drum before being mixed with cement to form a solid waste. In order to get better long-term performance from such forms, they may be made from a mixture of fly ash, or blast furnace slag, and Portland cement instead of normal concrete.

The Australian Synroc (synthetic rock) is a more sophisticated way to immobilize such waste, and this process may eventually come into commercial use for civil wastes. The Synroc contains pyrochlore and cryptomelane type minerals. The main minerals in Synroc are hollandite, zirconolite, and perovskite. The zirconolite and perovskite are hosts for the actinides. The strontium and barium will be fixed in the perovskite. The caesium will be fixed in the hollandite.

In above-ground disposal, dry cask storage typically involves taking waste from a spent fuel pool and sealing it in a steel cylinder, which is placed in a concrete cylinder that acts as a radiation shield.

Geologic disposal—the process of selecting appropriate deep final repositories for HLW and spent fuel—is underway in several countries. The basic concept is to locate a large, stable geologic formation and use mining technology to excavate a tunnel, or to use large-bore tunnel machines to drill a shaft 500 meters (1,600 feet) to 1,000 meters (3,300 feet) below the

surface where rooms or vaults can be excavated for disposal of high-level radioactive waste. The goal is to permanently isolate nuclear waste from the human environment.

Sea-based options for disposal of radioactive waste include burial beneath a stable abyssal plain, burial in a subduction zone that would slowly carry the waste downward into the Earth's mantle, and burial beneath a remote natural or human-made island. While these approaches all have merit and would facilitate an international solution to the problem of disposal of radioactive waste, they would require an amendment of the Law of the Sea.

The proposed land-based subductive waste disposal method disposes of nuclear waste in a subduction zone accessed from land; therefore, is not prohibited by international agreement. This method has been described as the most viable means of disposing of radioactive waste. Another approach termed Remix & Return would blend HLW with uranium mine and mill tailings down to the level of the original radioactivity of the uranium ore, then replace it in inactive uranium mines. This approach has the merits of providing jobs for miners who would double as disposal staff, and of facilitating a cradle-to-grave cycle for radioactive materials; but, would be inappropriate for spent reactor fuel in the absence of reprocessing, due to the presence in it of highly toxic radioactive elements such as plutonium.

Deep borehole disposal is the concept of disposing of high-level radioactive waste from nuclear reactors in extremely deep boreholes. This disposal method seeks to place the waste as much as 5 kilometers beneath the surface of the Earth and relies primarily on the immense natural geological barrier to confine the waste safely and permanently so that it should never pose a threat to the environment.

There have been proposals for reactors that consume nuclear waste and transmute it to other, less-harmful nuclear waste. The integral fast reactor was a proposed nuclear reactor with a nuclear fuel cycle that produced no transuranic waste (TRUW) and in fact, could consume TRUW. It proceeded as far as large-scale tests, but was then canceled by the U.S. government. Another approach, considered safer but requiring more development, is to dedicate subcritical reactors to the transmutation of the left-over transuranic elements.

Another option is to find applications for the isotopes in nuclear waste so as to re-use them. While re-use does not eliminate the need to manage radioisotopes, it reduces the quantity of waste produced.

Space disposal is attractive because it permanently removes nuclear waste from the environment. It has significant disadvantages, such as the potential for catastrophic failure of a launch vehicle that could spread radioactive material into the atmosphere and around the world and a high number of launches would be required because no individual rocket would be able to carry very much of the material relative to the total amount that needs to be disposed of. This makes the proposal impractical economically and it increases the risk of at least one or more launch failures. International agreements on the regulation of such a program would need to be established. Costs and inadequate reliability of modern rocket launch systems for space disposal has been one of the motives for interest in non-rocket space launch systems such as mass drivers, space elevators, and other proposals.

Video 10. Waste handling at the DOE WIPP facility
http://www.youtube.com/watch?v=GlEtQ2qlxEU

f. Describe the process for developing the listed documents.

Notice of Violation

The following was taken from 10 CFR 820.2.

Preliminary notice of violation is a document issued by the director, setting forth the preliminary conclusions that the respondent has violated or is continuing to violate a DOE nuclear safety requirement, and includes

- a statement specifying the DOE nuclear safety requirement to which the violation relates;
- a concise statement of the basis for alleging the violation;
- any proposed remedy, including the amount of any proposed civil penalty; and
- a statement explaining the reasoning behind any proposed remedy.

Final notice of violation is a document issued by the director in which the director determines that the respondent has violated or is continuing to violate a DOE nuclear safety requirement and includes

- a statement specifying the DOE nuclear safety requirement to which the violation relates;
- a concise statement of the basis for the determination;
- any remedy, including the amount of any civil penalty;
- a statement explaining the reasoning behind any remedy; and
- notice of respondent's right (if the notice assesses a civil penalty)
  - to waive further proceedings and pay the civil penalty;
  - to request an on-the-record adjudication of the assessment of the civil penalty; or
  - to seek judicial review of the assessment of the civil penalty.

RCRA Facility Investigation—Corrective Measures Study

The following is taken from 10 CFR 820.21.

The director may initiate and conduct investigations and inspections relating to the scope, nature, and extent of compliance by a person with the RCRA and the DOE nuclear safety requirements and take such action as he/she deems necessary and appropriate to the conduct of the investigation or inspection, including any action pursuant to 10 CFR 820.8, "Evidentiary Matters."

Any person may request the director to initiate an investigation or inspection pursuant to 10 CFR 820.21, "Investigations." A request for an investigation or inspection will state the subject matter or activity to be investigated or inspected as fully as possible and include supporting documentation and information.

Any person who is requested to furnish documentary evidence, information, or testimony in an investigation or during an inspection will be informed, upon written request, of the general purpose of the investigation or inspection.

Information or documents that are obtained during any investigation or inspection will not be disclosed unless the director directs or authorizes the public disclosure of the investigation. Upon such authorization, the information or documents are a matter of public record and disclosure is not precluded by the Freedom of Information Act (FOIA); 5 United States Code (U.S.C.) 552, *Public Information; Agency Rules, Opinions, Orders, Records, and Proceedings*; and 10 CFR 835.1004, "Freedom of Information." A request for confidential treatment of information for FOIA purposes will not prevent disclosure by the director if disclosure is determined to be in the public interest and otherwise permitted or required by law.

During the course of an investigation or inspection any person may submit at any time any document, statement of facts, or memorandum of law for the purpose of explaining the person's position or furnish information that the person considers relevant to a matter or activity under investigation or inspection.

Consent Order and Settlement Agreement

The following is taken from DOE G 435.1-1.

The RCRA requirements prohibit storage of hazardous waste restricted from land disposal except for purposes of accumulating sufficient quantities to facilitate recovery, treatment, or disposal. Capabilities and capacities to treat DOE mixed waste to the land disposal restriction treatment standards do not exist. Congress addressed this issue in 1992 with the passing of the Federal Facility Compliance Act of 1992 (FFCA). The FFCA required the Department to prepare site-specific treatment plans to address treatment of mixed waste to meet the land disposal restrictions at each facility where DOE generates or stores mixed waste. To meet the requirement, site-specific treatment plans were developed, and through agreements or consent orders, commitments to schedules to treat or otherwise meet the land disposal restrictions were made. Personnel should consult the site-specific treatment plans and agreements or consent orders as part of the life-cycle planning performed in accordance with waste generation planning.

The following is taken from 10 CFR 820.23.

DOE encourages settlement of an enforcement proceeding at any time if the settlement is consistent with the objectives of RCRA and the DOE nuclear safety requirements. The director and a person may confer at any time concerning settlement. These settlement conferences will not be open to the public and there will be no transcript.

DOE may at any time resolve any or all issues in an outstanding enforcement proceeding with a consent order. A consent order must be signed by the director and the person who is the subject, or a duly authorized representative; must indicate agreement to the terms contained therein; and must be filed. A consent order need not constitute an admission by any person that the RCRA or a DOE nuclear safety requirement has been violated, nor need it constitute a finding by DOE that such person has violated the RCRA or a DOE nuclear safety requirement. A consent order will, however, set forth the relevant facts that form the basis for the order and what remedy, if any, is imposed.

12. A technical program manager shall demonstrate a familiarity level knowledge of the development, review, and assessment of the following National Environmental Policy Act (NEPA) documentation:

- **Environmental impact statement (EIS)**
- **Environmental assessment (EA)**
- **Finding of no significant impact (FONSI)**
- **Categorical exclusion (CX)**
- **Record of decision (ROD)**

a. Describe the process for developing the listed documents.

EIS

The following is taken from DOE G 430.1-1, chapter 3.

EISs are prepared to meet the requirements of the NEPA whenever an EA does not result in a FONSI. The objective of an EIS is to evaluate any major Federal action that is proposed that has the potential for significant environmental impact, and to provide a forum for a public decision making process regarding the action. An EIS can include the following elements of work:

- EIS scoping in which the general technical approach is agreed upon and the public involvement program is initiated. Potential sources of data are identified and the scope of the proposed action, as well as any known alternatives, is reviewed.
- Inventorying natural, human, and cultural resources based on existing sources of information. Typical elements of the resource inventory include geology, hydrology, vegetation, wildlife, threatened and endangered species, air quality, land use, visual characteristics, socioeconomic character, and acoustic conditions. Cultural resources include archaeological sites, historical sites, sites with religious or social significance, and other sites with cultural significance.
- Impact assessment and mitigation planning, in which the proposed action is evaluated to determine the impact on the resources identified in the inventory. Appropriate mitigation measures are identified where it is possible to make adjustments in the proposed action that reduce or eliminate impacts. Alternatives to the proposed action, including "no action," are considered to evaluate the impact on the environment. The impact of the proposed action is compared to the impact of the other alternatives.
- Preparing a draft EIS and distributing that report to all interested parties including elected officials, citizen groups, and the public.
- Participating in agency reviews and public hearings regarding the draft EIS and responding to questions and comments.
- Preparing a final EIS including all comments and the responses to those comments.
- Preparing decision documents required for a ROD.

EA

The following is taken from DOE G 430.1-1, chapter 3.

The objective of an EA is to determine if a proposed action will have a significant impact on the environment and to assess that impact. If an EA results in a finding of FONSI, a notice is published in the Federal Register to that effect. If there is a significant impact or if there are

objections to the FONSI, an EIS may be required. An EA can include the following elements of work:

- Planning and coordination of the EA process, in which potential sources of data are identified and the scope of the proposed action is reviewed.
- Inventory of natural, human, and cultural resources based on existing sources of information. Typical elements of the resource inventory include geology, hydrology, vegetation, wildlife, threatened and endangered species, air quality, land use, visual characteristics, socioeconomic character, and acoustic conditions. Cultural resources include archaeological sites, historical sites, sites with religious or social significance, and other structures or areas with cultural significance.
- Impact assessment and mitigation planning, in which the proposed action is evaluated to determine the impact on the resources identified in the inventory. Appropriate mitigation measures are identified where it is possible to make adjustments in the proposed action that reduce or eliminate impacts.
- Participating in agency reviews of the EA and responding to questions and comments.
- Preparing an EA, including decision documents.

FONSI

The following is taken from 10 CFR 1021.322.

DOE will prepare a FONSI only if the related EA supports the finding that the proposed action will not have a significant effect on the human environment. If a required DOE EA does not support a FONSI, DOE will prepare an EIS and issue an ROD before taking action on the proposal addressed by the EA, except as permitted under 40 CFR 1506.1, "Limitations on Actions During NEPA Process," and 10 CFR 1021.211, "Interim Actions: Limitations on Actions During the NEPA Process."

In addition to the requirements found at 40 CFR 1508.13, "Finding of No Significant Impact," a DOE FONSI shall include the following:

- Any commitments to mitigations that are essential to render the impacts of the proposed action not significant, beyond those mitigations that are integral elements of the proposed action, and a reference to the mitigation action plan prepared under 10 CFR 1021.331, "Mitigation Action Plans"
- Any statement of findings required by 10 CFR 1022, "Compliance with Floodplain/Wetland Environmental Review Requirements"
- The date of issuance
- The signature of the DOE approving official

DOE will make FONSIs available to the public as provided in 40 CFR 1501.4, "Whether to Prepare an Environmental Impact Statement," and 40 CFR 1506.6, "Public Involvement"; DOE will make copies available for inspection in the appropriate DOE public reading room(s) or other appropriate location(s) for a reasonable time.

DOE will issue a proposed FONSI for public review and comment before making a final determination on the FONSI if required by 40 CFR 1501.4; DOE may issue a proposed FONSI for public review and comment in other situations as well.

Upon issuance of the FONSI, DOE may proceed with the proposed action subject to any mitigation commitments expressed in the FONSI that are essential to render the impacts of the proposed action no significant. DOE may revise a FONSI at any time, so long as the revision is supported by an existing EA. A revised FONSI is subject to all provisions of 10 CFR 1021.322.

CX

The following is taken from California Department of Transportation, CA.gov.

CXs are categories of actions that have been determined not to have a significant effect on the human environment, either individually or cumulatively. In its regulations for the implementation of NEPA, the Council on Environmental Quality directed all Federal agencies to adopt procedures which include identifying actions that are categorically excluded, i.e., normally do not require the preparation of either an environmental impact statement or an environmental assessment.

CXs are divided into two groups based on the action's potential for impacts. The first group consists of categories of actions that experience has shown almost never cause significant environmental impacts. These categories involve minor construction activities and activities that do not lead to construction. The second group consists of actions that normally do not involve significant impacts, but may, depending on circumstances, have the potential to cause significant environmental impacts. Because of the potential for significant impacts, these actions require some documentation in order to determine if the CX classification is proper. A CX from NEPA does not exclude a project from the other Federal or state environmental requirements for permits or consultation, except as provided in the other agreements.

ROD

The following is taken from 40 CFR 1505.2.

At the time of its decision or, if appropriate, its recommendation to Congress, each agency will prepare a concise public record of decision. The record, which may be integrated into any other record prepared by the agency, including that required by Office of Management and Budget (OMB) Circular A-95, *What it is—How it Works*, (rescinded), part I, sections 6(c) and (d), and part II, section 5(b)(4), shall

- state what the decision was;
- identify all alternatives considered by the agency in reaching its decision, specifying the alternative or alternatives that were considered to be environmentally preferable. An agency may discuss preferences among alternatives based on relevant factors including economic and technical considerations and agency statutory missions. An agency will identify and discuss all such factors including any essential considerations of national policy that were balanced by the agency in making its decision and state how those considerations entered into its decision; and
- state whether all practicable means to avoid or minimize environmental harm from the alternative selected have been adopted, and if not, why they were not. A monitoring and enforcement program will be adopted and summarized where applicable for any mitigation.

Video 11. The NEPA
http://www.youtube.com/watch?v=xQRlOYJV6Pg

13. A technical program manager shall demonstrate a familiarity level knowledge of the purpose and requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

a. Discuss the nine criteria set forth in 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," concerning the performance of cleanup alternative analysis.

The following is taken from 40 CFR 300.430.

The analysis of alternatives under review will reflect the scope and complexity of site problems and alternatives being evaluated, and consider the relative significance of the factors within each criterion. The nine evaluation criteria are as follows:

1. *Overall protection of human health and the environment*. Alternatives will be assessed to determine whether they can adequately protect human health and the environment, in the short- and long-term, from unacceptable risks posed by hazardous substances, pollutants, or contaminants present at the site by eliminating, reducing, or controlling exposures to levels established during development of remediation goals consistent with 40 CFR 300.430, "Remedial Investigation/Feasibility Study and Selection of Remedy." Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with applicable or relevant and appropriate requirements (ARARs).
2. *Compliance with ARARs*. The alternatives will be assessed to determine whether they attain ARARs under Federal environmental laws and state environmental or facility siting laws or provide grounds for invoking one of the waivers under 40 CFR 300.430.
3. *Long-term effectiveness and permanence*. Alternatives will be assessed for the long-term effectiveness and permanence they afford, along with the degree of certainty that the alternative will prove successful. Factors that will be considered, as appropriate, include the following:
    - Magnitude of residual risk remaining from untreated waste or treatment residuals remaining at the conclusion of the remedial activities. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate.
    - Adequacy and reliability of controls such as containment systems and institutional controls that are necessary to manage treatment residuals and untreated waste. This factor addresses in particular the uncertainties associated with land disposal for providing long-term protection from residuals; the assessment of the potential need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system; and the potential exposure pathways and risks posed should the remedial action need replacement.
4. *Reduction of toxicity, mobility, or volume through treatment*. The degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume will be assessed, including how treatment is used to address the principal threats

posed by the site. Factors that will be considered, as appropriate, include the following:

- The treatment or recycling processes the alternatives employ and materials they will treat
- The amount of hazardous substances, pollutants, or contaminants that will be destroyed, treated, or recycled
- The degree of expected reduction in toxicity, mobility, or volume of the waste due to treatment or recycling and the specification of which reduction(s) are occurring
- The degree to which the treatment is irreversible
- The type and quantity of residuals that will remain following treatment, considering the persistence, toxicity, mobility, and propensity to bioaccumulate of such hazardous substances and their constituents
- The degree to which treatment reduces the inherent hazards posed by principal threats at the site

5. *Short-term effectiveness*. The short-term impacts of alternatives will be assessed considering the following:
   - Short-term risks that might be posed to the community during implementation of an alternative
   - Potential impacts on workers during remedial action and the effectiveness and reliability of protective measures
   - Potential environmental impacts of the remedial action and the effectiveness and reliability of mitigative measures during implementation
   - Time until protection is achieved
6. *Implementability*. The ease or difficulty of implementing the alternative will be assessed by considering the following types of factors as appropriate:
   - Technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of the technology, ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy.
   - Administrative feasibility, including activities needed to coordinate with other offices and agencies and the ability and time required to obtain any necessary approvals and permits from other agencies.
   - Availability of services and materials, including the availability of adequate off-site treatment, storage capacity, and disposal capacity and services; the availability of necessary equipment and specialists, and provisions to ensure any necessary additional resources; the availability of services and materials; and availability of prospective technologies.
7. *Cost*. The types of costs that will be assessed include the following:
   - Capital costs, including direct and indirect costs
   - Annual operation and maintenance costs
   - Net present value of capital and operations and maintenance costs

8. *State acceptance*. Assessment of state concerns may not be completed until comments on the remedial investigation/feasibility study (RI/FS) are received but may be discussed, to the extent possible, in the proposed plan issued for public comment. The state concerns that will be assessed include the following:
    - The state's position and key concerns related to the preferred alternative and other alternatives
    - State comments on ARARs or the proposed use of waivers
9. *Community acceptance*. This assessment includes determining which components of the alternatives interested persons in the community support, have reservations about, or oppose. This assessment may not be completed until comments on the proposed plan are received.

b. Describe the requirements for public comments as they apply to the CERCLA activities.

The following is taken from 42 U.S.C.

Before adoption of any plan for remedial action to be undertaken by the president, by a state, or by any other person, the president or state, as appropriate, will take the following actions:

- Publish a notice and brief analysis of the proposed plan and make this plan available to the public.
- Provide a reasonable opportunity for submission of written and oral comments and an opportunity for a public meeting at or near the facility at issue regarding the proposed plan and regarding any proposed findings. The president or the state will keep a transcript of the meeting and make this transcript available to the public.

The notice and analysis published will include sufficient information as may be necessary to provide a reasonable explanation of the proposed plan and alternative proposals considered.

Notice of the final remedial action plan adopted will be published and the plan will be made available to the public before commencement of any remedial action. Such final plan will be accompanied by a discussion of any significant changes in the proposed plan and a response to each of the significant comments, criticisms, and new data submitted in written or oral presentations under 42 U.S.C., *Public Health, Social Welfare, and Civil Rights.*

After adoption of a final remedial action plan

- if any remedial action is taken;
- if any enforcement action under 42 U.S.C., section 9606 is taken; or
- if any settlement or consent decree under 42 U.S.C., section 9606 or 9622 is entered into; and
- if such action, settlement, or decree differs in any significant respect from the final plan;

the president or the state will publish an explanation of the significant differences and the reasons the changes were made.

Publication will include, at a minimum, publication in a major local newspaper of general circulation. In addition, each item developed, received, published, or made available to the

public under 42 U.S.C. will be available for public inspection and copying at or near the facility at issue.

c. Discuss the purpose and history of the CERCLA.

The following is taken from the Missouri Department of Natural Resources, *Comprehensive Environmental Response, Compensation and Liability Act*.

In the late 1970s, three hazardous waste sites, Love Canal in New York, Valley of the Drums in Kentucky, and Times Beach in Missouri, were discovered. At each of these sites, hazardous wastes had been dumped several years before the sites were found. Unfortunately, the RCRA did not cover wastes that were abandoned or uncontrolled.

On December 11, 1980, Congress passed CERCLA, better known as Superfund. CERCLA created a Federal trust fund through a tax on the chemical and petroleum industries. This trust fund or superfund was to be used to clean up uncontrolled or abandoned hazardous waste sites when potentially responsible parties (PRPs) could not be identified or located. The fund covered accidents, spills, and other emergency releases of pollutants and contaminants into the environment. CERCLA gave the EPA the power to search for the responsible parties, assure that they cooperated in the cleanup, and to recover costs once the cleanup was complete. The superfund was capitalized with $1.6 billion.

The following was taken from the EPA, *CERCLA Overview*.

CERCLA

- established prohibitions and requirements concerning closed and abandoned hazardous waste sites;
- provided for liability of persons responsible for releases of hazardous waste at these sites; and
- established a trust fund to provide for cleanup when no responsible party could be identified.

The law authorized two kinds of response actions

1. Short-term removals, where actions may be taken to address releases or threatened releases requiring prompt response; and
2. Long-term remedial response actions, which permanently and significantly reduce the dangers associated with releases or threats of releases of hazardous substances that are serious, but not immediately life threatening. These actions can be conducted only at sites listed on EPA's National Priorities List (NPL).

CERCLA enabled the revision of the national contingency plan (NCP). The NCP provided the guidelines and procedures needed to respond to releases and threatened releases of hazardous substances, pollutants, or contaminants. The NCP established the NPL.

Video 12. Love canal
http://www.youtube.com/watch?v=3iSFgZ-SlaU

Video 13. Valley of the Drums in Kentucky
http://www.youtube.com/watch?v=Ju8LJwCpXA0

Video 14. Times Beach, Missouri
http://www.ksdk.com/news/article/322748/3/EPA-crews-return-to-site-of-Times-Beach-disaster

d. Discuss the relationship between the CERCLA and all other environmental regulations, especially the relationship between CERCLA and RCRA.

The following is taken from the *U.S. Environmental Protection Orientation Manual*, chapter I.

The RCRA is an amendment to the Solid Waste Disposal Act, enacted in 1976 to address the huge volumes of municipal and industrial solid waste generated nationwide. RCRA regulates underground storage tanks that store petroleum or certain chemical products. Requirements exist for the design and operation of these tanks and the development of system to prevent accidental spills.

The Medical Waste Tracking Act of 1988 was a two-year demonstration program that expired in June 1991. It created a subtitle J program designed to track medical waste from generation to disposal. At present, no Federal EPA tracking regulations are in effect for medical waste, but many states have adopted their own programs.

CERCLA is a related statute that deals with cleaning up inactive and abandoned hazardous waste sites. RCRA, on the other hand, deals with materials that are currently destined for disposal or recycling.

14. A technical program manager shall demonstrate a working level knowledge of the management and negotiation of regulatory agreements and permits.

a. Describe the responsibilities involved with the management of the following documents:
- **National pollution discharge elimination system (NPDES)**
- **Federal facility agreement**
- **Consent Order and settlement agreements**
- **ROD**
- **RCRA permit parameters**
- **Grant conditions**

NPDES

The following is taken from EPA, Office of Wastewater Management, *Water Permitting 101*.

The EPA is authorized under the Clean Water Act (CWA) to directly implement the NPDES program. The EPA, however, may authorize states, territories, or tribes to implement all or parts of the national program. States, territories, or tribes applying for authorization may seek the authority to implement the base program and additional parts of the national program including
- permitting of Federal facilities;

- administering the National Pretreatment Program; and/or
- administering the Municipal Sewage Sludge Program.

If the state, territory, or tribe only has partial authority, the EPA will implement the other program activities. For example, a state may have an approved NPDES program, but has not received EPA approval of the state's municipal sewage sludge program. The EPA region would be responsible for ensuring that conditions to implement the standards for the use or disposal of sewage sludge were included in NPDES permits issued to publicly owned treatment works in that state. The EPA may issue a separate NPDES permit with the applicable sewage sludge standards and requirements, or may negotiate with the state on joint issuance of NPDES permits. The same process applies where state, territory, or tribe has not received approval for administering the national pretreatment program or permitting of Federal facilities.

In general, once a state, territory, or tribe is authorized to issue permits or administer a part of the program, EPA no longer conducts these activities. However, EPA must have an opportunity to review each permit issued by the state, territory, or tribe and may formally object to elements that conflict with Federal requirements. If the permitting agency does not address the objection points, the EPA will issue the permit directly. Once a permit is issued through a government agency, it is enforceable by the approved state, territorial, tribal, and Federal agencies with legal authority to implement and enforce the permit, and enforceable by private citizens in Federal court.

If the state, territory, or tribe does not have approval for administering the NPDES program, EPA will operate the NPDES program. When the EPA issues the permit, the CWA, section 401(a), "Compliance with Applicable Requirements; Application; Procedures; License Suspension," requires that the EPA obtain certification from the state where the discharge will occur to ensure that the discharge will be in compliance with effluent limits, the state's water quality standards, and any other appropriate requirement of state law. The CWA, section 401(d) requires the state to list in the certification the condition that must be included in the permit to implement the certification.

From the 1948 Water Pollution Control Act to the 1977 CWA to the Water Quality Act of 1987, the NPDES permitting program evolved from environmental legislation to control water quality degradation. Improvements to the quality of water in this country can be directly linked to the implementation of the NPDES program, and the control of pollutants discharged from municipal and industrial point sources into waters of the U.S. Individual and general permits set technology-based and water quality-based effluent limits to maintain environmental standards that ensure safe water for the enjoyment of all.

Federal Facility Agreement

The following is taken from the EPA, *Agreement with the Department of Energy—Model Provisions for CERCLA Federal Facility Agreements*.

In accordance with CERCLA, section 120, "Interagency Agreements," and 10 CFR 2705, "Notice of Environmental Restoration Activities," (archived), the DOE will normally be responsible for issuing primary and secondary documents to the EPA. As of the effective

date of this agreement, all draft and final reports for any deliverable document identified in this agreement shall be prepared, distributed, and subject to dispute in accordance with this agreement.

Primary documents include those reports that are major, discrete portions of remedial investigation/feasibility study (RI/FS) or remedial design/remedial action (RD/RA) activities. Primary documents are initially issued by the DOE in draft, subject to review and comment by the EPA. Following receipt of comments on a particular draft primary document, the DOE will respond to the comments received and issue a draft final primary document subject to dispute resolution. The draft final primary document will become the final primary document, either 30 days after the period established for review of a draft final document if dispute resolution is not invoked, or as modified by decision of the dispute resolution process.

Secondary documents include those reports that are discrete portions of the primary documents and are typically input or feeder documents. Secondary documents are issued by DOE in draft, subject to review and comment by the EPA. Although DOE will respond to comments received, the draft secondary documents may be finalized in the context of the corresponding primary documents. A secondary document may be disputed at the time the corresponding draft final primary document is issued.

Consent Order and Settlement Agreements

The following is taken from the *EPA Superfund Glossary*.

A consent decree is a legal document, approved and issued by a judge, that formalizes an agreement reached between the EPA and potentially responsible parties (PRPs), where PRPs will conduct all or part of a cleanup action at a superfund site; cease or correct actions or processes that are polluting the environment; or otherwise comply with EPA-initiated regulatory enforcement actions to resolve site contamination. The consent decree describes actions that PRPs are required to perform and may be subject to a public comment period.

The following is taken from Amy Luria's *CERCLA Contribution: An Inquiry into What Constitutes an Administrative Settlement*.

CERCLA provides broad authority to the Federal and state governments to address releases of hazardous substances. One such authority is the ability of the U.S. or individual states to hold liable for the costs of cleanup any party that is responsible for the presence of hazardous substances at certain hazardous waste sites. Because the cost of cleanup can often be astronomical, some parties responsible for the presence of hazardous substances may wish to settle their liability. If a settlement is deemed an "administrative settlement" or a "judicially approved settlement" under CERCLA, such a settlement provides a settling party with two tremendous benefits.

First, it protects a settling party from claims of contribution regarding matters addressed in the settlement. Second, it allows a settling party to seek contribution from any person who is not a party to a settlement who is responsible for the presence of hazardous substances at the site at issue.

ROD

The following is taken from EPA, *Superfund, Record of Decision*.

The ROD is a public document that explains which cleanup alternatives will be used to clean up a superfund site. The ROD for sites listed in the NPL is created from information generated during the RI/FS.

A ROD contains site history, site description, site characteristics, community participation, enforcement activities, past and present activities, contaminated media, the contaminants present, scope and role of response action, and the remedy selected for cleanup.

RCRA Permit Parameters

The following is taken from EPA 833-B-96-001, *Interim Guidance for Performance-Based Reduction of NPDES Permit Monitoring Frequencies*.

For each eligible facility, the compliance history for each parameter controlled in its existing permit is examined for significant noncompliance violations and/or effluent violations for critical parameters. These critical parameters are determined at the discretion of the permitting authority and could include pollutants that pose a higher risk to human or environmental health. The results of this examination determine which parameters are eligible for monitoring reductions.

The permitting authority then calculates, for each eligible parameter, the two-year composite average at each outfall. The composite average is compared with the permit limit, and the information in EPA 833-B-96-001, table 1, "Ratio of Long Term Effluent Average to Monthly Average Limit," which is based on the existing monitoring frequency, to determine the potential monitoring frequency reduction.

Grant Conditions

The following is taken from the EPA-315-K-08-001, *Environmental Review Guide for Special Appropriation Grants*.

Federal funding of the design and construction of a project funded in whole or in part under an EPA appropriations act is subject to NEPA. Under NEPA, EPA must evaluate the environmental impacts of its action and all reasonable alternatives, before taking the action (grant award). The EPA may award a grant for planning and preliminary design and later amend it to include final design and construction once the NEPA environmental review process has been completed.

Once the EPA appropriations bill is signed into law, the Office of Water in EPA HQ in Washington, D.C. begins developing national guidelines for administering the special appropriation act project grants. The guidelines are forwarded to the EPA regional and other HQ offices. The guidelines assist the regional and HQ offices in administering the grants for that fiscal year.

During this phase, the EPA and the grant recipient may discuss submission of the grant application and the scope of the environmental review information needed. These discussions may include the project scope, environmental review, environmental benefits and results,

grant work plan, cost eligibility of project components, engineering data, and other items of importance for submitting a grant application.

During the environmental review, the applicant provides information to the EPA to support a request for a categorical exclusion (CE) determination, submits an environmental information document (EID) or draft EA to EPA, or provides information for preparation of an EIS. The EPA reviews the CE request, the EID, draft EA, or EIS and prepares or finalizes the appropriate NEPA document.

Discussions between the EPA point of contact and the potential grantee continue throughout the application process. The grant applicant prepares the application and submits it to the EPA. The EPA reviews the application for completeness, undertakes the appropriate NEPA review, and awards the grant, if appropriate. Once the grantee fulfills the conditions of the grant, it is closed out.

b. Discuss the requirements and methods of negotiation for the following documents:

- **NPDES**
- **Federal facility agreement**
- **Consent Order and settlement**
- **ROD**
- **RCRA permit parameters**
- **Grant conditions**

NPDES

The following is taken from Weston Solutions, Inc., Technical Paper #0404, *Negotiating Higher NPDES Permit Limits—Strategies for Optimizing Technology and Water Quality-based Effluent Limit Calculations for Petroleum Refining*.

Permits are highly technical legal documents that take considerable resources and expertise to develop. The permit application can advocate alternate approaches and provide for development of higher permit limits than would otherwise be calculated. An application that requests alternate approaches and provides a legally and technically defensible rationale is usually successful.

Every data input and assumption in a permit calculation is a potential opportunity to negotiate a higher limit. When considering how a particular limit might be increased, there are often multiple options to be evaluated. The level of difficulty of obtaining a higher limit and the likelihood of success should be evaluated when formulating strategy. The issue should be resolved at the lowest level of effort in order to be most cost effective and have greater likelihood of success.

The NPDES regulations, 40 CFR 122.45, "Calculating NPDES Permit Conditions (Applicable to State NPDES Programs, see 123.25)," require that technology-based effluent limitations be based upon "not design capacity but reasonable measure of actual production." The EPA guidance refers to the use of production rates that are representative of the long-term average that might be anticipated during the five-year term of the permit. When preparing the production data for a permit application, five years of past production data is

typically considered. While past performance may be an indicator of future expectations, adjustments are often needed because the application data should project anticipated production for the next five-year permit term.

Analytical issues can make the difference between having a stringent water quality-based effluent limitation (WQBEL) versus a less stringent technology-based effluent limitation or no limit at all. The water quality criteria are often near or below the method detection limits. States typically establish a minimum quantification level that must be achieved, and policy regarding treatment of data that are reported as less than the established level.

Methods approved in 40 CFR 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants," should be used where possible, but alternative methods can be used if they better measure the toxic fraction. Data developed using alternate test methods may be provided as supplemental application data without having to have the methods formally approved by the EPA; however, the methods must be formally approved if used for permit compliance monitoring.

NPDES permit holders face significant liability for noncompliance with effluent limitations. Permit applicants can obtain higher effluent limitations and improved probability of compliance by understanding the basis of permit limitations and preparing strategies to obtain optimum limits. Collection of appropriate effluent and receiving water data can increase limits, or in some cases, eliminate the need for a WQBEL by showing there is not reasonable potential to violate water quality standards. Through planning and use of strategic approaches based on an understanding of the methodology, data, and assumptions used in development of effluent limitations, the application can result in the highest limits allowed under the regulation.

Federal Facility Agreement

The following is taken from DOE/OR/2331&D2, *Public Involvement Plan for CERCLA Activities at the U.S. Department of Energy Oak Ridge Reservation*.

Methods used to encourage public involvement vary widely and may include informal conversations, electronic communication, scheduled meetings and workshops, legally required hearings, and stakeholder advisory groups. DOE/Oak Ridge Office's environmental management actively seeks, considers, and incorporates or otherwise responds in a timely manner to the views of its stakeholders; thereby providing the opportunity to influence decisions. Stakeholders include individuals, groups, host communities, and other entities in the public and private sectors that are interested in or affected by CERCLA activities and decisions.

The public is kept informed of environmental management-related work and activities through various methods, including

- an annual report
- monthly newsletters
- site-specific advisory board's quarterly newsletters
- booths at conferences and special events

Consent Order and Agreement

The following is taken from the Administrative Conference of the U.S., *Negotiated Cleanup of Hazardous Waste Sites Under CERCLA.*

The EPA should emphasize the negotiation of voluntary cleanups at hazardous waste dump sites. The negotiation process for any site should include, at an appropriate time and in an appropriate manner, the key interests, such as Federal, state, and local governments, parties potentially responsible for cleanup, and local citizens. Whenever possible, efforts to negotiate a cleanup agreement should begin well before the commencement of litigation concerning a site. To increase the likelihood that negotiations will succeed, the administrator and other leading EPA officials, at HQ and in the regional offices, should support the negotiation process, follow its implementation, and be available to explain specific negotiated agreements before congressional oversight committees if necessary.

Citizens living in the vicinity of, or otherwise directly affected by, a site have a substantial interest in some issues related to the cleanup process. The EPA should consider means beyond complete reliance on local political institutions for involving these citizens, including the negotiation of collateral arrangements, participation of citizens groups in negotiations over the type and scope of the remedy, and the like.

The final agreement should take the form of an administrative consent order under CERCLA, section 106, or a judicial consent decree. Negotiations undertaken in the context of litigation require procedures and standards different from the procedures and standards applicable to negotiations occurring before an issue reaches litigation.

ROD

The following is taken from the EPA-315-K-08-001.

Following receipt of public comments and any final comments from the support agency, the lead agency selects and documents the remedy selection decision in a ROD. The ROD documents the remedial action plan for a site or operable unit and serves the following three basic functions:

1. It certifies that the remedy selection process was carried out in accordance with CERCLA and, to the extent practicable, with the national contingency plan (NCP).
2. It describes the technical parameters of the remedy, specifying the methods selected to protect human health and the environment including treatment, engineering, and institutional control components, as well as cleanup levels.
3. It provides the public with a consolidated summary of information about the site and the chosen remedy, including the rationale behind the selection.

While the ROD should provide a comprehensive description of site conditions, the scope of the action, the selected remedy, cleanup levels, and the reason for selecting the remedy, it is only one part of the administrative record file that contains the full details of site characterization, alternative evaluation, and remedy selection.

The ROD provides the framework for the transition into the next phase of the remedial process. RD (remedial design) is an engineering phase during which additional technical information and data identified are incorporated into technical drawings and specifications

developed for the subsequent remedial action. These specifications are based on the detailed description of the selected remedy and the cleanup criteria provided in the ROD.

When all phases of remedial activity at a site have been completed and no further response is appropriate, the site may be eligible for deletion from, or recategorization on, the NPL. Completed cleanup results are documented in a remedial action report or final closeout report and are compared with the terms in the ROD to determine whether remedial action objectives and cleanup levels have been attained. CERCLA requires a review to be conducted at least every five years at sites where an action has been selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Changes to the remedy selected in the ROD that occur during the RD/RA process must be described in an explanation of significant differences or ROD amendment pursuant to NCP 40 CFR 300.435, "Remedial Design/Remedial Action, Operation, and Maintenance," and 40 CFR 300.825, "Record Requirements After the Decision Document is Signed."

RCRA Permit Parameters

The following is taken from FindLaw, *Negotiating a RCRA Part B Permit*.

Considered as a whole, a relatively small percentage of the permit provisions are negotiable. A number of the permit provisions are required by the regulations and, obviously, are not negotiable. The permit, however, is negotiable with regard to those provisions that deal with the application of the programmatic requirements to the site-specific conditions of the facility.

Whether those provisions remain in generic form, with the facility-specific issues to be determined by the EPA or the state agency after the permit has been issued—when the permittee has almost no negotiating leverage—or the facility-specific issues are addressed in the permit process—where the permittee has the maximum available due process and negotiating leverage—depends on how proactive the permittee is during the permit application process.

For example, negotiating the details of the corrective action program as part of the permit application process has resulted in a much more user-friendly permit than the typical generic corrective action module. Other site-specific issues that might be negotiated during the permit application process include

- the technical details of a groundwater monitoring program;
- the technical details of a particular hazardous waste management unit; and
- all special conditions inserted by the agency in the draft permit pursuant to its omnibus authority.

While the EPA tends to be less communicative and less willing to negotiate permit provisions, most delegated state agencies will make a serious effort to address and resolve the applicant's issues before the final permit is issued.

Grant Conditions

The following is taken from the EPA, *RCRA Orientation Manual*.

Authorized states bear the primary responsibility for implementing the RCRA subtitle C program, but EPA still plays a role by offering financial assistance to states to help them develop and implement their hazardous waste programs, establishing broad national priorities, and ensuring that states properly carry out the RCRA program.

The EPA provides grants to states to assist them in developing or implementing authorized hazardous waste management programs. Each EPA regional office receives an allotment based upon multiple factors, such as population and the amounts and types of hazardous waste generated in the EPA region. States then submit proposed work plans that outline planned activities in the upcoming year, including permitting, enforcement, and program management. EPA regions then negotiate with each state over the specific work to be accomplished with these grant funds.

15. A technical program manager shall have a working level knowledge of project risk assessment.

a. Perform an assessment of project risks that identifies critical systems, subsystems, and other factors that require focused work and resolution.

This is a performance based KSA. The Qualifying Official will evaluate its completion.

b. Identify the type of risks that are addressed in a project risk assessment.

The following is taken from Right Track Associates, Inc., *Identifying Project Risks*.

To facilitate identification and assessment, and to pave the way for clarity in thought and communication, group potential risks into categories. The risk categories are

- management risks—risks that relate to the scope, structure, and strategy of a given project;
- technology risks—specific technical risks including design omissions, version conflicts, operational failures, incompatibilities, or bugs;
- resource risks—can involve staff changes, a lack of skilled resources, staff non-performance, or the reliability and availability of external service providers;
- timing risks—can include product delivery delays, or missed deadlines along the critical path;
- political risks—internal sensitivities relating to project support, sponsorship, internal cooperation, and communications; and
- external risks—risks beyond the direct control of the project team, caused by external environmental or industry factors.

c. Evaluate the assessed level of risk.

d. Describe the basis for the risk assessment.

e. Identify the critical project elements that contribute to the risk.

f. Identify the consequences of the risk.

g. Identify activities and alternatives to minimize the risk.

h. Identify the stage(s) of the project in which the risk exists.

Elements c through h are performance based KSAs. The Qualifying Official will evaluate their completion.

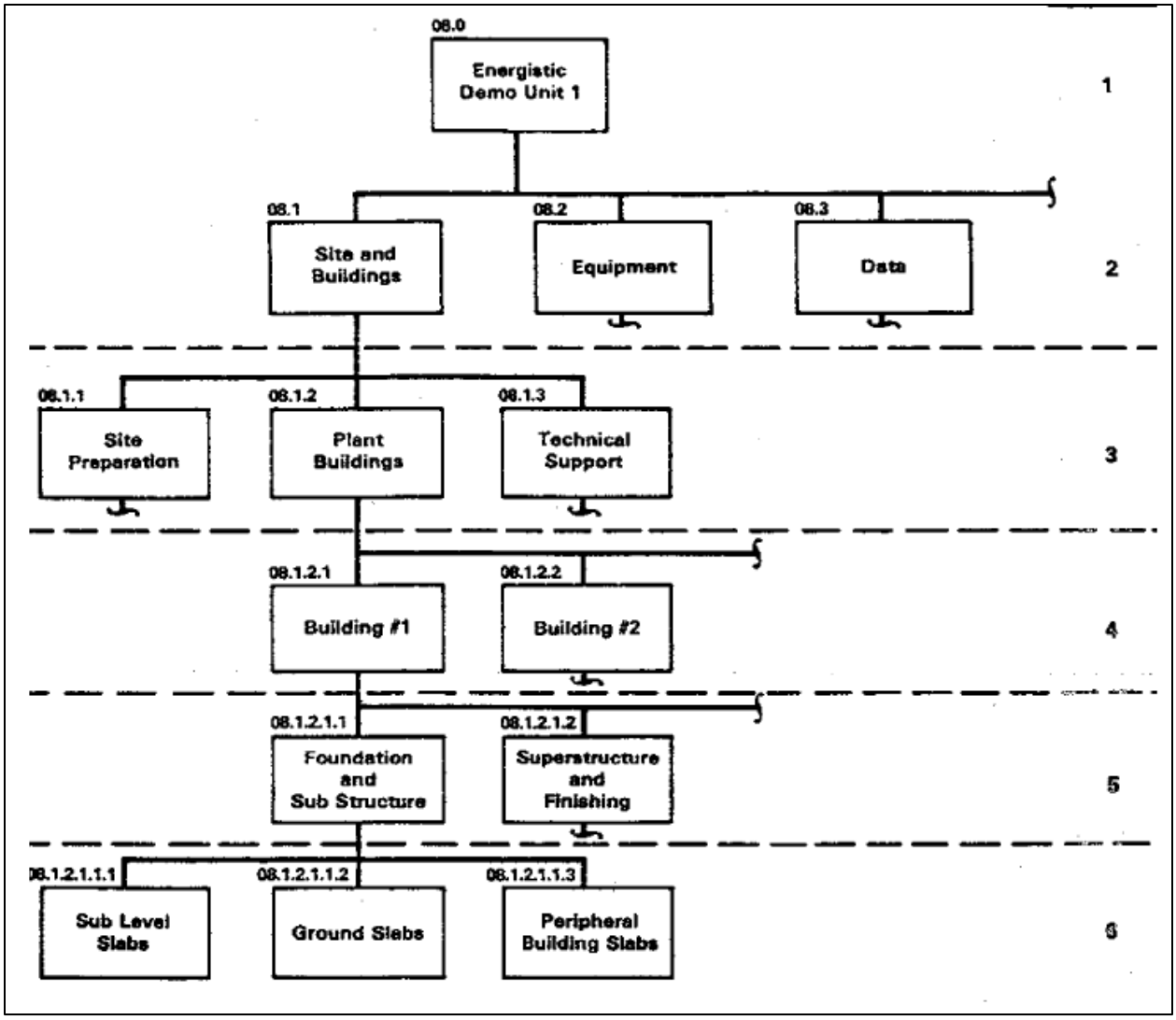
16. A technical program manager shall have a working level knowledge of financial management practices and application of resources necessary to integrate and apply program resources to meet commitments as described in DOE G 430.1-1, chapter 23, *Life Cycle Asset Management*.

[Note: DOE G 430.1-1, chapter 23, is now titled "Life Cycle Cost Estimate."]

a. Define the term "work breakdown structure" and discuss the process for developing one.

The following is taken from DOE G 430.1-1, chapter 5.

A work breakdown structure (WBS) is the result of project/program planning that establishes the physical work packages or elements and the activities within those packages that completely define a project. It organizes the physical work packages into levels that can be developed into a summary. Figure 4, *Typical Work Breakdown Structure*, shows a WBS.



Source: DOE G 430.1-1

Figure 5. Typical Work Breakdown Structure

A WBS shows the relationship of all elements of a project. This provides a sound basis for cost and schedule control. During that period of a project's life from its inception to completion, a number of diverse financial activities must take place. These activities include cost estimating, budgeting, accounting, reporting, controlling, and auditing. A WBS establishes a common frame of reference for relating job tasks to each other and relating project costs at the summary level of detail.

Since the WBS divides the project into work packages, it can be used to interrelate the schedule and costs. The work packages or their activities can be used as the schedule's activities. This enables resource loading of a schedule, resource budgeting against time, and the development of a variety of cost budgets plotted against time.

A WBS is a numerical, graphic representation that completely defines a project by relating elements of work in that project to each other and to the end product. The WBS is comprised

of discrete work packages, called elements, which describe a specific item of hardware, service, or data. Descending levels of the WBS provide elements of greater and greater detail. The number of levels of a WBS depends on the size and complexity of the project. The DOE WBS guide presents a structure that may be used as a guideline when developing the project/program WBS. Examples of the first three levels of a WBS are as follows:

1. Contains only the project end objective. The product at this level will be identifiable directly to elements of the DOE budget and reporting classification structure.
2. Contains the major product segments or subsections of the end objective. Major segments are often defined by location or by the purpose served.
3. Contains definable components, subsystems, or subsets, of the level 2 major segments.

The initial WBS prepared for a project is the project summary work breakdown structures (PSWBS). Normally, the PSWBS contains the top three levels only. Lower-level elements may be included when necessary to clearly communicate all project requirements.

Understanding of the Scope

The first prerequisite to the preparation of the PSWBS is the clear understanding and statement of the project objective by the project secretarial officer (PSO). This can include the delivery of a specific major end item, the erection of a building, or the remediation of a section of land. Once this overall project objective is established, it assists in the determination of the supporting project subobjectives. This process of identification and definition of subobjectives assists the PSO in structuring WBS levels and the contributing elements during WBS preparation.

Defining the Levels and Elements

Early in project planning, DOE project management should select the summary WBS(s) that will best describe the work of the project in the way it will be executed. WBS elements can be organized by physical area, process, or function. All elements of the WBS should be defined in an accompanying WBS dictionary. The summary WBS elements should be used as guides as the levels of the WBS are added or changed to reflect the changes and refinements of the scope as the design and project execution are being developed. As levels are added to the WBS, they should be checked across the project to ensure that they remain at the same level of detail. When developing a numbering system, the use of the computerized system should be considered since it may limit the number of digits in the WBS numeric identifier.

Use of the Work Breakdown Structure

The PSWBS should be used to identify work for proposed supporting contractors. Subsequently, the PSWBS elements assigned to contractors are extended by the contractors to derive each contract work breakdown structure (CWBS). Together, the PSWBS and each CWBS constitute the project WBS, which then provides the framework for cost, schedule, and technical planning, and control through the life of the project.

Updating the Work Breakdown Structure

The PSO must maintain the WBS. Changes may occur when the work effort can be more accurately defined or if a revised approach is implemented to satisfy or meet the project

objective. Contractors, while developing their CWBS, may propose to DOE alternative approaches to better accomplish the contract objectives. If the alternatives are accepted by DOE project management, the preliminary PSWBS will be revised accordingly. Thus, when establishing the numeric series for the WBS, it is advisable to leave some blocks of numbers for changes and additions to the scope. This makes the WBS revision process easier.

b. Define and compare the terms "cost estimate" and "budget."

Cost Estimate

The following is taken from DOE G 430.1-1, appendix A.

A cost estimate is a statement of costs estimated to be incurred in the conduct of an activity, such as a program, or the acquisition of a project or system. The estimate can be in the form of proposals by contractors or government agencies, a response to a program opportunity notice, or a DOE estimate.

Budget

The following is taken from About.com, *Economics*, "Definition of Budget."

A budget is a description of a financial plan. It is a list of estimates of revenues to and expenditures by an agent for a stated period of time. Normally, a budget describes a period in the future, not the past.

c. Describe the process for preparing cost estimates and budgets.

Cost Estimates

The following is taken from DOE G 430.1-1, chapter 13.

Check estimates and independent cost estimates (ICEs) are tools that can be used to validate a cost estimate. Estimate validation entails an objective review of the estimate to ensure that estimate criteria and requirements have been met, and a well documented, defensible estimate has been developed. The validation procedure occurs late winter to early spring in the pre-budgetary cycle. Validation is not a direct estimating function; however, estimators need to be aware of the validation cycle to ensure that those projects that require validation are ready for the validation process.

ICEs are defined as estimates developed by the Office of Infrastructure Acquisition (FM-50) for the express purpose of serving as an analytical tool to validate, cross-check, or analyze estimates developed in the proponency channels. ICEs follow a specific procedure and may involve site visits. ICEs are usually performed by a group of cost engineers, the estimator, schedulers, and experts in other disciplines, as required, hereinafter referred to as the ICE team. Estimates not performed by FM-50, but performed for the purpose of validating the official project estimate, are referred to as check estimates or review estimates, not ICEs.

The following technique is utilized by the ICE team depending on the stage of the project, the level of documentation available, and the time available:

- Documentation review (type I)—this type of review is not normally accomplished as an ICE, nor does it fulfill the requirements necessary to support the Energy System

Acquisition Advisory Board decision, since it only consists of an assessment of the documentation available to support the estimate. It is merely an inventory of existing documents, not a review, and determines that the required support documentation exists and identifies missing data.

- Reasonableness review (type II)—for this review, the ICE team reviews all available project documentation, receives briefings from the project team, holds discussions with the project team, completes sufficient analysis to assess the reasonableness of the project assumptions supporting the cost and schedule estimates, ascertains the validity of those assumptions, assesses the rationale for the methodology used, and checks the completeness of the estimate. The result is a report that details findings and recommendations.
- Parametric estimating technique (type III)—this technique, in addition to incorporating all activities needed for a reasonableness review, uses parametric techniques, factors, etc., to analyze project costs and schedules and is usually accomplished at a summary (WBS) level. The parametric techniques should be based on accepted historical cost/schedule analyses. At a minimum, these tools should be based on historical estimates from which models have been derived, and, where possible, from actual completed projects. An estimate with a minimum of 75 percent of the total project cost (TPC) based on parametric techniques is classified as a parametric estimate.
- Sampling technique (type IV)—this review begins with the activities needed for a reasonableness review, but in addition, it requires the ICE team to identify the key cost drivers. A "cost driver" is a major estimate element whose sensitivity significantly impacts the TPC. Detailed independent estimates must be developed that should include vendor quotes for major equipment and detailed estimates of other materials, labor, and subcontracts. For the balance of the project costs, the project estimate may be used, or, if appropriate, parametric techniques may be used for certain portions of the project costs. An estimate that provides a detailed cost for all cost drivers is classified as a sampling estimate.
- Bottoms-up estimating technique (type V)—this is the most detailed and extensive ICE effort, and begins with the activities needed for a reasonableness review. In addition, it requires a detailed bottoms-up independent estimate for cost and schedule. This involves quantity take-offs, vendor quotes, productivity analysis, use of historical information, and any other means available to do a thorough and complete estimate of at least 75 percent of the project's cost. It may not be possible to do a completely independent estimate on some portions of the PSO estimate, and for those portions—that should not exceed 25 percent of the total estimate—the project estimate may be used if it has passed the test of reasonableness. In all cases, a total cost (total estimated cost and TPC) should be developed. It must be recognized that all estimates will involve a combination of the techniques described in DOE G 430.1-1, chapter 13, because varying levels of information will be available. The accuracy of the estimate will be subjectively determined based on the weighted totality of the information available.

- Independent cost estimate content—the ICE is a term that includes all those elements that impact a project's TPC. Therefore, depending on the specific project involved, the ICE will address the reasonableness of the project scope and such activities as
  - direct project costs (equipment, material, labor subcontract)
  - indirect costs (overhead)
  - NEPA
  - design/site
  - project/construction management (manpower)
  - program management
  - research and development
  - startup
  - offsite costs
  - transportation
  - operations
  - remedial investigation/feasibility studies
  - decommissioning and demolition
  - contingency
  - escalation
  - interagency agreements
  - schedule
  - funding profile (including procurement plan)
  - progress to date (including estimate to complete)
  - other costs outside DOE

Budget

The following is taken from DOE O 130.1, attachment 2, "The Relationship of DOE 130.1 With Other Budget Guidance."

DOE O 130.1, *Budget Formulation*, establishes the budget formulation process. It sets the budget formulation policy, describes the overall framework for each phase, and defines roles and responsibilities. DOE O 130.1 does not provide all the varied and continually changing reporting and requirements for each new budget formulation cycle. Budget guidance that is subject to continual change is provided through other related budget documents.

These guidance documents are as follows:

- *Chief financial officer (CFO) calls*. Budget calls supplement DOE O 130.1 and provide specific information and requirements relevant to a particular phase of the budget formulation process. They contain items such as funding levels, due dates, and escalation rates, and describe any new or changed data requirements. They convey necessary revisions to the DOE budget formulation instructions.
- *DOE budget formulation instructions.* The budget formulation instructions contain detailed budget guidance such as definitions, key concepts and procedures for budget validation reviews, as well as the specific reporting requirements for each phase of the Department's annual budget formulation process. The instructions are updated as

needed to ensure all budget guidance is consistent with departmental, OMB, and Congressional directives and applicable Federal laws.

- *OMB Circular A-11, Preparation and Submission of Budget Estimates*. OMB issues an annual update to circular A-11 for the succeeding budget cycle. Print materials for the president's budget appendix will be developed according to the guidance issued in circular A-11. In addition, several sections of circular A-11 require the submission of crosscutting budget data for inclusion in the president's budget. These data will be developed in compliance with the formats and reporting requirements specified in circular A-11.
- *OMB allowance guidance.* Congressional budget submissions will be written to final OMB allowance levels. These funding levels are based upon final presidential policy and funding decisions and are typically provided at the decision unit level of detail. OMB allowances will be issued to HQ elements through the budget control table provided with the annual congressional budget call.
- *CFO memoranda*. The CFO memoranda provide supplemental guidance and are used to request additional budget data, as needed.

d. 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)**

The following is taken from DOE G 413.3-10A.

The earned value management system (EVMS) is an integrated set of policies, procedures, and practices necessary to provide reliable and accurate project and program information to support project management as a decision making tool and a critical component of risk management. An EVMS

- effectively integrates a project's work scope, cost, and schedule into a single performance measurement baseline (PMB); and
- reliably tracks
  - planned value of work to be performed or the BCWS;
  - EV of actual work performed or the BCWP; and
  - ACWP.

The following is taken from the U.S. Department of Health & Human Services, Public Health Emergency, *EVM Glossary of Terms*.

ACWP is the cost actually applied and recorded in accomplishing the work performed within a specified period.

BCWS is the sum of the performance budgets for all work scheduled to be accomplished within a given time period. This includes detailed work packages, planning packages, apportioned efforts, plus level of effort packages.

BCWP is the sum of the budgets for completed work packaged and completed portions of open work packages, plus the appropriate portion of the budgets for level of effort and apportioned effort.

e. Describe and compare labor and non-labor costs necessary to integrate and apply program resources to meet commitments.

The following is taken from DOE G 430.1-1, chapters 9 and 15.

Facilities constructed as conventional projects do not operate without labor. These facilities may employ various types of labor, including operations, technical, administrative, and clerical labor. The level of estimate detail will dictate the level of labor cost breakout in the estimate. For a detailed estimate, the reviewer should verify that all facility functions have been identified and properly estimated.

Estimates of labor costs for environmental projects will be different than estimates for conventional projects due to job functions required by the project. For example, work at the facility may dictate the number of health and safety professionals working on the project, and additional technical support may be required for projects that involve new or experimental remediation technology. Labor salaries are usually higher due to additional certification and training requirements for personnel who work in the environmental remediation field.

Operating cost estimates should include provisions for salaries and labor burden, including medical benefits, vacation and holidays, and other employee compensation items. Labor overhead will consist of administrative costs for scheduling, payroll, etc., as well as costs for employee workspace maintenance. Training costs may increase labor overhead for environmental projects. Labor overhead will be present regardless of the project operating schedule, but labor costs may be a function of the facility's operating schedule, especially if shift work is involved. Labor scheduling should contain an allowance for personnel decontamination time.

Some examples of possible differences are security areas, remote locations, nuclear radiation areas, degrees of inspection, documentation, etc. For differences like these, local productivity studies should be conducted to monitor the productivity at the specific site versus the labor hours given in the general estimating publications. If an estimate is derived using general estimating publications, the site productivity factor must be incorporated into the estimated labor-hours. This should be done prior to multiplication of the labor-hours by the labor rate.

In order to estimate labor costs, the worker's base rate plus all payroll indirect costs, such as Federal Insurance Contributions Act and payroll insurance, are multiplied by the estimated labor hours. Typically, this sum is handled as a direct labor cost. For ease of estimating, an average crew rate can be used and rounded to the nearest even dollar hourly rate.

The indirect costs may be included as part of the code of accounts for a project. One method to estimate the indirect costs is to assign a cost to each cost account. This method must be based on the size and type of contract and could be a lengthy list. This method requires a great deal of experience and a working knowledge of the construction firm's experience.

f. Describe and compare direct and indirect costs.

The following is taken from Wikipedia, *Indirect Costs*.

Direct costs are directly attributable to the cost object. In construction, the costs of materials, labor, equipment, etc., and all directly involved efforts or expenses for the cost object are direct costs. In manufacturing or other non-construction industries, the portion of operating costs that is directly assignable to a specific product or process is a direct cost. Direct costs are those for activities or services that benefit specific projects. For example, salaries for project staff and materials required for a particular project are direct costs. Because these activities are easily traced to projects, their costs are usually charged to projects on an item-by-item basis.

Indirect costs are not directly attributable to a cost object. Indirect costs are typically allocated to a cost object on some basis. In construction, all costs that are required for completion of the installation, but are not directly attributable to the cost object (such as overhead), are indirect. In manufacturing, costs not directly assignable to the end product or process are indirect. These may be costs for management, insurance, taxes, or maintenance. Indirect costs are those for activities or services that benefit more than one project. Their precise benefits to a specific project are often difficult or impossible to trace; for example, it may be difficult to determine precisely how the activities of the director of an organization benefit a specific project. Indirect costs do not vary substantially within certain production volumes or other indicators of activity, and so they may sometimes be considered to be fixed costs.

It is possible to justify the handling of almost any kind of cost as either direct or indirect. Labor costs, for example, can be indirect, as in the case of maintenance personnel and executive officers; or they can be direct, as in the case of project staff members. Similarly, materials such as miscellaneous supplies purchased in bulk—pencils, pens, paper—are typically handled as indirect costs, while materials required for specific projects are charged as direct costs.

g. Discuss methods of reducing indirect costs.

The following is taken from Government Accountability Office (GAO)-05-897, *Additional Opportunities Exist for Reducing Laboratory Contractors' Support Costs*.

In an era of Federal budget constraints, it is crucial to efficiently manage support costs at DOE laboratories, thereby maximizing funds available for laboratory missions. DOE and its contractors have taken steps to reduce support costs. To help decision-makers analyze support costs across the laboratories, several years ago DOE began to require laboratories to report functional support costs. DOE and its contractors have initiated several steps to reduce indirect and other support costs. First, DOE's laboratory contracts have increasingly included incentives to encourage cost reductions. NNSA began an "award-term" pilot program that allows a contractor to earn contract years based on performance and cost-savings achievements. Second, DOE requires its contractors to benchmark employee benefits and to reduce benefits if they exceed the benchmark. Third, DOE has begun to address a $1.9 billion backlog of deferred maintenance to reduce long-term costs and improve the safe, efficient,

and reliable operation of equipment and buildings. Last, some laboratories have used process improvement programs to streamline business processes and reduce costs.

h. Discuss the importance of determining the measure for work performed before work starts.

The following is taken from DOE, Oak Ridge, *The Performance-Based Management Handbook*, volume two, "Establishing an Integrated Performance Measurement System."

Change might be inevitable, but all too often it occurs like an unguided missile seeking an elusive target at unpredictable speeds. For most activities, it is far better to manage change with a plan—one that includes clear goals and useful indications of progress toward a desired objective. Participants in any activity need to know what outcome is expected, how their work contributes to the overall goal, how well things are progressing, and what to do if results are not occurring as they should. This approach places performance measures where they are the most effective; integrated with the activity.

Integration makes it possible for performance measures to be effective agents for change. If the measures quantify results of an activity, one only need compare the measured data with the desired goals to know if actions are needed. In other words, the measures should carry the message.

i. Explain what is meant by the term "baseline" as it relates to project management.

The following is taken from DOE G 430.1-1, appendix A.

Baseline is a quantitative definition of cost, schedule, and technical performance that serves as a base or standard for measurement and control during the performance of an effort; the established plan against which the status of resources and the effort of the overall program, field program(s), project(s), task(s), or subtask(s) are measured, assessed, and controlled. Once established, baselines are subject to change control discipline (modified).

j. Describe the types of data required to forecast cost and schedule performance.

The following is taken from DOE O 413.3B.

The contractor will submit monthly project performance data beginning no later than three months following CD-2 for projects having a total project cost greater than or equal to $20 million, as follows:

- For a cost reimbursement contract, the required project performance data will include
  - ANSI/EIA-748D, *Earned Value Management System*, earned value;
  - earned value time-phased incremental cost and quantity;
  - management reserve;
  - schedule;
  - variance analysis; and
  - risk management data.

- For project contracts to be awarded as subcontracts by the contractor, the contractor will develop a written acquisition plan, if applicable. The acquisition plan will receive the contracting officers' concurrence.

- Technical performance analysis and corrective action plans will be reported to DOE for variances to the project baseline objectives resulting from design reviews, component and system tests and simulations.
- A critical path schedule and a resource-loaded schedule must be developed and maintained for the project. At a minimum, resource-loaded schedules must contain labor material and equipment costs to include unit prices and quantities. For firm fixed-price contracts, the total project cost must be included in the resource loaded schedule.
- Project technical, cost, and schedule risks must be identified, quantified, and mitigated throughout the life of the project. A risk management plan (RMP) will be developed to cover processes and procedures that will be implemented to address risk assessment, risk monitoring, risk reporting, and lessons learned. The contractor's RMP must receive concurrence from DOE in accordance with contract requirements.

k. Describe methods for measuring work performed.

The following is taken from DOE, *Performance-Based Contracting*.

Metrics

In order to monitor progress against expectations, metrics should be developed for each performance measure. Metrics for performance measures should be developed at the time the specific requirements are developed, or as close thereto as possible. In most instances the minimum incentivized performance measure metric will equate to the level of performance stated in the scope of work (SOW). In other instances, the measure may be more discrete; i.e., linked to the accomplishment of a sub element of a SOW requirement. For example, if the SOW requires an approved purchasing system, a metric may be developed for an acceptable vendor payment process, which is a necessary step in developing an approved purchasing system.

Performance measures may be incentivized by allowing the opportunity for the contractor to earn an additional fee above that associated with the minimum incentivized performance measure metric if the contractor performs at a higher level of performance. Additional fee could be earned for such things as early completion, exceeding the performance measure metric, enhanced quality, etc. The identification of metrics that exceed the minimum incentivized performance level will let the contractor know what the approximate reward will be for a level of performance against a given metric. They will let the contractor know where the government believes it is important to pursue enhanced performance, and to what extent.

Metrics represent those performance levels that must be attained in order to receive a given rating/rating range (fee) for any requirement. The goal is to make them as objective as possible, but subjective areas should not be forced into an objective measurement system. Regardless of whether metrics are objective or subjective (or a combination), they must be measureable and verifiable to the greatest degree possible.

For those performance measures where it is desired that the contractor exceed the stated baseline performance level, metrics must be developed for the desired improved levels of performance. They should be as specific and objective as possible. They may take several forms such as the following:

- Point specific—below baseline, but acceptable = 601 millirem (mrem) of exposure; baseline = 600 mrem of exposure; & exceeds baseline = 599 mrem of exposure.
- Range specific—unacceptable: <500 barrels of waste moved; below baseline, but acceptable = 500-599 barrels of waste moved; baseline = 600-674 barrels of waste moved; exceeds baseline = 675-724 barrels of waste moved; significantly exceeds baseline = >725 barrels of waste moved.
- Objective—baseline = 600 barrels of waste; exceeds baseline = 675 barrels of waste; and significantly exceeds baseline = 725 barrels of waste.
- Subjective—unacceptable = lack of management oversight in meeting OSHA performance measures results in numerous hazards in the work place, fair housekeeping, fair focus on safety, and minimal management visibility in the work place; baseline = management oversight in meeting OSHA performance measures results in few work place hazards, good housekeeping, a commitment to safety, and management visibility in the work place; exceeds baseline = management oversight in meeting OSHA performance measures results in few work place hazards that are remedied quickly, a clean and well-organized work place, improved safety record, and a significant management presence in the work place.

Performance Objectives Not Incentivized

To the extent contracts, SOWs, and work authorization documents (WADs) are written to a baseline performance level, then the baseline metric for those requirements not specifically incentivized is the stated performance requirements in the WAD, or elsewhere in the contract. To ensure acceptable performance of these requirements, a conditional payment of fee clause should be included in the contract. This clause allows for the adjustment of fee in the event the performance of un-incentivized requirements is so poor as to jeopardize the overall performance of the contract.

In the event more specificity is desired, a performance measure encompassing all of the un-incentivized requirements, or the important ones, may be constructed with a specific fee associated with it. For the level of performance of these performance measures, reference only needs to be made to the appropriate documents. (Note: the contractor is only required to perform what is specified in writing in the contract. To the extent any effort is not specified as to the level of performance, or in the detail desired in the SOW, WAD, or elsewhere in the contract, consideration should be given to specifying it in section C of the contract, section H of the contract if a special provision, or an appropriate contract attachment. This would include primarily support type effort.)

In evaluating these performance requirements, one approach is to have the fee determination official or contracting officer note those requirements where the contractor failed to meet baseline performance and the degree to which he failed. The fee associated with the incentivized performance measures, or the specific performance measure created, would be subject to adjustment reflecting the degree to which the contractor failed to achieve baseline

performance in the requirement(s) and jeopardized overall contract performance. This would be based on the subjective judgment of the evaluators.

l. Discuss schedule and cost variance.

The following is taken from Houston Chronicle (Chron), *Small Business*, "How to Calculate a Cost Variance (CV) & a Schedule Variance (SV)", by Chirantan Basu.

CV is the budgeted cost of work performed minus the actual cost (AC) of work performed. It is the difference between planned and ACs of certain tasks within a specified period. A negative cost variance means that a project is over budget, while a positive variance means that is it under budget.

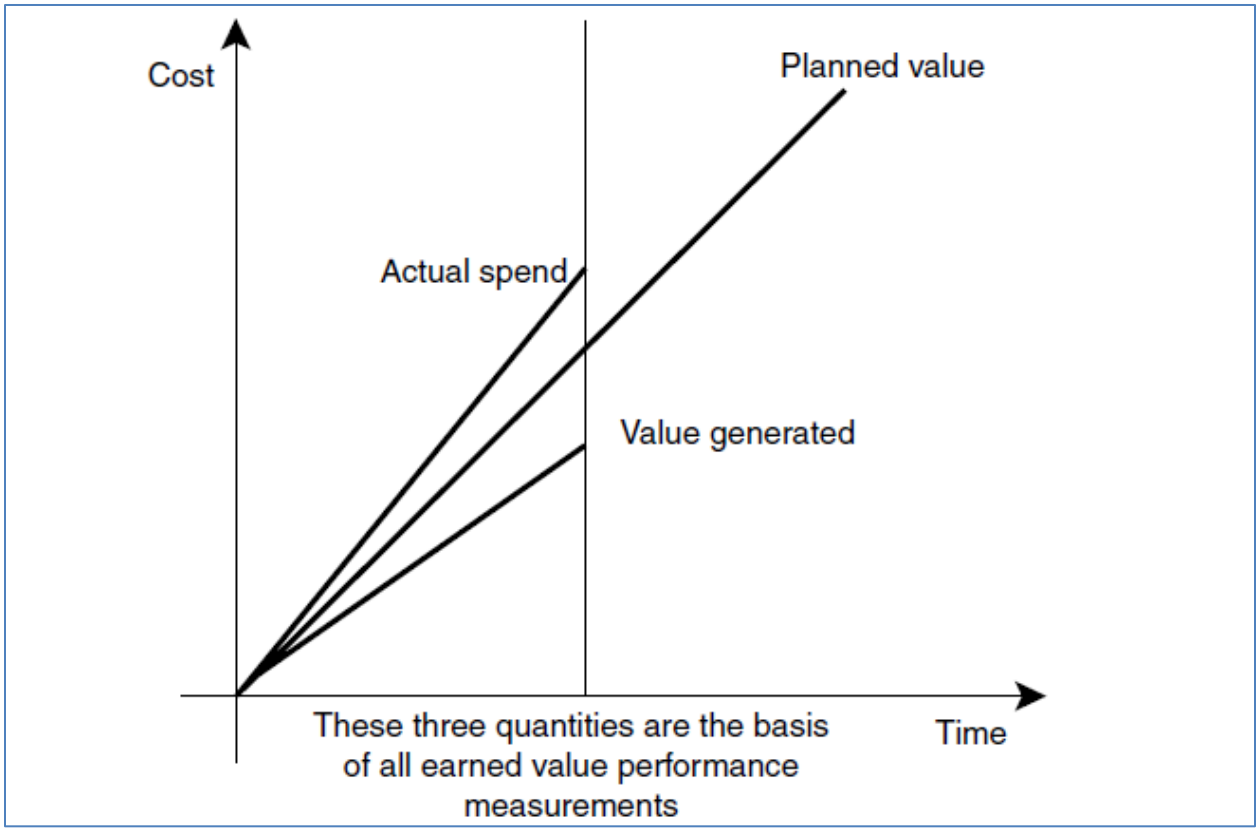
SV is the budgeted cost of work performed minus budgeted cost of work scheduled. In other words, it is the dollar value of the difference between the work scheduled for completion in a specified period and the work actually completed. A negative SV means that a project is behind schedule, while a positive variance means that it is ahead of schedule.

m. Describe the types of EV and how they are measured.

The following is taken from *Using Earned Value: A Project Manager's Guide*, by Alan Webb.

The EV principle is not difficult to understand—it comes from a basic concept that goes back to industrial engineering and accounting procedures that were around well before the discipline of project management arrived on the scene. Prior to the introduction of EV methods, project managers measured the performance of their projects by reference to Gantt charts and critical path analyses for the scheduling aspect, and the difference between the planned expenditure and the ACs to see how the money was going. Some highly influential customer organizations were embarrassed by cost overruns that weren't predicted until it was too late to do anything.

The answer to the problem was simple: make a detailed plan and a detailed valuation of all work in the project before starting, then, as the project progresses, make a note at each reporting point of 1) how much value should have been achieved according to the plan, 2) how much value has been created according to the work done, and 3) how much money has actually been spent. These values are shown in figure 6, *EV quantities*. Those three numbers form the basis of all EV methods; with a few simple mathematical ratios one can quickly judge the state of progress in terms of the cost and the schedule.



Source: Webb, Alan, Using Earned Value: A Project Manager's Guide

Figure 6. EV quantities

When EV was first introduced, there is no doubt that the sponsors were looking for a much better insight into the progress of their products from a cost and schedule standpoint than they had before. In particular, they did not want any nasty surprises from contractors making sudden demands for more money and increased time without any clear warning that the project situation was deteriorating. That situation has not altered; it is as important today as it was 40 years ago to have a clear view of how well a project is going and where it is heading.

EV methods demand effective planning, costing, and monitoring systems; the emphasis placed on these aspects can improve overall project management through the discipline they bring, and management using EV techniques requires a proper system of controls with the appropriate allocation of responsibility for achievement.

n. Define the term "estimate at completion" (EAC).

The following is taken from Cornell University Information Technologies, *Estimate at Completion (EAC).*

The definition of "estimate at completion" is the expected total cost of a scheduled activity, a work breakdown structure component, or the project when the defined scope of work will be completed.

The following is taken from DOE G 413.3-10A.

Whereas the PMB is important to measure a contractor's performance against a plan, an EAC is necessary to understand what the anticipated total funding requirements are to complete the project. Real-time updates of EACs for individual control accounts are important; however, individual control account EAC changes are often non-linear (i.e., their algebraic sum may not reflect the total impact). To better understand the EAC, a bottoms-up EAC should be required on some defined frequency. ANSI/EIA-748D requires periodic EAC reassessments at least annually or an on-going process of EAC review and maintenance. In either case, significant EAC changes should be incorporated as they are identified to provide visibility for program management purposes and potential funding implications. The consequences of not maintaining the EAC puts the project at risk should analysis of trends indicate the TPC may be insufficient. When the cumulative ACWP exceeds the projected EAC, it is a sign that EACs are not being properly maintained.

o. Define the term "Life Cycle Cost Estimate."

The following is taken from RADNET, section 4.

Life cycle cost estimate is a term used by DOE to designate the cost of complete remediation of weapons production facilities within the environmental management program. This term applies to the decommissioning of nuclear power facilities. It may also be used in reference to the life cycle disposal costs of specific components in a contaminated site; e.g., spent fuel from a nuclear power plant, reactor vessel wastes, etc.

p. Given sample data, calculate an LCC estimate.

This is a performance based KSA. The Qualifying Official will evaluate its completion.

q. Discuss the importance of formal change control with regard to project management.

The following is taken from DOE G 413.3-20.

A key goal of contract and project change control is to ensure performance baseline thresholds are not exceeded. Formal change control includes not only the decision-making framework for assessing, negotiating, and implementing project and contract changes; it also includes management and performance tracking systems, authorization and control levels, budgeting and financial management, and contract and project documentation.

r. Discuss the use of strategic planning, and how such planning relates to ongoing operations and safety of operations.

The following is taken from *"What is Strategic Planning?"* by Alliance for Nonprofit Management, (adapted from Bryson's *Strategic Planning in Pubic and Non-profit Organizations*).

Strategic planning is a management tool, and as such, it is used for one purpose only: to help an organization do a better job—to focus its energy, to ensure that members of the organization are working toward the same goals, and to assess and adjust the organization's

direction in response to a changing environment. In short, strategic planning is a disciplined effort to produce fundamental decisions and actions that shape and guide what an organization is, what it does, and why it does it, with a focus on the future.

A word by word dissection of this definition provides the key elements that underlie the meaning and success of a strategic planning process. The process is strategic because it involves preparing the best way to respond to the circumstances of the organization's environment, whether or not its circumstances are known in advance: nonprofits often must respond to dynamic and even hostile environments. Being strategic means being clear about the organization's objectives, being aware of the organization's resources, and incorporating them into being consciously responsive to a dynamic environment. The process is about planning because it involves intentionally setting goals and developing an approach to achieving those goals.

The process is disciplined in that it calls for a certain order and pattern to keep it focused and productive. The process raises a sequence of questions that helps planners examine experience, test assumptions, gather and incorporate information about the present, and anticipate the environment that the organization will be working with in the future. Finally, the process is about fundamental decisions and actions, because choices must be made in order to answer the sequence of questions mentioned here. The plan is ultimately no more, and no less, than a set of decisions about what to do, why to do it, and how to do it. Because it is impossible to do everything that needs to be done in this world, strategic planning implies that some organizational decisions and actions are more important than others—and that much of the strategy lies in making the tough decisions about what is most important to achieving organizational success.

17. A technical program manager 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, and follow up on actions taken as the result of assessments.

a. Describe the role of technical program managers in the oversight of government-owned contractor-operated facilities.

The following is taken from DOE03: *Make Field Facility Contracts Outcome-Oriented*.

Because the government wanted to take advantage of private sector capabilities to carry out research of critical national importance, government-owned, contractor-operated (GOCO) research and development facilities were constructed using management and operating (M&O) contracts for the national laboratories. The contracts have traditionally contained broad oversight and performance requirements and special provisions for the contractor.

Oversight of M&O contracts is performed by government officials in program offices and operations offices. Program managers oversee the science, technology, research, and development aspects of laboratory and weapons production activity. Operations office managers oversee contractual and cost accounting matters and provide day-to-day oversight and an on-site field presence. Relative to the size of the contracts being managed and the complexity of the work being performed, the government oversight staff is considered to be

small and inadequately trained. Oversight is hampered by a lack of specificity in the descriptions of products of M&O contracts and performance requirements, expectations, and measurement criteria.

b. Describe the assessment requirements and limitations associated with a technical program manager's interface with contractor employees.

The following is taken from DOE G 414.1-1B.

Managers perform management assessments to comply with the QA rule and QA Order and to improve performance. The purpose of this type of assessment is to identify the management systems, processes, and programs that affect performance and to make improvements. Management assessments look at the total picture, including

- how well the management systems and processes meet the customer's requirements;
- compliance with standards and requirements;
- meeting the expectations for safely performing work;
- clarity of the organizational mission, goals, and objectives; and
- identifying and correcting problems that hinder the organization from achieving its objectives.

The emphasis of management assessment is on issues that affect performance, strategic planning, personnel qualification and training, staffing and skills mix, communication, cost control, organizational interfaces, and mission objectives.

An independent assessment may be an audit, surveillance, for cause review, or inspection conducted by individuals within the organization or company, but independent from the work or process being evaluated, or by individuals from an external organization or company. The purpose of this assessment is to perform the following:

- Evaluate compliance with standards and requirements
- Evaluate the performance of work
- Measure the quality of the item or service
- Examine process effectiveness/adequacy
- Promote improvement

c. Explain the essential elements of a performance-based assessment, including the areas of investigation, fact-finding, and reporting. Include a discussion of the essential elements and processes of the following assessment activities:

- **Exit interviews**
- **Closure process**
- **Tracking to closure**
- **Follow-up**
- **Contractor corrective action implementation**

The Exit Meeting

The following is taken from DOE G 414.1-1B.

The exit meeting is used primarily by the assessment team to present the assessment summary. Reasonable time should be allowed to discuss any concerns, but this meeting should not be used to argue the assessment findings or methodology. There should be no

surprises during the exit meeting since the assessment team should have made every effort possible during the conduct of the assessment to ensure that the assessed organization was aware of the team's findings and concerns. Prior to the exit meeting, the assessment team should consider combining related findings into a small number of well-supported findings to help focus management's opportunities for improvement.

Closure Process

The following is taken from DOE-STD-3006-95 (archived).

To verify closure, support may be requested from the DOE ORR team leader or members but remains a management responsibility. DOE line management will verify that the corrective action plan has been entered into the appropriate quality program issue management system.

Monitoring and verification of satisfactory closure of prestart findings from the contractor and DOE ORRs is a management responsibility. The ORR team leader and team members may be required to assist in the verification or adequate resolution of prestart findings. DOE O 425.1D defines elements of the required process to close ORR prestart findings. This is accomplished by development of a closure package that is reviewed and certified by the facility management, and further reviewed by DOE management for findings from the DOE ORR. These procedures should be documented either in a facility-wide requirement or within the individual ORR implementation plan.

Tracking to Closure

The following is taken from DOE G 414.1-5 (cancelled).

An integral part of a successful corrective action program (CAP) is the capability to maintain a systematic approach for tracking and reporting the status of the corrective actions to successful closure and implementation. This may be accomplished manually or electronically.

Maintaining and updating this information provides consistent data for tracking and analyzing program status and trends. The process used to track and report corrective action progress should be readily accessible and provide sufficient data to appraise, analyze, and report the status of corrective actions affecting the safety, mission performance, and security of the site/organization.

Characteristics of an effective corrective action tracking and reporting system for consideration include the following:

- The number of data elements to enter, track, trend, and report information should be standardized and relevant for the reader to fully comprehend what, how, when, and by whom the problem finding will be effectively resolved so it will not recur. An excessive number of data elements to track and report may become too cumbersome and complicated, and may over-burden the ability of the system to provide qualitative and consistent information.
- The process for populating data elements should be clearly promulgated and enforced.
- The system should employ information technology that implements user-friendly, controlled access to the system and flexible reporting.

- A dedicated, highly reliable, automated database system may be the most cost-effective approach for tracking the CAP implementation, and it may significantly enhance the data collection, storage management, and processing of data and information in a timely manner. For the DOE corrective action management program, the corrective action tracking system (CATS) is used (http://www.eh.doe.gov/camp/index.html).
- A basic and simple process requiring minimal training and easy access to enter and retrieve data by the novice entry level member up through senior management and the computer technical expert will allow for increased participation and involvement by all personnel involved in identifying the findings and implementing corrective actions.
- The system should contain an automated workflow or a relationship capability for linking findings to corrective actions.
- The system should contain a pre-designed reporting capability for generating summary statistics and reporting timely, consistent, and accurate corrective action information.
- The information to be entered into the system should be consistent with simple, well-defined data elements and attributes for the data to be entered. Unorganized and inconsistent data collection significantly reduces the usefulness of the data. Guidance for the type of information to enter into the system should be thorough, clearly defined, and easily understood with a minimum of training and instruction.
- The data's access security should be an integral component of the system. Access should be limited to only those with a need to know. That may include members involved in the identification of finding and implementing the associated corrective actions. The corrective action information may delineate vulnerabilities of a site or organization and should not be available to the general population. Editor access to the system for updating data should be restricted to those registered personnel authorized by their management to access and enter only data involving the specified sites or organizations for which they have received authority. For the CATS, registration is required for readers and editors.
- The system should possess the capability to pinpoint problem areas and track trends. It should maintain historical data that supports ongoing problem resolution, trend analysis, and recurrence control activities.
- The system should allow flexible reporting, CAP changes and status, and real-time visibility of open and closed findings and corrective actions.
- The system should be able to integrate and link with other applicable databases.
- The system should be capable of conducting a flexible interactive search and retrieval of information for tracking and trending CAP status.
- The system should be continuously monitored, feedback requested from users, and changes made to ensure the system is meeting the needs of the users and the objectives of the CAP.
- Strong management support and participation in the operation and funding of the tracking and reporting system is critical to the effectiveness of the system.

Follow-up

The following is taken from DOE G 414.1-1B.

A follow-up assessment with special focus may be performed and should be completed in accordance with applicable corrective action documents. Particularly, this follow-up assessment should evaluate the effectiveness of corrective actions. A reasonable subset of corrective actions should be reviewed for effectiveness.

Contractor Corrective Action Implementation

The following is taken from DOE G 414.1-1B.

Managers responsible for the activities assessed are responsible for the development of effective corrective actions for the problem areas/deficiencies discovered during the assessment. At a minimum, these corrective actions should include the following:

- Measures to correct each deficiency
- Identification of all root causes for significant deficiencies
- Determination of the existence of similar deficiencies or underlying causes (i.e., extent of condition, extent of cause)
- Actions to preclude recurrence of like or similar deficiencies
- Assignment of corrective action responsibility
- Completion dates for each corrective action

Managers should verify that corrective actions are likely to fully address the identified deficiency and when actions are completed, validate that the actions have corrected the deficiency.

d. Describe the actions to be taken if the contractor challenges the assessment findings, and explain how such challenges can be avoided.

The following is taken from DOE G 450.4-1B, volume 2 (archived).

Differences in professional opinion could occur at several points during the process of resolving safety issues including

- disagreement between line organizations regarding the completeness, priority, cost-effectiveness, or funding of the proposed CAP;
- disagreement by the Office of Oversight with the adequacy of the line's CAP;
- disagreement by the Office of Oversight or line with the adequacy of CAP efforts at some time after implementation has begun;
- technical disagreement or funding inadequacies that arise during CAP implementation; and
- disputes identified during the CAP completion/closure verification process.

When a dispute is initially identified during this process, attempts are normally made to resolve it at the lowest organizational level possible, using a traditional process of discussion, mutual agreement, or compromise. It is assumed that within 30 days of stated objections, most areas of dispute can be resolved without the involvement of the secretary. Oral and written communications are considered effective tools for focusing issues, stating facts and rationale, and communicating information consistently to all interested parties. If informal

discussions successfully resolve the dispute, the resolution should be documented in a mutually agreeable way.

If an identified dispute cannot be resolved by informal discussions, it is elevated for resolution through a process that incorporates the following attributes, as appropriate:

- The dispute is appropriately documented to support its consideration by higher authority, with each party having equal opportunity for input on such documentation.
- The appropriate higher authorities are solicited to negotiate or arbitrate the dispute.
- Disputes are elevated to the minimum extent necessary to reach resolution, following the chain-of-command of the organizations involved.
- Dispute resolution is pursued as a priority, tracked in CATS, and completed by the higher authority within 30 days. Additional information, actions, or mutual decision to elevate the dispute to the next organizational level, should be completed within the 30-day target period.
- Discussions between organizations are coordinated in advance to ensure full participation of all parties.
- Resolution is documented in a mutually agreeable way or elevated to the Office of the Secretary.

If an issue is not resolved through the process described in the previous paragraph, it is elevated to the Office of the Secretary for resolution through a process that incorporates the following attributes:

- The dispute is appropriately documented, each party has equal input on such documentation, and the heads of the affected organizations concur with the documentation.
- The heads of the affected organizations work together to identify and brief the appropriate individual. An initial briefing may be provided at the senior policy/program advisor level, or the parties may prefer to discuss the matter directly with the secretary or designee.
- Resolutions by the secretary or designee are documented in accordance with established methods. The heads of the affected organizations provide any additional documentation required to support this effort.

18. A technical program manager shall have a working level knowledge of technical contract management to assess contractor performance.

a. Identify the three major DOE contract types, and describe the characteristics and the advantages and disadvantages of each.

The following is taken from DOE G 430.1-1, appendix A.

Cost Plus Award Fee (CPAF) Contract

A contract where the contractor recovers ACs incurred for completed work and is awarded a fee based on performance. Actual costs include general administration, overhead, labor and fringe benefits, other direct costs, and materials, including mark-up.

Cost Plus Fixed Fee (CPFF) Contract

A contract where the contractor recovers ACs incurred for completed work. The fee awarded is predetermined and set by the contract.

Cost Plus No Fee Contract

The following is taken from Wikipedia, *Cost-Plus Contract*.

A cost-plus contract, also called a cost reimbursement contract, is a contract where a contractor is paid for all of its allowed expenses to a set limit plus additional payment to allow for a profit.

Advantages

Advantages include the following:

- In contrast to a fixed-price contractor, a cost-plus contractor has less incentive to control costs.
- A cost-plus contract is often used when long-term quality is a much higher concern than cost, such as in the U.S. space program.
- Final cost may be less than a fixed price contract because contractors do not have to inflate the price to cover their risk.

Disadvantages

Disadvantages include the following:

- There is limited certainty as to what the final cost will be.
- A cost-plus contract requires additional oversight and administration to ensure that only permissible costs are paid and that the contractor is exercising adequate overall cost controls.
- Properly designing award or incentive fees requires additional oversight and administration.
- There is less incentive for the cost-plus contractor to be efficient, compared to a fixed-price contractor.

b. Identify and discuss the types of contracting processes that are used to put major contracts in place.

The following is taken from the Federal Acquisition Institute, *Contracting (FAC-C) Competencies*.

The ability to determine the most appropriate method of acquisition based on the customer's needs and requirements includes

- simplified acquisition procedures—identify policy when simplified acquisitions procedures, micro-purchases, and purchase orders should be used in fulfilling a requirement;
- blanket purchase agreements—identify and apply policy governing the use of blanket purchase agreements;
- sealed bidding—identify and apply the elements and limitations of sealed bidding; and
- contracting by negotiations—determine when contracting by negotiations should be used in fulfilling customer needs.

c. Describe the "Accountability Rule" and discuss the role that it plays in contract management.

The following is taken from the American Bar Association's, *The Most Important Questions a Surety Can Ask, The Surety's Environmental Risk*.

DOE now follows the "accountability rule" that has been in the process of implementation since 1991. Under this new rule, M&O contractors are still reimbursed for allowable costs, but are held liable for "avoidable costs." The contractor's liability for these "avoidable costs" is likely to be limited, per incident, to the amount the contractor earns during six months of the project. Although limiting the exposure of the contractor, the new cost-sharing arrangement rids DOE of the blank check system.

Under the terms of the new regulations, DOE will indemnify M&O contractors for claims arising out of the performance of DOE contracts provided the liabilities do not result from willful misconduct or lack of good faith on the part of the contractors' officers, directors, or supervising representatives: the avoidable costs. Contractors are now required to defend potentially covered claims and attempt to recoup these costs from the government afterward when the contracting officer determines that the claim is not covered and DOE elects not to provide the legal defense.

d. Discuss the following terms as they apply to financial accountability for the contractor:

- **Incentives**
- **Fines and penalties**
- **Third-party liabilities**
- **Loss of, or damage to, government property**
- **Allowable and non-allowable costs**

Incentives

The following is taken from Federal Acquisition Regulation (FAR) subpart 16.4, Incentive Contracts.

Incentive contracts are appropriate when a firm-fixed-price contract is not appropriate, the required supplies or services can be acquired at lower costs, and in certain instances (e.g., with improved delivery or technical performance) by relating the amount of profit or fee payable under the contract to the contractor's performance. Incentive contracts are designed to obtain specific acquisition objectives by

- establishing reasonable and attainable targets that are clearly communicated to the contractor; and
- including appropriate incentive arrangements designed to
  - motivate contractor efforts that might not otherwise be emphasized; and
  - discourage contractor inefficiency and waste.

The two basic categories of incentive contracts are fixed-price incentive contracts and cost-reimbursement incentive contracts. Since it is usually to the government's advantage for the contractor to assume substantial cost responsibility and an appropriate share of the cost risk, fixed-price incentive contracts are preferred when contract costs and performance

requirements are reasonably certain. Cost-reimbursement incentive contracts are subject to the overall limitations that apply to all cost-reimbursement contracts.

Fines and Penalties

The following is taken from FAR 31.205-15.

Costs of fines and penalties resulting from violations of, or failure of the contractor to comply with, Federal, state, local, or foreign laws and regulations are unallowable except when incurred as a result of compliance with specific terms and conditions of the contract or written instructions from the contracting officer.

Third-Party Liabilities

The following is taken from DOE/IG-0432.

A DOE contractor, specifically one that is a subsidiary of a major entity, could incur a large liability that it does not have the resources to sustain. In such cases, given the emphasis of the contract reform effort on holding contractors accountable, the reasonable expectation is that the parent entity would assume such liabilities. However, in the absence of an effective form of performance guarantee with indemnification provisions, the parent may not be legally liable for those obligations. Though the Department may not be directly liable for those obligations (unless it deemed itself liable), it may have to pay third-party costs that are the contractual responsibility of the operating contractors.

These third-party claims include whistleblower, workers' compensation, discrimination, and tort cases. While it is not possible to state with certainty the final dollar outcome of these lawsuits, the Department should utilize contract reform provisions and indemnification provisions in performance guarantees to help reduce future potential government liability and financial exposure.

For example, a 1996 third-party lawsuit for damages in excess of $15 million is pending against a DOE subsidiary contractor. The liability provisions of the Department's contract with the contractor are in accordance with the accountability rule. Under these provisions, the contractor liability for third-party claims is limited to avoidable costs up to the amount of fee earned during the fee period when the event occurred. In this case, a judgment against the contractor at or near the $15 million claim amount would be greater than the annual fee earned by the contractor. If, as a result, the contractor becomes bankrupt and the parent is not bound, the Department could be confronted with paying some portion of the unpaid balance.

Loss of, or Damage to, Government Property

The following is taken from FAR 45.103.

Contractors are responsible and liable for government property in their possession, unless otherwise provided by the contract. Generally, government contracts do not hold contractors liable for loss of, or damage to, government property when the property is provided under

- negotiated fixed-price contracts for which the contract price is not based upon adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation;
- cost-reimbursement contracts;

- facility contracts; or
- negotiated or sealed bid service contracts performed on a government installation where the contracting officer determines that the contractor has little direct control over the government property because it is located on a government installation and is subject to accessibility by personnel other than the contractor's employees, and that by placing the risk on the contractor, the cost of the contract would be substantially increased.

When justified by the circumstances, the contract may require the contractor to assume greater liability for loss of, or damage to, government property than that contemplated by the government property clauses. For example, this may be the case when the contractor is using government property primarily for commercial work rather than government work. If the government provides government property directly to a subcontractor, the terms of FAR 45.103, *General*, will apply to the subcontractor.

A prime contractor that provides government property to a subcontractor will not be relieved of any responsibility to the government that the prime contractor may have under the terms of the prime contract.

Allowable Costs

The following is taken from 48 CFR 31.105.

Allowable ownership and operating costs will be determined as follows:

- Actual cost data will be used when such data can be determined for ownership and operating costs for each piece of equipment, or groups of similar serial or series equipment, from the contractor's accounting records. When such costs cannot be so determined, the contracting agency may specify the use of a particular schedule of predetermined rates or any part thereof to determine ownership and operating costs of construction equipment. However, costs otherwise unallowable under 48 CFR 31.105, "Construction and Architect—Engineer Contracts," will not become allowable through the use of any schedule. For example, schedules need to be adjusted for government contract costing purposes if they are based on replacement cost, include unallowable interest costs, or use improper cost of money rates or computations. Contracting officers should review the computations and factors included within the specified schedule, and ensure that unallowable or unacceptably computed factors are not allowed in cost submissions.
- Predetermined schedules of construction equipment use rates that provide average ownership and operating rates for construction equipment. The allowance for ownership costs should include the cost of depreciation and may include facilities' capital cost of money. The allowance for operating costs may include costs for such items as fuel, filters, oil, and grease; servicing, repairs, and maintenance; and tire wear and repair. Costs of labor, mobilization, demobilization, overhead, and profit are generally not reflected in schedules, and separate consideration may be necessary.
- When a schedule of predetermined use rates for construction equipment is used to determine direct costs, all costs of equipment that are included in the cost allowances provided by the schedule will be identified and eliminated from the contractor's other direct and indirect costs charged to the contract. If the contractor's accounting system

provides for site or home office overhead allocations, all costs that are included in the equipment allowances may need to be included in any cost input base before computing the contractor's overhead rate. In periods of suspension of work pursuant to a contract clause, the allowance for equipment ownership will not exceed an amount for standby cost as determined by the schedule or contract provision.

- Reasonable costs of renting construction equipment are allowable.
- Costs, such as maintenance and minor or running repairs incident to operating such rented equipment, that are not included in the rental rate are allowable.
- Costs incident to major repair and overhaul of rental equipment are unallowable.
- The allowability of charges for construction equipment rental from any division, subsidiary, or organization under common control, will be determined in accordance with 48 CFR 31.205-36, "Rental Costs."
- Costs incurred at the job site incident to performing the work, such as the cost of superintendence, timekeeping and clerical work, engineering, utility costs, supplies, material handling, restoration and cleanup, etc., are allowable as direct or indirect costs, provided the accounting practice used is in accordance with the contractor's established and consistently followed cost accounting practices for all work.
- Rental and any other costs, less any applicable credits incurred in acquiring the temporary use of land, structures, and facilities, are allowable. Costs, less any applicable credits, incurred in constructing or fabricating structures, and facilities of a temporary nature are allowable.

Non-Allowable Costs

The following is taken from 48 CFR 9904.405-40.

Costs expressly unallowable or mutually agreed to be unallowable, including costs mutually agreed to be unallowable directly associated costs, will be identified and excluded from any billing, claim, or proposal applicable to a government contract.

Costs that specifically become designated as unallowable as a result of a written decision furnished by a contracting officer pursuant to contract dispute procedures will be identified if included in or used in the computation of any billing, claim, or proposal applicable to a government contract. This identification requirement applies to any costs incurred for the same purpose under like circumstances as the costs specifically identified as unallowable.

Costs that, in a contracting officer's written decision furnished pursuant to contract dispute procedures, are designated as unallowable directly associated costs of unallowable costs covered by 48 CFR 9904.405-40, "Fundamental Requirements."

The costs of any work project not contractually authorized, whether or not related to performance of a proposed or existing contract, will be accounted for, to the extent appropriate, in a manner that permits ready separation from the costs of authorized work projects.

All unallowable costs covered by 48 CFR 9904.405-40 will be subject to the same cost accounting principles governing cost allocability as allowable costs. In circumstances where these unallowable costs normally would be part of a regular, indirect-cost allocation base or

bases, they will remain in such base or bases. Where a directly associated cost is part of a category of costs normally included in an indirect-cost pool that will be allocated over a base containing the unallowable cost with which it is associated, such a directly associated cost will be retained in the indirect-cost pool and be allocated through the regular allocation process.

Where the total of the allocable and otherwise allowable costs exceeds a limitation-of-cost or ceiling-price provision in a contract, full direct and indirect cost allocation will be made to the contract cost objective, in accordance with established cost accounting practices and standards that regularly govern a given entity's allocations to government contract cost objectives. In any determination of unallowable cost overrun, the amount thereof will be identified in terms of the excess of allowable costs over the ceiling amount, rather than through specific identification of particular cost items or cost elements.

e. Discuss the technical oversight and qualifications required to assess contractor performance and the training of contractor employees.

The following is taken from DOE P 226.1B.

The purpose of DOE P 226.1B, *Department of Energy Oversight Policy*, is to establish the DOE expectations for the implementation of a comprehensive and robust oversight process that enables the Department's mission to be accomplished effectively and efficiently while maintaining the highest standard of performance for safety and security.

To provide strong assurance that the workers, the public, the environment, and national security assets are adequately protected, the Department expects that

- robust assurance systems are effectively implemented by site contractors and, for DOE operated activities, by the responsible DOE line management organizations; and
- DOE oversight is performed effectively by line management, DOE HQ and field, as well as by independent oversight organizations.

Collectively, effective assurance systems and oversight programs provide reasonable assurance that mission objectives are being accomplished without sacrificing adequate protections.

Attributes of effective assurance and oversight processes include

- assurance systems tailored to meet the needs and unique risks of each site or activity, including methods to perform rigorous self-assessments, conduct feedback and continuous improvement activities, identify and correct negative performance trends, and share lessons learned;
- DOE oversight programs designed and conducted commensurate with the level of risk of the activities; and
- the oversight of activities with potentially high consequences, which is given high priority and greater emphasis.

The following is taken from DOE O 426.2.

It is the responsibility of the heads of field organizations/field element managers for NNSA operations or designees to perform periodic systematic evaluations of contractor training and

qualification programs using DOE-STD-1070-94, *Guidelines for Evaluation of Nuclear Facility Training Programs*, and provide oversight of training program activities.

The following is taken from DOE G 226.1-2.

DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*, requires DOE organizations to maintain sufficient technical capability and knowledge of site and contractor activities to make informed decisions about hazards, risks, and resource allocation; provide direction to contractors; and evaluate contractor performance.

In accordance with DOE O 227.1, *Independent Oversight Program*, the DOE independent oversight program for safety and security programs is implemented by the Office of Health, Safety, and Security's (HSS's) Office of Enforcement and Oversight. This program provides DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of adequacy of DOE policy and requirements and the effectiveness of DOE and contractor performance in safety, security, and other critical functions. The HSS independent oversight program is unique in that it examines site programs and the three tiers of line management oversight to provide management with independent perspectives on the overall effectiveness of DOE policies, programs, and performance in safety and security.

The following is taken from DOE-STD-1070-94.

Each evaluator's experience should be commensurate with individually assigned objectives and criteria. Before beginning the evaluation, the evaluator(s) should be trained in evaluation methodology, and should be familiar with the objectives and criteria they are assigned to evaluate. The training program objectives and criteria contained in DOE-STD-1070-94 are not a substitute for the evaluator's technical knowledge of the facility or program.

The evaluation must be performed using personnel who have a technical background in the subject area(s) being evaluated. If a group of individuals are performing the evaluation, the team should be made up of an appropriate balance of personnel with training and technical backgrounds. The optimum situation is to use personnel with a technical background and experience in training design, development, and management. If the evaluation is conducted by someone who does not have the specific technical qualifications, the results should be reviewed by a subject matter expert with expertise in the subject area(s) before it is forwarded to the M&O contractor.

f. Discuss the fee-based evaluation process, including the development of performance criteria, conduct of the evaluation, and documentation and transmittal requirements for performance.

The following is taken from NNSA Policy Letter NAP-4B.

The objective of NNSA Policy Letter NAP-4B, *Corporate Performance Evaluation Process for Management and Operating Contractors*, is to establish and implement a uniform, corporate process for evaluation of NNSA M&O contractors' performance that promotes effective and efficient accomplishment of the NNSA mission while effectively balancing safety and production. This process results in documented, consistent, and fair evaluation of M&O contractor performance.

Fee-Based Evaluation Process

The contractor performance evaluation process will be an "NNSA-corporate," integrated process applied consistently by all NNSA sites. The corporate process may be updated periodically to reflect changes and lessons learned. The annual performance evaluation plan (PEP) for each site will follow the format and boundaries as follows:

- PEPs will contain performance objectives (POs) and performance based incentives (PBIs), if applicable.
- PEPs will provide essential and stretch goals; whereas, fee for stretch can only be earned if performance on essential goals meets certain expectations.
- PEPs will provide appropriate weight/fee distribution among POs and PBIs based on criticality of the represented scope and its relative cost, benefit, and risk.
- Fee determining official (FDO) has the discretion to adjust the site office manager's recommended rating or fee.

The FDO will review and approve that, unless otherwise specified in the contract, the fee rate, the amount of available fee for each period of performance, the award term incentives, and the performance targets in the PEP are based on the recommendation of the site office managers and management council.

Fee Policy

The following is taken from 48 CFR 970.1504.

- DOE management and operating contractors may be paid a fee in accordance with the requirements of 48 CFR 970.1504-1-2. There are three basic principles underlying the department's fee policy:
  - The amount of available fee should reflect the financial risk assumed by the contractor.
  - When work elements cannot be fixed price, incentive fees tied to objective measures should be used to the maximum extent appropriate.
  - When work elements cannot be fixed price and award fees are employed, they should be tied to either objective or subjective measures. Each measure should, to the maximum extent appropriate, be directly tied to a specific portion of the fee pool.
- Fee objectives and amounts are to be determined for each contract. Standard fees or across-the-board fee agreements will not be used or made. Due to the nature of funding management and operating contracts, it is anticipated that fee will be established in accordance with the annual funding cycle; however, with the prior approval of the senior procurement executive or designee, a longer period may be used where necessary to incentive performance objectives that span funding cycles or to optimize cost reduction efforts.
- Annual fee amounts will be established in accordance with 48 CFR 970.1504-1-2. Annual amounts will not exceed maximum amounts derived from the appropriate fee schedule unless approved in advance by the senior procurement executive or designee. In no event will any fee exceed statutory limits imposed by 41 U.S.C. 254, *Contract Requirements*.
- Contracting officers will include negative fee incentives in contracts when appropriate. A negative fee incentive is one where the contractor will not be paid the

full target fee amount when the actual performance level falls below the target level established in the contract.

- Negative fee incentives may only be used when
  - a target level of performance can be established that the contractor can reasonably be expected to reach;
  - the value of the negative incentive is commensurate with the lower level of performance and any additional administrative costs;
  - factors likely to prevent attainment of the target level of performance are clearly within the control of the contractor; and
  - the contract indicates clearly a level below which performance is not acceptable.

Development of Performance Criteria

The following is taken from NNSA Policy Letter NAP-4B.

NNSA sites will use consistent format and definitions for describing the desired performance for its M&O contractors in the PEP. PEPs will be organized into the following sections: introduction, mission, operations, business/management, and multi-site. PEPs will use the following definitions:

- Performance objective—a statement of desired results for an organization or activity.
- Performance measure—a term used to describe a particular value or characteristic designated to measure input, output, outcome, efficiency, or effectiveness.
- Performance target—the desired condition or target level of achievement for each measure, established at an appropriately detailed level that can be tracked and used for a judgment or decision on performance assessment.

Conduct of the Evaluation

The following is taken from NNSA Policy Letter NAP-4B.

The evaluation process is divided into four phases for NNSA M&O contracts:

1. The planning phase, which precedes the execution year (generally a government fiscal year) and includes
   - review and incorporation of lessons learned from the prior year;
   - identification of performance measures consistent with the planning, programming, budgeting, and execution/evaluation (PPBE/E) process and associated program implementation planning (PIP) process;
   - development, review, and approval of PEPs for each NNSA M&O contract by the FDO; and
   - determination of the amount of fee to be available and allocated within the PEP for the period of performance.
2. The monitoring phase, which takes place during the execution year and includes
   - monitoring of contractor performance—operational awareness and evaluation of results achieved and safely performed during the execution year, supported by appropriate documentation;
   - linkage of evaluation activities to the PPBE/E, including the quarterly program review processes, PIPs, and work authorizations for approved funding programs; and
   - periodic reporting of performance results to appropriate NNSA program officials.

3. The assessment phase, which begins after the execution year has ended and will be completed before interest penalties are assessed on late payment of fee, if applicable. In the assessment phase
    - site offices, with input from program offices, functional offices, and non-NNSA offices, as applicable, will validate contractor performance at the end of the performance period and provide recommended ratings and/or a recommended fee amount to the management council and ultimately the FDO (NNSA administrator). Timely and effective HQ input is critical to a successful assessment phase;
    - the FDO will determine the final performance rating and earned fee for the contractor; and
    - the FDO has the discretion to adjust the recommended rating or earned fee within the available fee pool. The adjustment should generally be within the range of plus or minus 10 percent. If the adjustment is more than plus or minus 10 percent, the site office manager's letter to the contractor that transmits the final performance evaluation report (PER) will provide a rationale for the adjustment.
4. The post assessment phase, in which site office managers will be aware that a "fully releasable" PEP and PER suitable for public posting may be requested for public affairs and/or Congressional purposes. At a minimum, the following documents should be readily available:
    - Summary of available and earned fee
    - One page narrative summary on contractor performance
    - PER
    - Redacted PER

g. Identify who can make contractual requests or approvals of contract provisions, and the qualifications required of that individual(s).

The following is taken from FAR, subpart 1.6, *Career Development, Contracting Authority, and Responsibilities*.

Unless specifically prohibited by another provision of law, authority and responsibility to contract for authorized supplies and services are vested in the agency head. The agency head may establish contracting activities and delegate broad authority to manage the agency's contracting functions to heads of such contracting activities. Contracts may be entered into and signed on behalf of the government only by contracting officers. In some agencies, a relatively small number of high-level officials are designated contracting officers solely by virtue of their positions. Contracting officers below the level of a head of a contracting activity will be selected and appointed under FAR subpart 1.603, *Selection, Appointment, and Termination of Appointment*.

In selecting contracting officers, the appointing official will consider the complexity and dollar value of the acquisitions to be assigned and the candidate's experience, training, education, business acumen, judgment, character, and reputation. Examples of selection criteria include

- experience in government contracting and administration, commercial purchasing, or related fields;
- education or special training in business administration, law, accounting, engineering, or related fields;

- knowledge of acquisition policies and procedures, including this and other applicable regulations;
- specialized knowledge in the particular assigned field of contracting; and
- satisfactory completion of acquisition training courses.

h. Discuss the intent of the revised Department of Energy Acquisition Regulations (DEAR) clause regarding safety, and the impact of contract reform on safety.

The following is taken from 48 CFR 970.2303-2-70.

DOE regulates the nuclear safety of its major facilities under its own statutory authority derived from the Atomic Energy Act and other legislation. The Department regulates, under certain specific conditions, the use by its contractors of radioactive materials and ionizing radiation producing machines.

The inclusion of environment, safety, and health clauses in DOE contracts will be made by the contracting officer in accordance with 48 CFR 970.2303-2-70, "General," and in consultation with appropriate environmental, safety, and health program management personnel.

The following is taken from 48 CFR 970.2303-3.

When work under M&O contracts and subcontracts is to be performed at a facility where DOE will exercise its statutory authority to enforce occupational safety and health standards applicable to the working conditions of the contractor and subcontractor employees at such facility, 48 CFR 970.5223-1, "Integration of Environment, Safety and Health into Work Planning and Execution," will be used in such contracts or subcontracts and made applicable to the work if conditions in 48 CFR 970.2303-3, "Contract Clauses," are satisfied that

- DOE work is segregated from the contractor's or subcontractor's other work;
- the operation is of sufficient size to support its own safety and health services; and
- the facility is government-owned, or leased by or for the account of the government.

The clause set forth in 40 CFR 952.223-72, "Radiation Protection and Nuclear Criticality," will be included in those contracts or subcontracts for, and be made applicable to, work to be performed at a facility where DOE does not elect to assert its statutory authority to enforce occupational safety and health standards applicable to the working conditions of contractor and subcontractor employees, but does need to enforce radiological safety and health standards pursuant to provisions of the contract or subcontract rather than by reliance upon the NRC licensing requirements (including agreements with states under the Atomic Energy Act, section 274).

19. A technical program manager shall demonstrate the ability to communicate (both orally and in writing) when working or interacting with the contractor, stakeholders, and other internal and external organizations.

a. Identify the various internal and external groups with whom technical program manager personnel must interface within the performance of their duties.

This is a site-specific KSA. The local Qualifying Official will evaluate its completion.

b. Apply written communication skills in the development of
- **assessment reports**
- **technical reports**
- **technical papers**

c. Apply effective and appropriate communications skills when providing specific work or task directions to contractors.

KSAs b and c are performance-based KSAs. The Qualifying Official will evaluate their completion.

20. A technical program manager shall have a familiarity level knowledge of the Occupational Radiation Protection requirements as contained in 10 CFR 835, "Occupational Radiation Protection" and the supporting Radiological Control Technical Standards and Guides.

a. Discuss the applicability of 10 CFR 835 to a DOE activity.

The following is taken from DOE G 441.1-1C, admin chg 1.

10 CFR 835, "Occupational Radiation Protection," establishes specific requirements for the development, content, revision, and approval of the documented RPP for a DOE activity. These requirements include identifying existing and/or anticipated operational tasks and formal plans and measures for maintaining occupational radiation doses ALARA. Guidance provided in DOE G 441.1-1C, admin chg 1, *Radiation Protection Programs Guide for use with Title 10, Code of Federal Regulations, Part 835, Occupational Radiation Protection*, in combination with the provisions of site radiological control manuals developed and implemented consistent with guidance provided by DOE-STD-1098-2008, chg 1, *Radiological Control*, for those regulatory provisions not addressed in DOE G 441.1-1C, admin chg 1, provide reasonable assurance that a site RPP will meet the requirements of 10 CFR 835.

The RPP for a specific DOE activity is approved by the DOE, typically by the cognizant DOE HQ program office. The RPP is intended to provide DOE reasonable assurance that the DOE activity will be conducted in compliance with the provisions of 10 CFR 835. The RPP satisfies the requirement for an implementation plan found in other DOE directives. Guidance concerning the specific documentation required for DOE approval of RPPs as required in 10 CFR 835.101, "Radiation Protection Programs," is provided in appendix 3.A, "Preparation, Review, and Approval of Radiation Protection Programs." Appendix 3.A is based on guidance that previously was provided in DOE-STD-1082-94, (archived), *Preparation, Review, and Approval of Implementation Plans for Nuclear Safety Requirements*. Guidance is provided by the cognizant DOE HQ program office.

b. Discuss the role of the radiation protection program (RPP) in a site safety program (SSP).

The following is taken from 10 CFR 835.101.

A DOE activity will be conducted in compliance with a documented RPP as approved by the DOE. The DOE may direct or make modifications to an RPP.

The content of each RPP will be commensurate with the nature of the activities performed and will include formal plans and measures for applying the ALARA process to occupational exposure.

The RPP will specify the existing and/or anticipated operational tasks that are intended to be within the scope of the RPP. Except as provided in 10 CFR 835.101, any task outside the scope of an RPP will not be initiated until an update of the RPP is approved by DOE.

The content of the RPP will address, but not necessarily be limited to, each requirement in 10 CFR 835.101. The RPP will include plans, schedules, and other measures for achieving compliance with regulations in 10 CFR 835.101. Unless otherwise specified, compliance with the amendments to 10 CFR 835.101 will be achieved no later than July 9, 2010.

An update of the RPP will be submitted to DOE:

- Whenever a change or an addition to the RPP is made
- Prior to the initiation of a task not within the scope of the RPP
- Within 180 days of the effective date of any modifications to this part

Changes, additions, or updates to the RPP may become effective without prior Department approval only if the changes do not decrease the effectiveness of the RPP and the RPP, as changed, continues to meet the requirements of 10 CFR 835.101. Proposed changes that decrease the effectiveness of the RPP will not be implemented without submittal to and approval by the Department. An initial RPP or an update will be considered approved 180 days after its submission unless rejected by DOE at an earlier date.

c. Explain the concept of ALARA and how it applies to DOE activities.

The following is taken from HPS (Health Physics Society), *ALARA.*

ALARA is an acronym for "as low as reasonably achievable." It means making every reasonable effort to maintain exposures to ionizing radiation as far below the dose limits as practical. Be consistent with the purpose for which the licensed activity is undertaken, taking into account the state of technology, the economics of improvements in relation to state of technology, the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations. These means are in relation to utilization of nuclear energy and licensed materials in the public interest.

The following is taken from DOE G 441.1-1C, admin chg 1.

In making 10 CFR 835 official, DOE considered alternatives to reduce the risk from radiation exposure to workers that included retaining the current occupational dose limits, reducing these limits, and emphasizing efforts to maintain occupational doses ALARA. After considering public comments on this issue, DOE elected to emphasize the ALARA process to maintain occupational dose for DOE and contractor employees as far below the current regulatory occupational dose limits as reasonably achievable. Adopting the ALARA process in DOE occupational radiation protection regulations provides consistency with recommendations provided in *The President's Radiation Protection Guidance to Federal Agencies for Occupational Exposure*, (January 27, 1987) that endorsed the ALARA process.

The importance of the ALARA concept was further stressed in DOE P 441.1, *DOE Radiological Health and Safety Policy*, (archived) that states,

> It is the policy of Department of Energy to conduct its radiological operations in a manner that ensures the health and safety of all its employees, contractors, and the general public. In achieving this objective, the Department shall ensure that radiation exposures to its workers and the public and releases of radioactivity to the environment are maintained below regulatory limits and deliberate efforts are made to further reduce exposures and releases ALARA. The Department is fully committed to implementing a radiological control program of the highest quality that consistently reflects this policy.

10 CFR 835 requires formal plans and measures for maintaining occupational exposures ALARA as part of the documented RPP. Measures include incorporating ALARA considerations into the design of new facilities and modifications of existing facilities, as well as activities that pose the potential for significant occupational dose. Additionally, administrative controls are addressed as measures that supplement engineered controls and are integrated into the work planning process. Recordkeeping and training requirements related to ALARA are specified. DOE G 441.1-1C, admin chg 1, chapter 4.0, discusses acceptable methods for implementing the ALARA process provisions in 10 CFR 835.

Due to the complex nature of many DOE activities, a combination of radiological and non-radiological hazards may be encountered. Identification of non-radiological hazards is critical to the ALARA process, because efforts to apply the ALARA process may inadvertently increase risks from non-radiological hazards. An ISM approach that optimizes worker protection from all hazards should be considered in the ALARA process for a given DOE activity.

Video 15. ALARA and TDS
http://www.bing.com/videos/search?q=as+low+as+reasonably+achievable&view=detail&mid=37E32425D68666A8115B37E32425D68666A8115B&first=0

d. Discuss the following concepts in radiation protection:
- **Monitoring of individuals and areas**
- **Entry control program**
- **Posting and labeling**
- **Records**
- **Radiation safety training**
- **Radioactive contamination control**
- **Design and control**
- **Sealed radioactive source control**
- **Emergency exposure situations**

Monitoring of Individuals and Areas
The following is taken from 10 CFR 835.401.

Monitoring of individuals and areas will be performed to
- demonstrate compliance with the regulations in this part;
- document radiological conditions;

- detect changes in radiological conditions;
- detect the gradual buildup of radioactive material;
- verify the effectiveness of engineered and administrative controls in containing radioactive material and reducing radiation exposure; and
- identify and control potential sources of individual exposure to radiation and/or radioactive material.

Instruments and equipment used for monitoring will be

- periodically maintained and calibrated on an established frequency;
- appropriate for the type(s), levels, and energies of the radiation(s) encountered;
- appropriate for existing environmental conditions; and
- routinely tested for operability.

The following is taken from 10 CFR 835.402.

For the purpose of monitoring individual exposures to external radiation, personnel dosimeters will be provided to and used by

- radiological workers who, under typical conditions, are likely to receive one or more of the following:
  - an effective dose of 0.1 rem (0.001 Sievert (Sv)) or more in a year;
  - an equivalent dose to the skin or to any extremity of 5 roentgen equivalent in man/mammals (rems) (0.05 Sv) or more in a year;
  - an equivalent dose to the lens of the eye of 1.5 rems (0.015 Sv) or more in a year;
- declared pregnant workers who are likely to receive from external sources an equivalent dose to the embryo/fetus in excess of 10 percent of the applicable limit at 10 CFR 835.206(a), "Limits for the Embryo/Fetus";
- occupationally exposed minors likely to receive a dose in excess of 50 percent of the applicable limits at 10 CFR 835.207, "Occupational Dose Limits for Minors," in a year from external sources;
- members of the public entering a controlled area likely to receive a dose in excess of 50 percent of the limit at 10 CFR 835.208, "Limits for Members of the Public Entering a Controlled Area," in a year from external sources; and
- individuals entering a high or very high radiation area.

External dose monitoring programs implemented to demonstrate compliance with 10 CFR 835.402(a) will be adequate to demonstrate compliance with the dose limits established in 10 CFR 835, subpart C, "Standards for Internal and External Exposure," and will be

- accredited, or excepted from accreditation, in accordance with the DOE laboratory accreditation program for personnel dosimetry; or
- determined by the secretarial officer responsible for environment, safety, and health matters to have performance substantially equivalent to that of programs accredited under the DOE laboratory accreditation program for personnel dosimetry.

For the purpose of monitoring individual exposures to internal radiation, internal dosimetry programs (including routine bioassay programs) will be conducted for

- radiological workers who, under typical conditions, are likely to receive a committed effective dose of 0.1 rem (0.001 Sv) or more from all occupational radionuclide intakes in a year;

- declared pregnant workers likely to receive an intake or intakes resulting in an equivalent dose to the embryo/fetus in excess of 10 percent of the limit stated in 10 CFR 835.206(a);
- occupationally exposed minors who are likely to receive a dose in excess of 50 percent of the applicable limit stated in 10 CFR 835.207 from all radionuclide intakes in a year; or
- members of the public entering a controlled area likely to receive a dose in excess of 50 percent of the limit stated at 10 CFR 835.208 from all radionuclide intakes in a year.

Internal dose monitoring programs implemented to demonstrate compliance with 10 CFR 835.402(c) will be adequate to demonstrate compliance with the dose limits established in 10 CFR 835.402, subpart C, and will be

- accredited, or excepted from accreditation, in accordance with the DOE laboratory accreditation program for radiobioassay; or
- determined by the secretarial officer responsible for environment, safety, and health matters to have performance substantially equivalent to that of programs accredited under the DOE laboratory accreditation program for radiobioassay.

The following is taken from 10 CFR 835.403.

Monitoring of airborne radioactivity will be performed

- where an individual is likely to receive an exposure of 40 or more derived air concentration-hours in a year; or
- as necessary to characterize the airborne radioactivity hazard where respiratory protective devices for protection against airborne radionuclides have been prescribed.

Real-time air monitoring will be performed as necessary to detect and provide warning of airborne radioactivity concentrations that warrant immediate action to terminate inhalation of airborne radioactive material.

Entry Control Program

The following is taken from 10 CFR 835.501.

Personnel entry control will be maintained for each radiological area. The degree of control will be commensurate with existing and potential radiological hazards within the area.

One or more of the following methods will be used to ensure control:

- Signs and barricades
- Control devices on entrances
- Conspicuous visual and/or audible alarms
- Locked entry ways
- Administrative controls

Written authorizations will be required to control entry into and perform work within radiological areas. These authorizations will specify radiation protection measures commensurate with the existing and potential hazards. No control(s) will be installed at any radiological area exits that would prevent rapid evacuation of personnel under emergency conditions.

The following is taken from 10 CFR 835.502.

Each entrance or access point to a high radiation area where radiation levels exist such that an individual could exceed an equivalent dose to the whole body of 1 rem (0.01 Sv) in any one hour at 30 centimeters from the source, or from any surface that the radiation penetrates, will include one or more of the following features:

- A control device that prevents entry to the area when high radiation levels exist or upon entry causes the radiation level to be reduced below that level defining a high radiation area.
- A device that functions automatically to prevent use or operation of the radiation source or field while individuals are in the area.
- A control device that energizes a conspicuous visible or audible alarm signal so that the individual entering the high radiation area and the supervisor of the activity are made aware of the entry.
- Entryways that are locked. During periods when access to the area is required, positive control over entry is maintained.
- Continuous direct or electronic surveillance that is capable of preventing unauthorized entry.
- A control device that will automatically generate audible and visual alarm signals to alert personnel in the area before use or operation of the radiation source and in sufficient time to permit evacuation of the area or activation of a secondary control device that will prevent use or operation of the source.

Very high radiation areas—in addition to the above requirements, additional measures will be implemented to ensure individuals are not able to gain unauthorized or inadvertent access to very high radiation areas.

No control(s) will be established in a high or very high radiation area that would prevent rapid evacuation of personnel.

Posting and Labeling

The following is taken from 10 CFR 835.603.

Each access point to radiological areas and radioactive material areas will be posted with conspicuous signs bearing the wording provided in 10 CFR 835.603, "Radiological Areas and Radioactive Material Areas."

- *Radiation area*. The words "Caution, Radiation Area" will be posed at each radiation area.
- *High radiation area*. The words "Caution, High Radiation Area" or "Danger, High Radiation Area" will be posted at each high radiation area.
- *Very high radiation area*. The words "Grave Danger, Very High Radiation Area" will be posted at each very high radiation area.
- *Airborne radioactivity area*. The words "Caution, Airborne Radioactivity Area" or "Danger, Airborne Radioactivity Area" will be posted at each airborne radioactivity area.
- *Contamination area*. The words "Caution, Contamination Area" will be posted at each contamination area.

- *High contamination area*. The words "Caution, High Contamination Area" or "Danger, High Contamination Area" will be posted at each high contamination area.
- *Radioactive material area*. The words "Caution, Radioactive Material(s)" will be posted at each radioactive material area.

The following is taken from 10 CFR 835.605.

Except as provided in 10 CFR 835.606, "Exceptions to Labeling Requirements," each item or container of radioactive material will bear a durable, clearly visible label bearing the standard radiation warning trefoil and the words "Caution, Radioactive Material," or "Danger, Radioactive Material." The label will provide sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers to take precautions to avoid or control exposures.

Records

The following is taken from 10 CFR 835.702.

Records will be maintained to document doses received by all individuals for whom monitoring was conducted, and to document doses received during planning special exposures, unplanned doses exceeding the monitoring thresholds of 10 CFR 835.402, and authorized emergency exposures.

Recording of the non-uniform equivalent dose to the skin is not required if the dose is less than two percent of the limit specified for the skin at 10 CFR 835.202, "Occupational Dose Limits for General Employees." Recording of internal dose (committed effective dose or committed equivalent dose) is not required for any monitoring result estimated to correspond to an individual receiving less than 0.01 rem (0.1 millisievert) committed effective dose. The bioassay or air monitoring result used to make the estimate will be maintained in accordance with 10 CFR 835.703, "Other Monitoring Records," and the unrecorded internal dose estimated for any individual in a year will not exceed the applicable monitoring threshold at 10 CFR 835.402, "Individual Monitoring."

The records required by 10 CFR 835.702, "Individual Monitoring Records," will

- be sufficient to evaluate compliance with 10 CFR 835, subpart C;
- be sufficient to provide dose information necessary to complete reports required by 10 CFR 835, subpart I, "Reports to Individuals";
- include the results of monitoring used to assess the following quantities for external dose received during the year:
  - the effective dose from external sources of radiation (equivalent dose to the whole body may be used as effective dose for external exposure);
  - the equivalent dose to the lens of the eye;
  - the equivalent dose to the skin;
  - the equivalent dose to the extremities;
- include the following information for internal dose resulting from intakes received during the year:
  - committed effective dose;
  - committed equivalent dose to any organ or tissue of concern;

    - identity of radionuclides;
- include the following quantities for the summation of the external and internal dose:
    - total effective dose in a year;
    - the sum of the equivalent dose to the whole body from external exposures and the committed equivalent dose to that organ or tissue for any organ or tissue assigned an internal dose during the year;
    - cumulative total effective dose; and
- include the equivalent dose to the embryo/fetus of a declared pregnant worker.

Documentation of all occupational doses received during the current year, except for doses resulting from planned special exposures conducted in compliance with 10 CFR 835.204, "Planned Special Exposures," and emergency exposures authorized in accordance with 10 CFR 835.1302, "Emergency Exposure Situations," will be obtained to demonstrate compliance with 10 CFR 835.202(a). If complete records documenting previous occupational dose during the year cannot be obtained, a written estimate signed by the individual may be accepted to demonstrate compliance.

For radiological workers whose occupational dose is monitored in accordance with 10 CFR 835.402, reasonable efforts will be made to obtain complete records of prior years occupational internal and external doses.

The records specified in 10 CFR 835.702 that are identified with a specific individual will be readily available to that individual. Data necessary to allow future verification or reassessment of the recorded doses will be recorded. All records required by 10 CFR 835.702 will be transferred to the DOE upon cessation of activities at the site that could cause exposure to individuals.

Radiation Safety Training

The following is taken from 10 CFR 835.901.

Each individual will complete radiation safety training on the topics established in 10 CFR 835.901, "Radiation Safety Training," commensurate with the hazards in the area and the required controls

- before being permitted unescorted access to controlled areas; and
- before receiving occupational dose during access to controlled areas at a DOE site or facility.

Each individual will demonstrate knowledge of the radiation safety training topics established at 10 CFR 835.901, commensurate with the hazards in the area and required controls, by successful completion of an examination and performance demonstrations

- before being permitted unescorted access to radiological areas; and
- before performing unescorted assignments as a radiological worker.

Radiation safety training will include the following topics, to the extent appropriate to each individual's prior training, work assignments, and degree of exposure to potential radiological hazards:

- Risks of exposure to radiation and radioactive materials, including prenatal radiation exposure
- Basic radiological fundamentals and radiation protection concepts

- Physical design features, administrative controls, limits, policies, procedures, alarms, and other measures implemented at the facility to manage doses and maintain doses ALARA, including routine and emergency actions
- Individual rights and responsibilities as related to implementation of the facility RPP
- Individual responsibilities for implementing ALARA measures required by 10 CFR 835.101
- Individual exposure reports that may be requested in accordance with 10 CFR 835.801, "Reports to Individuals"

When an escort is used in lieu of training, in accordance with 10 CFR 835.901, paragraph (a) or (b), the escort will

- have completed radiation safety training, examinations, and performance demonstrations required for entry to the area and performance of the work; and
- ensure that all escorted individuals comply with the documented RPP.

Radiation safety training will be provided to individuals when there is a significant change to radiation protection policies and procedures that may affect the individual and at intervals not to exceed 24 months. Such training provided for individuals subject to the requirements of 10 CFR 835.901(b)(1) and (b)(2) will include successful completion of an examination.

Radioactive Contamination Control

The following is taken from 10 CFR 835.1001.

Measures will be taken to maintain radiation exposure in controlled areas ALARA through engineered and administrative controls. The primary methods used will be physical design features (e.g., confinement, ventilation, remote handling, and shielding). Administrative controls will be employed only as supplemental methods to control radiation exposure.

For specific activities where use of engineered controls is demonstrated to be impractical, administrative controls will be used to maintain radiation exposures ALARA.

Design and Control

The following is taken from 10 CFR 835-1002.

During the design of new facilities or modification of existing facilities, the following objectives will be adopted:

- Optimization methods will be used to assure that occupational exposure is maintained ALARA in developing and justifying facility design and physical controls.
- The design objective for controlling personnel exposure from external sources of radiation in areas of continuous occupational occupancy (2,000 hours per year) will be to maintain exposure levels below an average of 0.5 millirem (5 µSv) per hour and as far below this average as is reasonably achievable. The design objectives for exposure rates for potential exposure to a radiological worker where occupancy differs from the above will be ALARA and will not exceed 20 percent of the applicable standards in 10 CFR 835.202.
- Regarding the control of airborne radioactive material, the design objective will be, under normal conditions, to avoid releases to the workplace atmosphere and in any

situation, to control the inhalation of such material by workers to levels that are ALARA; confinement and ventilation will normally be used.
- The design or modification of a facility and the selection of materials will include features that facilitate operations, maintenance, decontamination, and decommissioning.

Sealed Radioactive Source Control

The following is taken from 10 CFR 835.1201.

Sealed radioactive sources will be used, handled, and stored in a manner commensurate with the hazards associated with operations involving the sources.

Emergency Exposure Situations

The following is taken from 10 CFR 835.1302.

The risk of injury to those individuals involved in rescue and recovery operations will be minimized. Operating management will weigh actual and potential risks against the benefits to be gained. No individual will be required to perform a rescue action that might involve substantial personal risk.

Each individual authorized to perform emergency actions likely to result in occupational doses exceeding the values of the limits provided in 10 CFR 835.202(a) will be trained in accordance with 10 CFR 835.901(b) and briefed beforehand on the known or anticipated hazards that the individual will be subjected to.

e. Describe the basic concepts of DOE Order 5400.5, *Radioactive Protection of the Public and the Environment*, and how it applies to the free release of radioactive materials or property.

[Note: DOE Order 5400.5 has been cancelled by DOE O 458.1, chg 2, *Radiation Protection of the Public and the Environment*.]

The following is taken from DOE O 458.1, chg 2.

The purpose of DOE O 458.1, chg 2, is to establish requirements to protect the public and the environment against undue risk from radiation associated with radiological activities conducted under the control of DOE pursuant to the Atomic Energy Act of 1954, as amended.

The objectives of DOE O 458.1, chg 2, are to
- conduct DOE radiological activities so that exposure to members of the public is maintained within the dose limits established in DOE O 458.1, chg 2;
- control the radiological clearance of DOE real and personal property;
- ensure that potential radiation exposures to members of the public are ALARA;
- ensure that DOE sites have the capability, consistent with the types of radiological activities conducted, to monitor routine and non-routine radiological releases and to assess the radiation dose to members of the public; and
- provide protection of the environment from the effects of radiation and radioactive material.

21. A technical program manager shall have a working level of knowledge of problem identification, solving, and decision-making techniques.

a. Describe the following five problem analysis techniques below and provide an example of their application to a recent problem or occurrence at your site:

1. **Root cause analysis**
2. **Causal factor analysis**
3. **Change analysis**
4. **Barrier analysis**
5. **Management oversight and risk tree analysis**

Root Cause Analysis

The following is taken from Wikipedia, *Root Cause Analysis*.

Root cause analysis (RCA) is a method of problem solving that tries to identify the root causes of faults or problems that cause operating events. RCA practice tries to solve problems by attempting to identify and correct the root cause of events, as opposed to simply addressing their symptoms. By focusing correction on root causes, problem recurrence can be prevented.

In the U.S. nuclear power industry, the NRC requires that "in the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to prevent repetition." In practice, more than one cause is allowed and more than one corrective action is not forbidden. Conversely, there may be several effective measures (methods) that address the root cause of a problem. RCA is often considered to be an iterative process, and is frequently viewed as a tool of continuous improvement.

RCA is typically used as a reactive method of identifying event(s) causes, revealing problems and solving them. Analysis is done after an event has occurred. Insights in RCA may make it useful as a proactive method. In that event, RCA can be used to forecast or predict probable events even before they occur.

Video 16. Root cause analysis
http://www.youtube.com/watch?v=GOVeO5_0qD0

Causal Factor Analysis

The following is taken from CRCnetBase, Charles D. Reese, *Accidents/Incident Prevention Techniques*, 2nd Edition.

Causal factor analysis is used when there are multiple problems with a long causal factor chain of events. A causal factor chain is a sequence of events that shows, step-by-step, the events that took place in order for the accident to occur. Causal factor analysis puts all the necessary and sufficient events and causal factors for an accident into a logical, chronological sequence. It analyzes the accident and evaluates evidence during an investigation. It is used to help prevent similar accidents in the future and to evaluate the accuracy of pre-accidental system analysis.

Accidents are rarely simple and almost never result from a single cause. They may develop from a sequence of events involving performance errors, changes in procedures, oversights, and omissions. Events and conditions must be identified and examined in order to find the cause of the accident and a way to prevent that accident and similar accidents from recurring. To prevent the recurrence of accidents, one must identify the accident's causal factors. The higher the level in the management and oversight chain in which the root cause is found, the more diffuse the problem may be.

Causal factor analysis is a form of root cause analysis that aids in the development of evidence by collecting information and putting the information into a logical sequence so that it can be easily examined. This will lead to the causal factors of the accident and then to the development of new methods in order to help eliminate hazards or causes of that accident or similar accidents and prevent their recurrence in the future. By creating an event in the causal factor tree, multiple causes can be visually illustrated, and a visual relationship between the direct and contributing causes can be identified. By adding all harmful energy, events, exceeded/failed barriers, and people/objects affected by harmful energy that produced the undesired outcome, event causal charting also visually delineates the interactions and relationships of all involved groups or individuals. By using causal factor analysis, one can develop an event causal chain to examine the accident in a step-by-step manner by looking at the events, conditions, and causal factors chronologically, in order to prevent future accidents.

Video 17. Causal factor analysis
http://www.bing.com/videos/search?q=causal+factor+analysis&view=detail&mid=688B9B1584793737F29D688B9B1584793737F29D&first=0

Change Analysis

The following is taken from Wikipedia, *Change Impact Analysis*.

Change impact analysis (IA) is defined by Bohner and Arnold as "identifying the potential consequences of a change, or estimating what needs to be modified to accomplish a change," focusing on scoping changes within the details of a design. By contrast, Pfleeger and Atlee focus on the risks associated with changes and state that IA is: "the evaluation of the many risks associated with the change, including estimates of the effects on resources, effort, and schedule." The design details and risks associated with modifications are critical to performing IA within change management processes.

IA techniques can be classified into three types:

1. Traceability
2. Dependency
3. Experiential

In traceability IA, links between requirements, specifications, design elements, and tests are captured, and these relationships can be analyzed to determine the scope of an initiating change. In dependency IA, linkages between parts, variables, logic, modules, etc., are assessed to determine the consequences of an initiating change. Dependency IA occurs at a

more detailed level than traceability IA. Within software design, static and dynamic algorithms can be run on code to perform dependency IA. Static methods focus on the program structure, while dynamic algorithms gather information about program behaviors at run-time.

Literature and engineering practice suggest a third type of IA, experiential IA, in that the impact of changes is often determined using expert design knowledge. Review meeting protocols, informal team discussions, and individual engineering judgment can be used to determine the consequences of a modification.

Barrier Analysis

The following is taken from National Patient Safety Agency, *7 Steps Root Cause Analysis Tool Kit*.

What is barrier analysis (BA)? A barrier is a control measure designed to prevent harm to vulnerable or valuable objects. This technique establishes what barriers (defenses or controls) should have been in place to prevent the incident, or could be installed to increase system safety. BA offers a structured way to visualize the events related to system failure. It can be used reactively to solve problems or proactively to evaluate existing barriers. Four types of barriers are available:

1. Physical barriers
2. Natural barriers; i.e., barriers of distance, time, or placement
3. Human action barriers
4. Administrative barriers

Of these four types of barriers, physical barriers are the most reliable in terms of providing failsafe solutions to safety problems. Natural barriers, while less effective, generally provide a more robust solution than human action and administrative barriers. The reason that human action and administrative barriers are considered to be the least reliable barriers, in terms of failsafe, is because they rely on human action and behavior. Humans are known to err.

Barrier analysis can be used proactively (risk assessment) and retrospectively (incident analysis) and therefore can include the following applications:

- Identification of missing or failed barriers
- Evaluation of proposed corrective actions, by assessing the strength of each corrective action and choosing the strongest ones

Management Oversight and Risk Tree Analysis

The following is taken from International Crisis Management Association, *Theory and Practice*, *MORT*.

The management oversight and risk tree (MORT) is an analytical procedure for determining causes and contributing factors. MORT arose from a project undertaken in the 1970s. The work aimed to provide the U.S. nuclear industry with a risk management program competent to achieve high standards of health and safety. Although the MORT chart was just one aspect of the work, it proved to be popular as an evaluation tool and lent its name to the whole program.

In MORT, accidents are defined as unplanned events that produce harm or damage, that is, losses. Losses occur when a harmful agent comes into contact with a person or asset. This contact can occur either because of a failure of prevention or as an unfortunate but acceptable outcome of a risk that has been properly assessed and acted-on (assumed risk). MORT analysis always evaluates the failure route before considering the assumed risk hypothesis.

In MORT analysis, most of the effort is directed at identifying problems in the control of a work/process and deficiencies in the associated protective barriers. These problems are then analyzed for their origins in planning, design, policy, etc.

To use MORT, you must first identify key episodes in the sequence of events. Each episode can be characterized as

- a vulnerable target exposed to—
- an agent of harm in the—
- absence of adequate barriers.

MORT analysis can be applied to any one or more of the episodes identified; it is a choice to be made in the light of the circumstances particular to a specific investigation. To identify these key episodes, a barrier analysis must be undertaken. Barrier analysis allows MORT analysis to be focused; it is very difficult to use MORT, even in a superficial way, without it.

MORT is the ultimate hazard identification tool. It uses a series of MORT charts developed and perfected over several years by DOE in connection with their nuclear safety programs. Each MORT chart identifies a potential operating or management level hazard that might be present in an operation. The attention to detail characteristic of MORT is illustrated by the fact that the full MORT diagram or tree contains more than 10,000 blocks. Even the simplest MORT chart contains over 300 blocks. Full application of MORT is a very time-consuming and costly venture. The basic MORT chart with about 300 blocks can be routinely used as a check on the other hazard identification tools. By reviewing the major headings of the MORT chart, an analyst will often be reminded of a type of hazard that was overlooked in the initial analysis. The MORT diagram is very effective in assuring attention to the underlying management root causes of hazards.

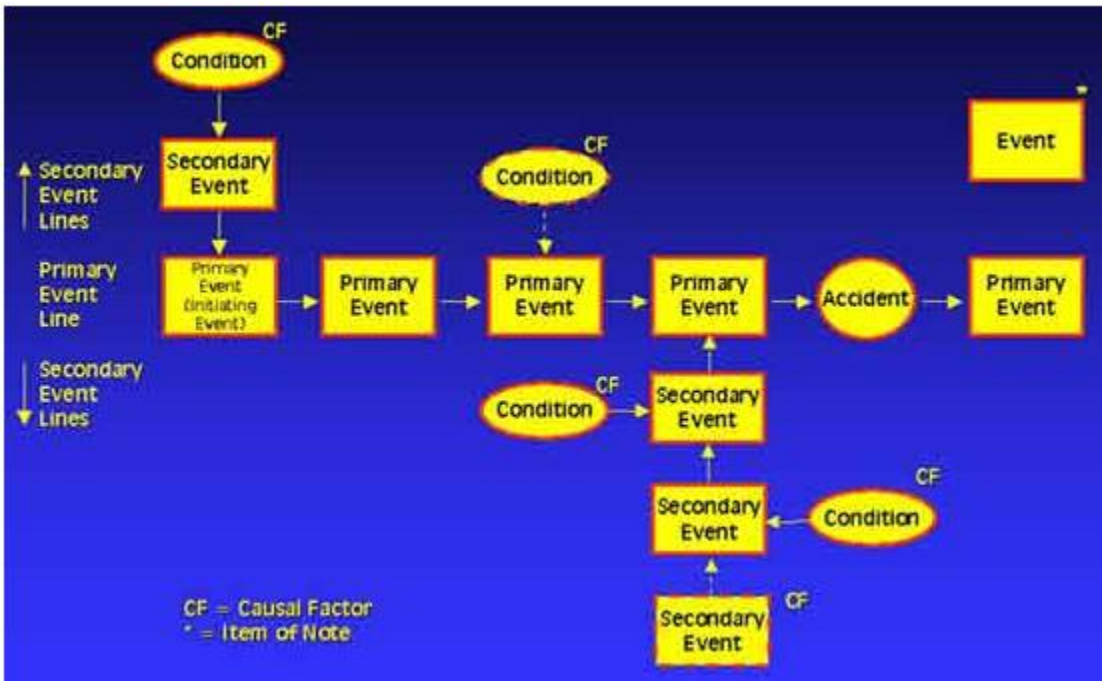
The MORT diagram is essentially an elaborate negative logic diagram. The difference is primarily that the MORT diagram is already filled out for the user, allowing a person to identify various contributing cause factors for a given undesirable event. Since the MORT is very detailed, a person can identify basic causes for essentially any type of event.

b. 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**

Events and Causal Factors Charting

The following is taken from OSHA Academy, *Event and Causal Factor Charting*.



Source: OSHA Academy, Event and Causal Factor Charting

Figure 7. Event and causal factor charting

Figure 7, *Event and causal factor charting*, shows a written or graphical description for the time sequence of contributing events associated with an accident. The charts produced in event charting consist of the following elements:

- Condition—a distinct state that facilitates the occurrence of an event. A condition may be equipment status, weather, employee health, or anything that affects an event.
- Event—a point in time defined by a specific action occurring.
- Accident—any action, state, or condition in which a system is not meeting one or more of its design intents. Includes actual accidents and near misses. This event is the focus of the analysis.
- Primary event line—the key sequence of occurrences that led to the accident. The primary event line provides the basic nature of the event in a logical progression, but it does not provide all of the contributing causes. This line always contains the accident, but it does not necessarily end with an accident event. The primary event line can contain events and conditions.
- Primary events and conditions—the events and conditions that make up the primary event line.
- Secondary event lines—the sequences of occurrences that lead to primary events or primary conditions. The secondary event lines expand the development of the primary event line to show all of the contributing causes for an accident. Causal factors are almost always found in secondary event lines, and most event and causal factor charts have more than one secondary event line.

- Secondary events and conditions—the events and conditions that make up a secondary event line.
- Causal factors—key events or conditions that, if eliminated, would have prevented an accident or reduced its effects. Causal factors are such things as human error or equipment failure, and they commonly include the following:
  - The initiating event for an accident
  - Each failed safeguard
  - Each reasonable safeguard that was not provided
- Items of note—undesirable events or conditions identified during an analysis that must be addressed or corrected but did not contribute to the accident of interest. These are shown as separate boxes outside the event chain.
- Limitations of event and causal factor charting—although event charting is an effective tool for understanding the sequence of contributing events that lead to an accident, it does have two primary limitations:
  - It will not necessarily yield root causes—event charting is effective for identifying causal factors; however, it does not necessarily ensure that the root causes have been identified, unless the causal factor is the root cause.
  - Overkill for simple problems—using event charting can overwork simple problems. A two-event accident probably does not require an extensive investigation of secondary events and conditions.

Root Cause Coding

The following is taken from AFRL-ML-WP-TR-2007-4113.

Cause codes can be tailored to a specific incident being investigated. The coding system is depicted in table form and is broken down into seven main categories:

1. Equipment/material deficiency
2. Procedure problem
3. Personnel error
4. Design problem
5. Training deficiency
6. Management problem
7. External phenomenon

These cause codes are listed in AFRL-ML-WP-TR-2007-4113, *Investigation and Root Cause Analysis Guidelines in Safety-of-Flight Aircraft* Structure, appendix E, "Cause Codes," and in DOE O 232.2. See the following table:

Table 1. Root cause codes

Category	Code Description	Category	Code Description
A1 Design/Engineering Problem		A5 Communications LTA	
B1	Design input LTA	B1	Written communications method of presentation LTA
B2	Design output LTA	B2	Written communications content LTA
B3	Design documentation LTA	B3	Written communication not used

Category	Code Description	Category	Code Description
B4	Design installation verification LTA	B4	Verbal communication LTA
B5	Operability of design/environment LTA		
A2 Equipment/Material Problem		A6 Training Deficiency	
B1	Calibration for instruments LTA	B1	No training provided
B2	Periodic / corrective maintenance LTA	B2	Training methods LTA
B3	Inspection / testing LTA	B3	Training material LTA
B4	Material control LTA		
B5	Procurement control LTA		
B6	Defective, failed or contaminated		
A3 Human Performance LTA		A7 Other Problem	
B1	Skill-based error	B1	External phenomena
B2	Rule-based error	B2	Radiological/hazardous material problem
B3	Knowledge-based error	B3	Legacy
B4	Work practices LTA	B4	No cause is applicable
A4 Management Problem			
B1	Management methods LTA		
B2	Resource management LTA		
B3	Work organization and planning LTA		
B4	Supervisory methods LTA		
B5	Change management LTA		

Source: DOE O 232.2

Recommendation Generation

The following is taken from GlobalSpec, *Root Cause Analysis Handbook: A Guide to Effective Incident Investigation*, Chapter 5: "Recommendation Generation and Implementation", by James R. Rooney.

The most significant aspect of root cause analysis is the final step. Following the identification of root cause(s) for a particular causal factor, recommendations for preventing its recurrence must be generated. The identification of effective corrective actions is addressed explicitly in the definition of root causes. Root causes are defined as the most basic causes that can reasonably be identified, that management has control to fix, and for which effective recommendations for preventing recurrence can be generated. The emphasis is on correcting the problem so that it will not be repeated. The following criteria for ensuring the viability of corrective actions are suggested:

- Will these corrective actions prevent recurrence of the condition or event?
- Is the corrective action within the capability of the organization to implement?
- Are the recommendations directly related to the root causes?
- Can it be ensured that implementation of the recommendation will not introduce unacceptable risks?

c. Describe the elements of an effective issue management system and its importance to safety.

The following is taken from DOE O 226.1B, attachment 1.

The contractor must establish an assurance system that includes assignment of management responsibilities and accountabilities and provides evidence to assure DOE and the contractor's management that work is being performed safely, securely, and in compliance with all requirements; risks are being identified and managed; and that the systems of control are effective and efficient. The contractor assurance system, at a minimum, must include the following:

- A structured issues management system that is formally described and documented and that
  - captures program and performance deficiencies (individually and collectively) in systems that provide for timely reporting, and taking compensatory corrective actions when needed;
  - contains an issues management process that is capable of categorizing the significance of findings based on risk and priority and other appropriate factors that enables contractor management to ensure that problems are evaluated and corrected on a timely basis. For issues categorized as higher significance findings, contractor management must ensure the following activities:
    - Completion of a thorough analysis of the underlying causal factors.
    - Identification and implementation of timely corrective actions that will address the cause(s) of the findings and prevent recurrence.
    - Conduction of an effectiveness review using trained and qualified personnel who can validate the effectiveness of corrective action/plan implementation that results in preventing recurrences after completion of a corrective action or a set of corrective actions.
    - Documentation of the analysis process and results described in DOE O 226.1B, attachment 1, "Contractor Requirements Document," and maintenance and tracking to completion of plans and schedules for the corrective actions and effectiveness reviews described in DOE O 226.1B, attachment 1, in a readily accessible system.
    - Communication of issues and performance trends or analysis results up the contractor management chain to senior management using a graded approach that considers hazards and risks, and provides sufficient technical basis to allow managers to make informed decisions and correct negative performance/compliance trends before they become significant issues.
  - includes timely and appropriate communication to the contracting officer, including electronic access of assurance-related information;
  - includes continuous feedback and improvement, including worker feedback mechanisms, improvements in work planning and hazard identification activities, and lessons learned programs; and
  - includes metrics and targets to assess the effectiveness of performance, including benchmarking of key functional areas with other DOE contractors, industry, and research institutions.

d. Describe the following types of investigations and discuss an example of the application of each:

- **Type A**
- **Type B**
- **Type C**

[Note: Types A, B, and C investigations have been replaced with the following criteria found in DOE O 225.1B, appendix A, "Accident Investigation Criteria."]

The following criteria must be considered to determine whether any accident resulting from DOE, contractor, or subcontractor operations requires the appointment of an accident investigation board (AIB). Accidents must be analyzed expeditiously, as indicated in DOE O 225.1B, *Accident Investigations*, to determine whether an AIB must be appointed based on the criteria indicated below, the value of the knowledge to be gained by conducting the investigation, and other relevant factors.

Determination criteria include the following:

- Human effects include
  - any injury or chemical or biological exposure that results in, or is likely to result in, the fatality of an employee or member of the public. Fatal injury is defined as any injury that results in death within 30 calendar days of the accident;
  - any single accident that results in the hospitalization for more than five calendar days, commencing within seven calendar days of the accident, of one or more DOE, contractor, or subcontractor employees, or members of the public due to a serious personal injury or acute chemical or biological exposure. Serious personal injury means any injury that (1) results in a fracture of any bone, except simple fractures of fingers, toes, or nose; (2) causes severe hemorrhages or nerve, muscle, or tendon damage; (3) involves any internal organ; or (4) involves second or third degree burns or any burns affecting more than 5 percent of the body surface;
  - any single accident resulting in three or more DOE, contractor, or subcontractor employees having lost-workday cases; and
  - accidents involving Federal or contractor employees driving vehicles while on official government business, on or off government property, if the consequences result in meeting any of these criteria.
- Loss of control of radioactive material includes
  - any single accident that results in
    - a general employee exceeding any of the external dose limits in 10 CFR 835.202, by a factor of two or more;
    - the embryo/fetus of a declared pregnant worker, a minor, or a member of the public in a controlled area exceeding an external dose of 1 rem effective dose;
    - any confirmed monitoring result indicating an intake of radioactive material by a general employee equivalent to two or more times the annual limit on intake (ALI);
    - Any confirmed monitoring result indicating an intake of radioactive material to a declared pregnant worker; a minor; or a member of the public in a controlled area equivalent to 20 percent or more of an ALI;

- Notes:
  —Dose thresholds for the embryo/fetus apply after declaration of pregnancy.
  —Confirmation must be made within 3 working days following identification of monitoring results indicating an exposure exceeding one or more of the criteria in DOE O 225.1B.
  —Monitoring results are those obtained prior to medical intervention to reduce or otherwise mitigate dose.
  —ALIs for an inhalation are 10 CFR 835, appendix A, values, in uCi/ml, multiplied by 2.4 E 9; ALIs for ingestion are ingestion dose coefficients from International Commission on Radiological Protection (ICRP) 68, *Dose Coefficients for Intakes of Radionuclides by Workers*; ALIs for wounds should use dose coefficients published in a consensus or referred report;
  —Planned special exposures or authorized emergency exposures to general employees are excluded.
  —Confirmed means a monitoring result confirmed by follow-up radiobioassay, by association with a known incident, or by investigation.

- Environmental release of hazardous material includes
  - an accident that resulted in the environmental release of a hazardous material from a DOE facility, in an amount greater than five times the reportable quantities specified in 40 CFR 302, "Designation, Reportable Quantities, and Notification";
  - an accident that resulted in the release of a hazardous material from a DOE facility that meets the criterion for classification as a site area or general emergency in DOE O 151.1C, *Comprehensive Emergency Management System*;
  - any offsite transportation incident involving hazardous materials that would require immediate notice pursuant to 40 CFR 302;
  - an incident that resulted in, or could reasonably have resulted in, a catastrophic release of a highly hazardous chemical in the workplace, for facilities in which 29 CFR 1910.119, "Process Safety Management of Highly Hazardous Chemical," is applicable,
- Property effects include
  - estimated loss of or damage to DOE property, including aircraft, equal to or greater than $2.5 million or requiring estimated costs equal to or greater than $2.5 million for cleaning, decontaminating, renovating, replacing, or rehabilitating property. DOE facility damage is estimated within 72 hours of the accident, based on comparison with the facility replacement value in the facility information management system database maintained by the HQ Office of Administration, Office of Engineering and Construction Management.
  - any unplanned nuclear activity.
- Other effects include
  - any accident or series of accidents for which an AIB is deemed appropriate by the secretary or deputy secretary. In such circumstances, the secretary or deputy secretary may direct the head of the HQ's element or chief health, safety and security officer, to conduct an accident investigation.

e. Discuss the necessary considerations that must be addressed when developing a corrective action.

The following is taken from IAEA-Technical Document-1458.

Corrective actions will not be effective unless the following overall characteristics have been adequately addressed:

- Policies are established by management to align the organization to effectively implement corrective actions and to set criteria for expectations and priorities.
- Personnel, including contractors, are actively encouraged by plant management to identify and report events. Reporting criteria and reporting systems are clearly defined and familiar.
- Reported events and minor problems are screened and evaluated in a timely manner based on their actual or potential consequences.
- Significant events and repeated problems are investigated at their root causes to identify effective corrective actions.
- Investigation of events of lower significance may focus on correcting immediate cause and trending and may not address the root cause.
- Personnel with sufficient knowledge and skills carry out investigations of significant events and recurring problems using well-defined root cause analysis techniques.
- Root causes, contributing causes, and direct causes are identified by the investigation.
- The operating experience (OE) indicators (data gathered from significant events, low-level events, near misses, error-likely situations reporting, screening, and investigation) are trended to identify system vulnerabilities, generic issues, or weaknesses in the organization.
- Plant management encourages and reinforces the use of OE information (use of lessons learned) by personnel.
- Employees who identify problems receive feedback on decisions made and on corrective actions taken.
- Appropriate resources (personnel, equipment, funds) are allocated by the management to the corrective action program.

f. Discuss the immediate, short-term, and long-term actions taken as the result of problem identification or an occurrence.

[Note: Corrective actions are no longer classified as short term and long term in DOE directives.]

The following is taken from DOE G 225.1A-1 (archived).

The final report is submitted by the appointing official to senior managers of organizations identified in the judgments of need in the report, with a request for the organizations to prepare corrective action plans. These plans contain actions for addressing judgments of need identified in the report and include milestones for completing the actions.

Corrective actions fall into four categories:

1. Immediate corrective actions that are taken by the organization managing the site where the accident occurred to prevent a second or related accident.

2. Corrective actions required to satisfy judgments of need identified by the board in the final report. These corrective actions are developed by the heads of field elements and/or contractors responsible for the activities resulting in the accident and are designed to prevent recurrence and correct system problems.
3. Corrective actions determined by the appointing official to be appropriate for DOE-wide application. The appointing official recommends these corrective actions when the report is distributed.
4. DOE headquarters corrective actions that result from discussions with senior management. These actions usually address DOE policy.

g. Given the data for an event, determine the root cause and develop corrective actions. Compare the results with that of the originator. Discuss any differences.

This is a performance based KSA. The Qualifying Official will evaluate its completion.

22. A technical program manager shall have a familiarity level knowledge of the policies and procedures used to recruit, select, train, and qualify employees to establish and maintain technical competency.

a. As described in DOE M 426.1-1, *Federal Technical Capability Manual*, discuss planning, recruitment, and selection processes that can be used to acquire a technically competent workforce with the necessary knowledge, skills, abilities, and/or potential to accomplish the goals of the organization. Discuss the roles and responsibilities of the Federal Technical Capability Panel and Panel Agents in the recruitment, selection, training, and retention of technical personnel. Describe the following three types of mentoring relationships and discuss the types of goals that an organizationally sponsored mentoring program is intended to meet:
- **Supervisor**
- **Informal**
- **Structured-Facilitated**

[Note: DOE M 426.1-1 has been cancelled.]

The following is taken from DOE O 426.1, chg 1, appendix B.

Recruitment, hiring, and retention of high-quality employees are essential in performing the DOE mission. Hiring and retaining high-quality employees are often major challenges confronting line managers. Several tools, collectively referred to as administrative flexibilities, are available to provide options in Federal employment actions supporting recruitment, hiring, and retention of high-quality employees. Line managers and servicing personnel offices should reference these tools for information about recruitment, hiring, and retention.

DOE organizations have established intern programs to address the specific needs of their respective organizations. Individuals hired under the NNSA Future Leaders Program have been a principal source of new technical professionals for the NNSA. NNSA recruits talented individuals with bachelors and/or masters degrees in engineering, science, security, business, or other disciplines. The Future Leaders Program requires participants to complete at least two rotational assignments. Each intern is assigned a peer mentor and selects a senior level

mentor utilizing an NNSA mentoring program. The participants will be involved in an aggressive internal training program that will provide the essential tools needed to have a successful career.

b. Discuss the parameters of the excepted service authority (ies), the circumstances which would dictate use of an excepted service authority, and the process and procedures for using an excepted service authority to recruit and hire.

The following is taken from DOE O 426.1, chg 1, appendix B.

Excepted service appointment authorities included in the National Defense Authorization Act for Fiscal Year 1995 was an excellent tool for HQ and field organizations to recruit and retain high-quality technical staff. Even though this tool is no longer available, the excepted service authorities in the Department of Energy Organization Act of 1997 are available and can expedite the hiring process and provide pay flexibilities to enhance recruitment and retention of key technical staff. The excepted service authorities may be particularly useful to organizations undergoing restructuring and associated skills mix concerns.

The National Defense Authorization Act for Fiscal Year 1995 included authority to fill scientific, engineering, and technical positions relating to the safety of DOE defense nuclear facilities and operations. This authority could only be used to hire people for scientific, engineering, or technical defense positions related to the safety of defense nuclear facilities. The excepted service appointment authority found in the Department of Energy Organization Act, section 621(d), is available for use in hiring high-quality individuals who may otherwise be difficult to attract and retain under current competitive service rules and procedures. Although primarily intended for scientific, engineering, and technical positions, this authority may be used for professional and administrative positions and positions in operations not related to defense nuclear facilities safety.

Pay under excepted service personnel authorities may be established up to an amount provided for by executive level III. Broad salary bands in contracts to pay ranges established under the more traditional general schedule/senior level/senior executive service systems govern pay administration in the excepted service. Some of the positions under these authorities are subject to review and approval by the Department's Executive Resources Board, including actions to fill the positions.

c. Discuss ways to motivate, reward, recognize, and retain excellent employees or recognize a major contribution to the organization using local rewards programs or the programs described in the DOE Guide 426.1-1, R*ecruiting, Hiring and Retaining High-Quality Technical Staff*.

[Note: DOE G 426.1-1 has been cancelled.]

The following is taken from DOE O 331.1C, admin chg 1.

Awards include

- performance awards—provide three to four percent of the covered employees' total salaries as of the last day of the annual appraisal period;
- cash awards—determined based on the summary rating and shares multiplied by the applicable share value of the applicable pool;
- quality increase—an employee with a summary rating of significantly exceeds expectations is eligible for a quality step increase or equivalent pay adjustment, referred to as a quality increase in lieu of a cash or time-off award; and
- time-off award—an employee may be given a time-off award in lieu of a quality increase or a cash award.

d. Describe methods used to assess an employee's unique developmental needs and why providing developmental opportunities to employees could contribute to the achievement of organizational goals.

The following is taken from DOE O 360.1C.

Each DOE element must have a training policy and procedures that establish an integrated cycle of organizational needs analysis, training planning, needs assessment, resource allocation, design and delivery, evaluation, and reporting processes consistent with the requirements and responsibilities of DOE O 360.1C.

All DOE employees must have individual development plans (IDPs) in place within 60 days of joining DOE, changing positions (reassignments, promotions, and/or details), or the beginning of a new performance cycle.

When supervisors and employees jointly determine and record that individual development planning would result in little or no benefit to DOE because of an employee's position, expertise, career status, performance level, or personal circumstances, individual development planning is not required.

Managers and supervisors

- ensure that employees comply with applicable workforce training requirements and agreements;
- participate in performance and training needs assessments to identify training opportunities for themselves and their employees;
- participate in the development and maintenance of IDPs for themselves and their employees;
- ensure that selected training and development is mission-oriented, appropriate, and cost-effective;
- provide resources to meet training needs of their employees;
- nominate employees for long-term and extended training opportunities where applicable;
- review and maintain accurate training records, documenting performance requirements and competencies related to training
- ensure timely requests, approvals, authorizations, and notifications of training; and

- ensure that training complies with applicable laws, regulations, policies, requirements, and provisions of workforce training agreements.

e. Describe, in general, the training and qualification requirements for contractors specified in DOE Order 5480.20A, *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*.

[Note: DOE Order 5480.20A has been cancelled.]

The following is taken from DOE O 426.2, attachment 1.

The operating contractor must establish one or more organizations to be responsible for the training of all applicable personnel. This organization(s) must be held accountable for providing the support necessary to ensure that personnel are qualified to safely and effectively meet job requirements. The responsibilities, qualifications, and authority of training organization personnel must be documented, and managerial roles, responsibilities, authority, and accountability clearly defined.

A training program must be established for operations, maintenance, and technical staff personnel, utilizing the systematic approach to training process. The training and qualification program must be developed using a graded approach based on the hazards involved and risk associated with the operation of the facility or activity. The level of detail and content of the training program, and associated documents or procedures, must reflect the personnel selection, training, and qualifications that are required at these facilities.

Contractors must perform periodic systematic evaluations of training and qualification programs (not to exceed three years) in accordance with DOE-STD-1070-94, *Guidelines for Evaluation of Nuclear Facility Training Programs*. Training programs must consist of a combination of classroom-type and on-the-job training, and include simulator and laboratory training as it applies to the position. Classroom-type training may include lectures, seminars, computer based training, and structured self-study activities.

All technicians and maintenance personnel must be qualified to perform the tasks associated with their specialty, or work under the direct supervision of personnel qualified to perform the activity or task. Personnel who perform work on engineered safety features as identified in the facility DSA must be trained on those systems/components. System training must, at a minimum, include the following elements:

- Purpose of the system
- General description of the system including major components, relationship to other systems, and all safety implications associated with working on the system
- Related industry and facility-specific experience

Training program content for radiological control technician (RCT) must be in accordance with the requirements contained in 10 CFR 835 and DOE-STD-1098-2008. RCT training program elements must be in accordance with the requirements of the CRD.

Qualification is defined in terms of education, experience, training, examination, and any special requirements necessary for performance of assigned responsibilities. The

requirements of the CRD are intended to provide reasonable assurance that personnel at DOE hazard category 1, 2, and 3 nuclear facilities possess qualifications to operate and maintain the facility safely and reliably under all conditions.

The program leading to qualification must be governed by written procedures that include requirements for documented assessment of the person's qualifications, through examinations and performance demonstrations. The contractor must define qualification requirements for personnel in each functional level or area based on the criteria contained in the CRD. The contractor must have a method for formally indicating that a person is qualified and when the qualifications expire.

Qualification may be granted only after assuring that all specified requirements (including training and examinations) have been satisfactorily completed. Qualification of operators and their immediate supervisors is valid for a period not to exceed two years unless revoked for cause.

Subcontractor personnel must meet the qualification requirements for the job function to be performed. The operating contractor must ensure that subcontractor and temporary personnel who perform specialized activities are qualified to perform their assigned tasks. Personnel must be considered adequately qualified with proper documentation based on at least one of the following:

- The satisfactory result of an audit of subcontractor records that relate to qualification of the subcontractor personnel being considered for assignment by the operating organization
- The operating contractor's previous verification (within two years) of the ability of the subcontractor employee to perform assigned tasks safely and efficiently
- Successful completion by the subcontractor employee of those segments of the operating organization's qualification program that are considered pertinent to accomplishment of the task to be performed

Even though applied broadly to personnel in the operating organization, the term qualification has a different application for managers and technical staff personnel. These personnel may be considered qualified by virtue of meeting the education and experience requirements associated with the position and by completing applicable position-specific training. A comprehensive examination need not be administered to determine their qualifications. Continuing training and professional development programs should be established to meet the needs of the individual and the position.

Technician and maintenance personnel qualification must include demonstrated performance capabilities to ascertain their ability to adequately perform assigned tasks. Written examinations should be administered to personnel in these positions as applicable. However, a comprehensive final examination need not be administered to ascertain formal qualification of technicians and maintenance personnel (with the exclusion of RCTs). Qualification of operators and their immediate supervisors must include examinations as applicable to the position.

f. Participate in the oral examination or walk-through for a facility representative, safety system oversight, or other technical qualification.

This is a performance based KSA. The Qualifying Official will evaluate its completion.

23. A technical program manager shall have a familiarity level knowledge of the employee concerns program as it relates to personnel and facility safety.

a. Describe the purpose, scope, and importance of the department's Employee Concerns Program.

The following is taken from DOE O 442.1A.

The purpose of the Employee Concerns Program (ECP) is to establish a DOE ECP that ensures employee concerns related to such issues as the environment, safety, health, and management of DOE and NNSA programs and facilities are addressed through

- prompt identification, reporting, and resolution of employee concerns regarding DOE facilities or operations in a manner that provides the highest degree of safe operations;
- free and open expression of employee concerns that results in an independent, objective evaluation; and
- supplementation of existing processes with an independent avenue for reporting concerns.

The ECP applies to all DOE elements and contractors and is important because it ensures that employees can bring concerns to management without fear of retribution.

b. Describe the responsibilities of the following in implementing DOE O 442.1A, *Department of Energy Employee Concerns Program*:

- **Headquarters and field office managers**
- **Employee concerns manager**

The following is taken from DOE O 442.1A.

Secretarial Officers and Field Element Manager/NNSA Deputy Administrators

- designate the management position or positions responsible for developing and implementing the ECP;
- direct the ECP and provide adequate resources and training for effective implementation;
- ensure implementation of ECPs required by contract for contractors under their jurisdiction; and
- use management assessment results to verify the adequacy and implementation of the ECP and improve performance.

ECP Managers

- develop and submit ECP program implementation documentation to the secretarial officer or field element manager, as appropriate, for approval;
- implement the approved ECP and ensure concerns are processed as required by DOE O 442.1A;
- publicize ECP processes, employee rights and responsibilities to report concerns through these processes, and management's intolerance of reprisals against employees who have reported concerns;
- maintain an employee concerns tracking system and a secure filing system;
- decide which concerns that are brought to the attention of the ECP that the ECP office should seek to resolve, the ones that warrant referral or transfer to another office for further review, or the ones that warrant no further action;
- assist in evaluation and resolution of employee concerns;
- transfer concerns to other programs or processes if the concern is deemed to be outside the scope of the ECP;
- document that an individual, office, or organization has accepted responsibility for minimizing, correcting, and preventing recurrence of concerns that have been substantiated through the ECP process;
- prepare quarterly and annual reports and review them for lessons learned and possible adverse trends;
- coordinate with DOE contracting officers to determine the existence of contract requirements for the establishment of contractor ECPs and the means and criteria by which such contractor ECPs will be evaluated; and
- advise appropriate levels of management when actions are either ineffective or not timely in resolving concerns or correcting identified deficiencies.

c. Describe how employee concerns are reported, processed, and documented as stated in DOE O 442.1A, *Department of Energy Employee Concerns Program*, and in DOE G 442.1-1, *Department of Energy Employee Concerns Program Guide*.

The following is taken from DOE O 442.1A.

Concerns must be processed in one of the following manners:

- Investigated or otherwise evaluated through the ECP, in coordination with DOE, including NNSA or external offices when required
- Referred to other offices or programs and tracked by the ECP until they are resolved
- Transferred to another DOE or contractor organization with jurisdiction over the issues, when those issues are outside the scope of the ECP
- Closed as per DOE O 442.1A, paragraph 4c

ECP personnel must document concerns in sufficient detail to permit investigation or other appropriate levels of review. Concerns must be tracked until closure. Unless otherwise agreed to by the employee, an organization other than that of the employee's immediate supervisor must conduct the investigation. Similarly, individuals or organizations outside the concerned employee's organization should not be selected to conduct the investigation where their involvement presents a conflict of interest.

If the concerned employee requests confidentiality, his or her identity must not be disclosed during the investigation or other process used to evaluate the concern. However, ECP personnel should advise employees of the limitations of its ability to protect confidentiality under certain circumstances. ECP personnel must evaluate and attempt to resolve employee concerns in a manner that protects the health and safety of employees and the public, ensures effective and efficient operation or programs, and uses alternative dispute resolution techniques whenever appropriate. ECP personnel must immediately report to an appropriate line manager and/or the environment, safety, and health program office those concerns that involve an imminent danger or condition or a serious concern. Appropriate offices must determine whether DOE, including NNSA or its contractors, have taken action to minimize, correct, or prevent recurrence of program, process, or management weaknesses identified and substantiated through the ECP. Reports of concerns must be reviewed for classified information and, if classified, sanitized by an authorized classifier.

Video 18. The rights of the whistleblower
http://www.youtube.com/watch?v=G799vjiZphs

Closure

An employee concern case is designated as closed when one of the following occurs:

- The concern has been investigated; necessary corrective actions have been identified; the office responsible for taking the corrective action has accepted jurisdiction over the matter; and the resolution has been documented in a formal tracking system.
- The concern has been investigated and no corrective action is deemed necessary.
- The subject matter of the concern is outside the scope of the ECP and the concern has been transferred to another organization with jurisdiction over the subject matter.
- ECP personnel have advised an employee raising a concern that is outside the scope of the ECP of available means to have the concern addressed, if direct transfer of the concern to another organization is not appropriate.
- The ECP determines that the issues are frivolous or too general to investigate.
- The concerned employee has been notified that the concern has been closed.

If the ECP does not resolve a concern to the satisfaction of the concerned employee, the concerned employee must be advised if there are any offices with authority or responsibility for addressing the subject matter of the concern.

Documents and Records

At a minimum, the ECP office must prepare and maintain the following records:

- Concern log
- Concern reports
- Concern investigation and resolution summaries, including a description of the basis for closing the concern, consistent with DOE O 442.1A
- Management assessment results
- Quarterly and annual reports

ECP personnel must submit quarterly and annual reports to the head of the field element and the Office of Employee Concerns. The reports must address the following:

- Employee concerns activity levels for the period

- Nature of the concerns
- Resolution of the concerns
- Other information required under ECP directives for the effective coordination of ECPs

In maintaining ECP records, steps must be taken to protect the identity of the concerned employee consistent with the employee's request for confidentiality and the provisions of the Privacy Act and the Freedom of Information Act.

Federal records cannot be destroyed unless authorized by the archivist of the U.S. NARA. Authorities are found in the General Records Schedule of the Government, as issued by NARA, and in NARA-approved DOE records disposition scheduled. Should any or all ECP records not be covered by authorized records disposition schedule, the responsible ECP manager must seek NARA authorization through the cognizant local records officer in liaison with the departmental records officer.

Alternatives for Processing Concerns

The following is taken from DOE G 442.1-1.

The ECPs retain a role in processing referred concerns. When a concern is transferred, it is closed and becomes a matter to be dealt with by the concerned employee and the office to which the concern was transferred or to which the employee submits the concern.

Concerns can be referred or transferred to organizations either inside or outside DOE. For example, the ECP office may refer or transfer a concern to a manufacturer of equipment being used in response to an employee concern that involves a technical question related to equipment specifications and its safe use under certain conditions. Threats of physical violence, including death threats, can be transferred within DOE to the Office of Inspector General or externally to the Federal Bureau of Investigation, local law enforcement, or contractor protection services.

The individual assigned responsibility for investigating an employee concern may, in most cases, enter and inspect places and records, interview employees with knowledge of the issues, inspect relevant documents, sites, or equipment, and obtain other information deemed necessary. Contractors should cooperate fully with the investigator in making available employees and all pertinent evidence, including records, consistent with their contractual obligations to DOE.

Initial Collection of Concern Information

When a concern is received, the person receiving the concern attempts to obtain as much information as possible from the concerned employee. At a minimum, the following information is obtained when possible:

- Full name of the concerned employee
- Complete mailing address
- Telephone number where the employee can be reached
- Position or relationship to the employer (DOE or contractor)
- Nature of the concern
- The availability of employer processes to address the concern

- Previous attempts to have the concern addressed within the concerned employee's organization
- Whether the concerned employee is requesting confidentiality

ECP personnel create a written record, preferably signed by the concerned employee, reflecting the scope and substance of the concern. If the concerned employee declines to provide the requested information, the individual receiving the concern attempts to establish the reason but does not discourage the employee from using the process by demanding additional details.

d. Describe the criteria for designating and processing occupational health and safety concerns.

The following is taken from DOE G 442.1-1.

Concerns are designated for processing in accordance with the criteria established by the Office of ES&H. An employee concern involving an imminent danger condition/concern or serious condition/concern will be immediately brought to the attention of the appropriate line manager and/or the ES&H program office for evaluation and action. The ECP must ensure that an initial determination of the health and safety significance of the concern is performed. Priorities for resolution must be established based on determination of the risk of the concern. Generic guidance for safety significance is provided in DOE G 442.1-1; however, for occupational safety and health concerns, additional classifications follow.

Imminent Danger Condition/Concern

Any condition or practice in any workplace that creates a danger that could reasonably be expected to cause death or serious physical harm immediately or before the onset of the danger could be eliminated through the normal procedural mechanism. ES&H requires that such concerns be investigated within 24 hours.

Serious Condition/Concern

A hazard, violation, or condition that causes a substantial probability that death or serious physical harm, property loss, and/or environmental impact could result. ES&H requires that such concerns be investigated within 3 working days.

Other-Than-Serious Condition/Concern

Hazards, violations, or conditions that may not result in death or serious physical harm, property loss, and/or environmental impact but may have a direct and immediate relationship to worker safety and health or the environment. ES&H requires that such concerns be investigated within 20 working days.

The following ES&H guidelines are intended to be illustrative, not all-inclusive, of criteria that should be used to assess the significance of the concern. The degree to which a concern involves an imminent danger or condition is judged by determining whether the concern involves any of the following criteria:

- Initiation of work in the face of identified environmental, safety, or health concerns that could result in an immediate or near-term threat to the safety or health of the public or workers

- Continuation of operations in the face of inoperable or deficient environmental, safety, and health equipment, monitoring instrumentation, or systems
- Violations of the Price-Anderson Amendments Act enforcement authority; criminal acts involving nuclear safety matters; willful violations of regulations, DOE directives, operating procedures, or specifications; or other criminal acts
- Deficiencies observed in the normal reporting system
- Collection, dissemination, and recording of inaccurate or falsified environmental, safety, or health related data
- Material misrepresentations to inspectors, auditors, or reviewers when performing official duties

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