U.S. Department of Energy Orders Self-Study Program

DOE-STD-1073-2003

CONFIGURATION MANAGEMENT

National Nuclear Security Administration

DOE-STD-1073-2003
CONFIGURATION MANAGEMENT
FAMILIAR LEVEL

OBJECTIVES

Given the familiar level of this module and the resources, you will be able to answer the following questions:

1. What is the purpose of DOE-STD-1073-2003?
2. What are the objectives of configuration management?
3. To what type of DOE facility does DOE-STD-1073-2003 apply?
4. What is the first set of structures, systems, and components (SSCs) that must be included in a configuration management program?
5. What is a work control process?
6. What is the objective of change control?
7. What are three elements that a technical review is designed to verify?
8. What three elements should be included in a design basis review?
9. What is the purpose of document controls?
10. What is the purpose of a periodic performance assessment of a configuration management program?

Note: If you think that you can complete the practice at the end of this level without working through the instructional material and/or examples, complete the practice now. The course manager will check your work. You will need to complete the practice at this level successfully before taking the criterion test.

RESOURCES

10 CFR 830, "Nuclear Safety Management." January 1, 2011.
10 CFR 830.122, "Quality Assurance Criteria." January 1, 2011.
10 CFR 830.204, "Documented Safety Analysis." January 1, 2011.
DOE O 420.1B, *Facility Safety*. 12/22/05.
DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities.* 4/21/10.
DOE-STD-1073-2003, *Configuration Management.* October, 2003.

INTRODUCTION

The familiar level of this module is divided into three sections. The first section covers chapters 1 through 3. The second section covers chapters 4 and 5. Chapters 6 and 7 are covered in section three. We have provided examples throughout the module to help familiarize you with the material. The examples will also help prepare you for the practice at the end of this module and for the criterion test.

Before continuing, you should obtain a copy of the resources. Copies of the standard are available at http://www.directives.doe.gov/ or through the course manager. You may need to refer to these documents to complete the examples, practice, and criterion test.

SECTION 1

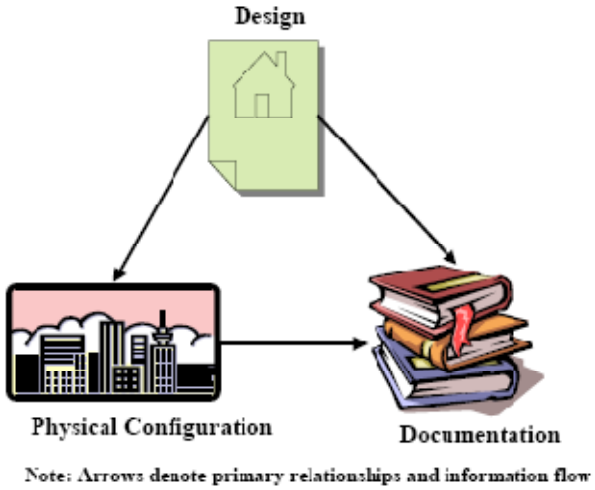
Chapter 1—Introduction/Purpose

The purpose of DOE-STD-1073-2003 is to define the objectives of a configuration management (CM) process for DOE nuclear facilities, and to provide detailed examples and supplementary guidance on methods of achieving those objectives. Configuration management 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 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.

This objective and the relationship between design, documentation, and the actual physical plant configuration of the facility, activity, or operation are illustrated in figure 1.



Source: DOE-STD-1073-2003

Figure 1. Basic relationships in CM

Fulfilling the CM objective is accomplished through the key CM elements as illustrated in figure 2.

Source: DOE-STD-1073-2003

Figure 2. Key CM elements

Chapters 3 through 7 in DOE-STD-1073-2003 address each of the key elements in figure 2 and provide additional details on how they can be implemented.

The contractor must formally document and implement the CM process to be used for the activity in a CM plan. The CM plan must address

- how each of the key elements of CM will be implemented;
- what are the systems, structures, and components (SSCs) to be included in the CM process and what is the basis/justification for the selection;
- what CM training is provided;
- who is assigned key responsibilities and authorities for CM;
- how interfaces are controlled; and
- what programs and procedures must incorporate CM.

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

- support the integrated safety management system (ISMS);
- help to maintain the safety basis as required by subpart B of 10 CFR 830, "Nuclear Safety Management";
- meet the quality assurance requirements for work processes and assessments in subpart A of 10 CFR 830;
- meet the CM requirements of DOE O 420.1B, *Facility Safety*;
- meet the CM and work control requirements of DOE O 433.1B, *Maintenance Management Program for DOE Nuclear Facilities.*

Chapter 2—Applicability

DOE-STD-1073-2003 provides guidance and information to be used for the development and implementation of CM processes at DOE nuclear facilities. It was written specifically to apply to hazard category 1, 2, and 3 nuclear facilities as determined especially with respect to the references to safety basis and 10 CFR 830.

Chapter 3—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 CM 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 facilities and activities to identify and document design requirements.

The contractor should have identified the design requirements for safety systems, SSCs for existing, hazard category 1, 2, and 3 nuclear facilities during the development of the documented safety analysis (DSA) to meet 10 CFR 830, subpart B.

The contractor should document the new or revised design requirements as maintenance and modifications are performed at the facility or activity. In these cases, the contractor must

- ensure that the DSA demonstrates that the functional requirements for the safety SSCs are sufficient
- validate that the safety SSCs will perform their safety functions as assumed in the analysis

Defining the Scope of Configuration Management SSCs

To assess the impact a change will have to an activity, the contractor must first understand the design requirements of the activity. These design requirements must be identified and documented, and changes to them must be controlled.

The first set of SSCs that must be included in the CM SSCs for hazard category 1, 2, and 3 nuclear facilities is the set of safety SSCs identified in the DSA as required by 10 CFR 830.204, "Documented Safety Analysis." Safety SSCs are defined as the combination of safety-class SSCs and safety-significant SSCs, and they include those SSCs whose preventive or mitigative functions are considered to be major contributors to defense-in-depth and worker safety. Defense-in-depth refers to the various layers of protection provided to ensure public safety, worker safety, and protection of the environment. The safety SSCs identified in the DSA constitute the baseline set of SSCs that must be included in the CM process.

In addition, contractors should include in the set of CM SSCs the SSCs whose functions are considered to be important to defense-in-depth or worker safety, but are not already included in the safety SSCs. The combination of the safety SSCs and the other defense-in-depth SSCs should encompass the "vital safety systems." The vital safety systems include the safety significant systems, the safety class systems, and other systems that perform an important defense-in-depth safety function.

Identifying and Documenting Design Requirements

Once the set of CM SSCs is identified, the contractor must identify and document the design requirements for this set of SSCs. The contractor must assess the effects of changes to the design requirements of CM SSCs through the CM process. Furthermore, the contractor must maintain the design requirements for CM SSCs throughout the life of the nuclear activity.

The documentation should identify which of the design requirements are required for safety and which are necessary for cost, environmental, or other considerations, so the impacts of changes can be better assessed.

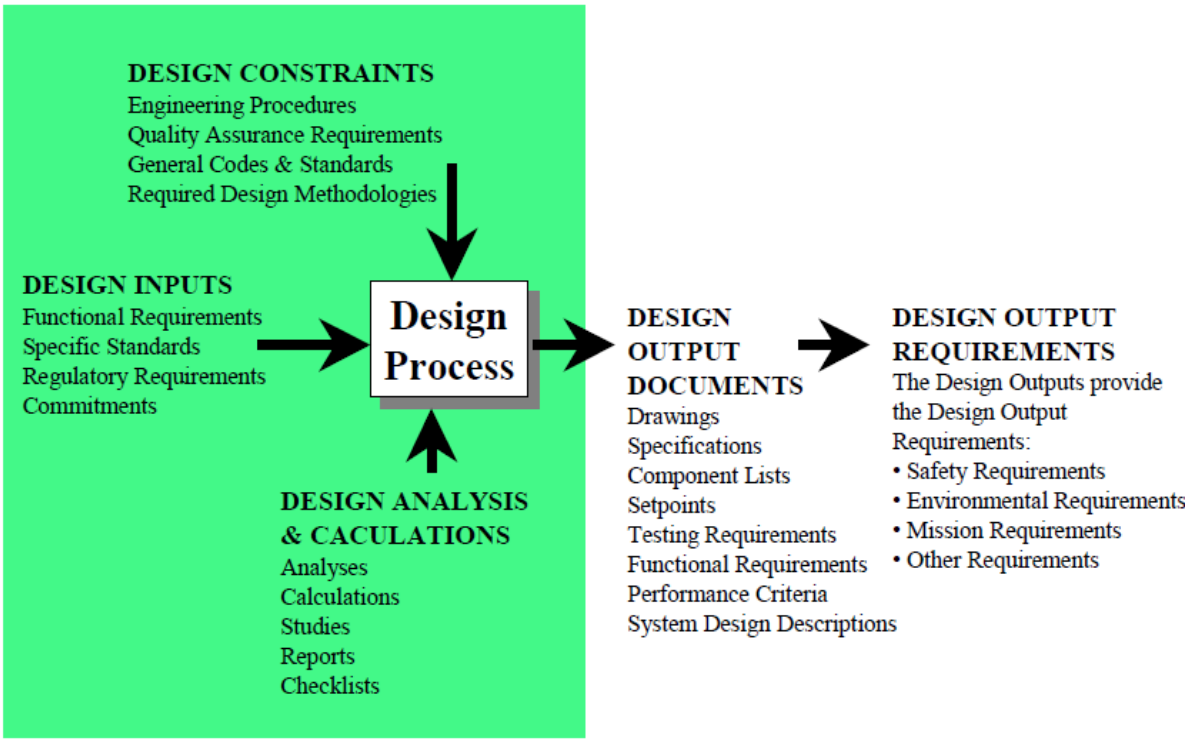
The design requirements to be documented include those that affect

- function
- installation
- performance
- operation
- maintenance

Design Process

Figure 3 illustrates the process of identifying design requirements for CM SSCs. The design process has three elements:

- Design inputs consist of those specific criteria, limits, bases, or other initial requirements upon which the detailed final design is based.
- Design constraints are those general restrictions and limits to the engineering design process that ensure consistency and quality of design.
- 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.



Source: DOE-STD-1073-2003

Figure 3. Design requirements

Design Outputs

Figure 3 also illustrates the design output documents, which are the products of the design process that specify the design output requirements for the facility or activity SSCs. The 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. The design output requirements include the functional requirements, as well as procurement requirements, quality

assurance 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 also referred to as the "as designed conditions." The 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 amenable 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
- setpoint lists

Establishing the Design Authority

Contractors should establish the design authority for each SSC. The design authority is the single organization responsible for establishing and maintaining the design requirements, ensuring that design output documents accurately reflect the design basis, and maintaining design control and ultimate technical adequacy of the design process.

Reviewing Design Requirements

When the design requirements are initially established for the CM process, the contractor must perform a technical management review to determine the adequacy of these requirements. The technical management review team must include technical managers who have broad design backgrounds and experience and represent the various design disciplines.

In deciding whether the design requirement documentation for the CM SSCs is adequate, the team should base its determination on the completeness, accuracy, and level of documentation. The team should also consider the results of applicable assessments, especially any initial CM assessments when performing its assessment.

The technical management review process may include the following methods of assessing completeness:

- Certification of conformance with specified industry codes and standards that identify expected design requirements
- Comparisons of like design requirements for comparable components
- Comparisons of like design basis for comparable design requirements
- Review of design information to identify CM SSCs with missing or incomplete design requirements
- Review of open items and discrepancies that have not been resolved

- Review by independent, external, technical experts

Using System Design Descriptions
A recommended approach to documenting design requirements and providing a link between engineering design documents, the safety basis, and implementing procedures is to develop system design descriptions (SDDs). SDDs identify requirements, explain why those requirements exist, and describe the features of the system design provided to meet those requirements. SDDs can be used to promote consistency among the engineering requirements, the actual installed physical configuration, and the associated documentation. SDDs help facility personnel understand system functions and requirements. In addition to providing a system drawing and written description, they include discussions of functional process requirements, system and component design requirements, system interfaces and interlocks, setpoints, and design requirements related to operations, maintenance, and testing, detailed design and operating descriptions, diagrams, and load lists.

Grading
The initial grading of SSCs for the CM process begins with the identification of the CM SSCs. That process separates the SSCs that will be assessed through the CM process when changes are made from those that will not.

Additional grading may be appropriate. For example, the contractors may want to apply a more stringent CM process to safety SSCs, than to costly SSCs. If so, then the contractor must clearly document the different processes being used and the SSCs to which each process applies.

Contractors should also consider that developing and implementing multiple levels of CM is not always more cost effective than developing and implementing a single, consistently-applied CM process.

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; and
- any other relative hazard.

Design Basis versus Design Requirements
The design requirements are the output of the design process as shown in figure 3. The design basis provides the technical and analytical basis for the design requirements. The design requirements specify “what” is required and the design basis documents “why” a design requirement is specified. In addition to safety basis documents, design basis information is found in other documents, such as transient calculations, setpoint calculations, and sizing calculations.

There may be differences between the values in the design basis and the design requirements for a facility or activity. For example, the design basis may specify a requirement for a pump to deliver 160 gallons per minute (gpm), while the design requirements may specify a pump rated to deliver a flow of 200 gpm. This difference may represent conservatism that the design engineer felt was appropriate or the higher rating may have been chosen to match the rating of an available, off-the-shelf pump.

The significance of the difference between the design basis and the design requirements is that a change to the design basis would necessitate a new design analysis, but a change to a design requirement would not require a new design analysis if the design basis is not affected.

To simplify the process, design requirements should be specified consistent with the design basis. If the design requires a 160 gpm pump and the contractor intends to purchase a 200 gpm pump, the procurement specification can document this without revising the design requirements.

Using Cognizant System Engineers in the Process of Documenting Design Requirements
DOE O 420.1B, requires contractors to designate a cognizant system engineer for each system for DOE category 1, 2, or 3 nuclear facilities. The qualifications for the cognizant system engineer must be consistent with those defined in DOE O 420.1B. In addition, as stated in DOE O 433.1B, the cognizant system engineer has the lead responsibility for the CM of design.

The cognizant system engineer must be knowledgeable of the system and the related safety basis. The cognizant system engineer must also retain a working knowledge of the facility's operation and the existing condition of the system. Consequently, the cognizant system engineer is also responsible for overseeing the configuration of the assigned system to ensure that it continues to be able to perform its expected functions. The cognizant system engineer 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 SDDs, technical drawings, diagrams, and procedures for surveillance, testing, and maintenance; and
- be appropriately involved in the design, review, and approval of changes affecting/impacting system design, operation, and maintenance.

Note: You do not have to do example 1 on the following page, but it is a good time to check your skill or knowledge of the information covered. You may do example 1 or go to section 2.

EXAMPLE 1

Using the familiar level of this module and the resources, answer the following questions.

1. What is the purpose of DOE-STD-1073-2003?

2. What are two objectives for CM?

3. What type of DOE facilities does DOE-STD-1073-2003 apply to?

Note: When you have finished, compare your answers to those contained in the example 1 self-check. When you are satisfied with your answers, go to section 2.

EXAMPLE 1 SELF-CHECK

1. What is the purpose of DOE-STD-1073-2003?
   The purpose of this standard is to define the objectives of a CM process for DOE nuclear facilities (including activities and operations), and to provide detailed examples and supplementary guidance on methods of achieving those objectives.

2. What are two objectives for CM?
   The objectives of CM are to
   - establish consistency among design requirements, physical configuration, and documentation for the activity, and
   - maintain this consistency throughout the life of the facility or activity; particularly as changes are being made.

3. To what type of DOE facilities does DOE-STD-1073-2003 apply?
   DOE-STD-1073-2003 was written specifically to apply to hazard category 1, 2, and 3 nuclear facilities.

SECTION 2

Chapter 4, Work Control

To ensure that work is appropriately evaluated and coordinated before it is performed, contractors must incorporate a work control process into their procedures. Work control is an administrative process by which work activities are identified, initiated, planned, scheduled, coordinated, performed, approved, validated and reviewed for adequacy and completeness, and documented. Work control processes should ensure that when work activities are performed, consistency is maintained between the documents, the procedures, and the physical configuration of the nuclear facility.

The contractor must clearly communicate the responsibilities, authorities, and expectations of work control to all individuals who do work, including facility personnel, subcontractors, and non-facility personnel. The specific responsibilities, authorities, and interfaces related to work control must be defined in applicable work processes, including procedures.

Contractors must use the ISMS process to integrate safety into all aspects of work planning and execution. Safety requires both the involvement of the workers and hands-on involvement of line managers. The ISMS process is designed to promote this involvement. An ISMS ensures that environment, safety, and health management is an integral part of performing work. Line managers are responsible for safety, as well as the work being performed.

Authorized personnel approving the work should ensure that the change control process, including the unreviewed safety question (USQ) process, was used for changes that could impact the safety analysis or the hazard controls. If during the performance of work, additional changes affecting the safety analysis or the hazard controls are identified, these changes should be processed using the change control and USQ processes and work should not resume until these changes have been analyzed and approved.

Chapter 5, Change Control

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 the following:

- 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.

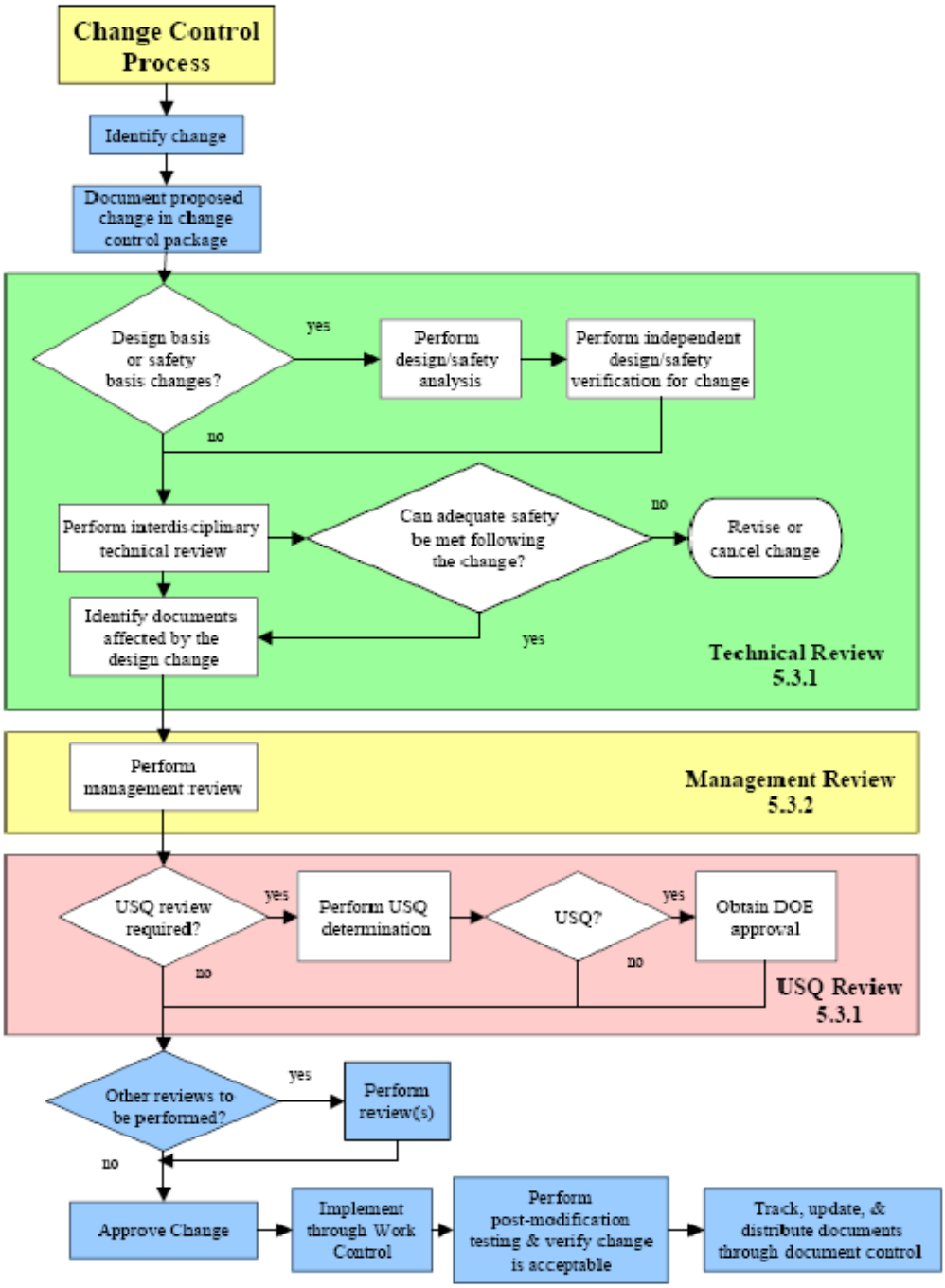
Approved changes are adequately and fully implemented or the effects of the partial implementation are evaluated and accepted.
Implemented changes are properly assessed to ensure the results of the changes agree with the expectations.
Documents are revised consistent with the changes and the revised documents are provided to the users'

A diagram of the change control functions is provided in figure 4.

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.



Source: DOE-STD-1073-2003

Figure 4. Change control process

Making Equivalent Changes

Changes that are shown to be equivalent changes do not need to be evaluated under the change control process. Equivalent changes are hardware changes that

- continue to meet the design requirements for the equipment
- meet all interface requirements
- do not impact the safety basis

An example of an equivalent change would be replacement of a failed part with the same make and model number part. However, as vendors sometimes change materials or design of components without changing the model number, the contractor should ensure that the design requirements continue to be met with the replacement part.

Reviewing Changes

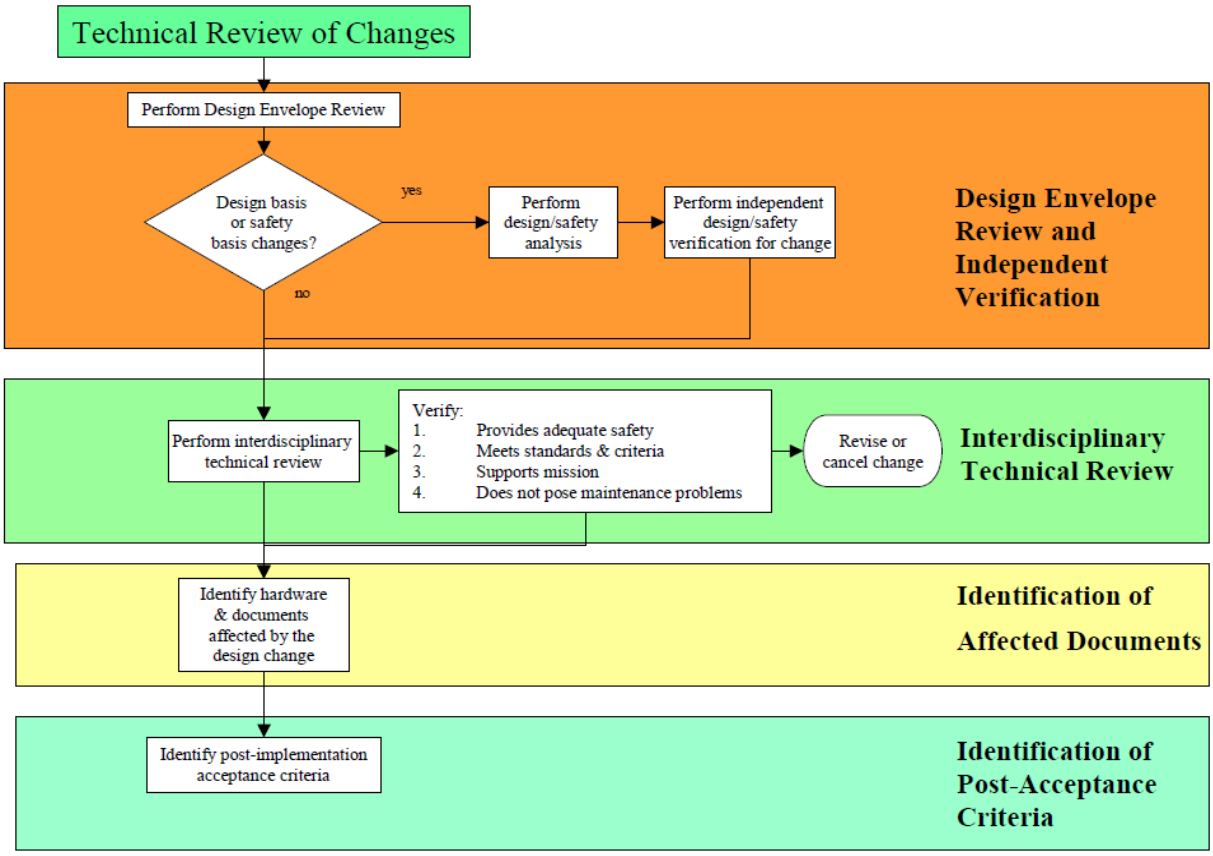
The change control process must involve a formal change control review for each proposed change. The change control review must include a technical review and a management review. The technical review should be interdisciplinary, except where the change is so isolated as to not impact the efforts of more than one discipline. The management review should ensure that management considerations, such as funding, have been adequately considered prior to approving the change for implementation. The results of both reviews must be formally documented. Finally, some changes will need to be reviewed under the DOE-approved USQ process for the facility or activity in accordance with the requirements of 10 CFR 830. The USQ review may be performed concurrent with the technical and management reviews, but it must reflect the final configuration of the change. In addition, if during the management review modifications are made to the proposed change, those modifications must also receive a technical review.

Technical Reviews

The change control process must contain provisions for a formal, multidisciplinary technical review to be performed for proposed changes to assess the impacts of the proposed changes to the facility, activity, or operation. The technical review must verify that

- the facility, activity, or operation will continue to operate safely and provide adequate protection to workers, the public, and the environment;
- the contractor’s ability to continue to meet safety and environmental requirements, performance criteria, permit requirements, or any other applicable state or Federal requirement is not negatively affected;
- the mission can continue to be achieved;
- the change will not create unacceptable maintenance problems;
- the security of the facility or activity is not compromised; and
- the safety basis is preserved or the changes to the safety basis are assessed and determined to be acceptable.

The technical review process is illustrated in figure 5.



Source: DOE-STD-1073-2003

Figure 5. Technical review process

Design Basis Review

If the proposed change is not within the current design basis, the contractor must perform a design analysis for the change. The design analysis must be sufficiently detailed that the technical reviewers can assess the adequacy of the analysis. The individuals responsible for the technical review must be provided with the change control package for those reviews. The design analysis should include

- current and proposed design inputs and constraints
- an analysis of the proposed changes and their impacts
- design outputs
- consideration of systems interactions
- any assumptions that must be verified in the post-operational testing
- identification of any computer program that was used in the analysis

Changes that affect the design basis require a design analysis by the design authority. The design basis is generally identified by the design requirements in the equipment database or the references

listed in the equipment database. Therefore, changes to the design requirements identified in the equipment database will likely require a design analysis.

Independent Design Verifications

The provisions of 10 CFR 830.122, "Quality Assurance Criteria," require the contractor to use individuals or groups other than those who performed the work to verify or validate the adequacy of any changes to design products. Documentation of the independent design verification must be included in the change control package. The independent design verification must verify that

- design inputs and constraints are correctly identified;
- design analyses and calculations are complete and correct;
- design outputs are complete and consistent;
- reasonable methods are used in the analysis and, where applicable, computer programs are verified;
- system interactions are considered appropriately;
- the assumptions are reasonable; and
- appropriate post-modification testing and acceptance criteria are established.

Management Reviews

Following the technical review, contractor management must review the proposed change to verify that

- the technical review was adequately performed
- the change control package is complete and ready for implementation
- any necessary external reviews and approvals have been obtained
- funding is expected to be available to complete the implementation and update the documentation

The management review may also consider

- whether the change is necessary
- whether the benefits of the change warrant the cost and schedule impacts
- the source of funding to complete the change
- whether management approval should be based on other criteria

In some cases, it may be possible to perform the technical review and the management review concurrently. However, in such cases, the contractor must ensure that both sets of responsibilities are sufficiently executed.

Developing Change Control Packages

The contractor should document each step of the change control process and track the implementation in the change control package. Documenting and tracking are essential to ensure that each change is fully assessed, approved, and implemented in accordance with the approved change, and that the affected documentation is identified, updated, and distributed to controlled users. The change control package should be used to capture the change request, the various technical reviews and evaluations, the management review, and the implementation results. The

contractor must also include related information in the change control package. The change control package should be kept in one location until installation is complete.

The change control package should be used to track the changes to completion. Prior to implementation of the changes, the change control package should be reviewed to ensure that

- it is complete and usable
- there are no unidentified physical interferences
- the change is likely to meet defined post-implementation acceptance criteria
- the change has been approved for implementation

The change control package should

- identify all deviations from current design requirements so that the changes are tracked and documented
- identify all documents that need to be revised consistent with the approved change
- define the authorities and responsibilities associated with the approved change
- identify the work processes to be used to implement the change
- identify any constraints to the implementation process

Post-Modification Testing

The quality assurance provisions of 10 CFR 830.122 require contractors to validate work before implementation and perform acceptance testing. The change control package should specify the post-modification testing to be performed and the acceptance criteria. Post-modification testing validates the system or component performs as intended and operates within the design requirements after the change is installed and before turnover to operations. These tests serve as the final and independent check of the adequacy of the design review for the proposed change.

Note: You do not have to do example 2 on the following page, but it is a good time to check your skill or knowledge of the information covered. You may do example 2 or go to section 3.

EXAMPLE 2

Using the familiar level of this module and the resources, answer the following questions.

1. How is safety integrated into the work control process?

2. What are three elements that contractors must ensure through the change control process?

3. What are three conditions that comprise an equivalent change?

Note: When you have finished, compare your answers to those contained in the example 2 self-check. When you are satisfied with your answers, go to section 3.

EXAMPLE 2 SELF-CHECK

1. How is safety integrated into the work control process?
   Contractors must use the ISMS process to integrate safety into all aspects of work planning and execution. Safety requires both the involvement of the workers and hands-on involvement of line managers. The ISMS process is designed to promote this involvement. ISMSs ensure that environment, safety, and health management is an integral part of performing work. Line managers are responsible for safety, as well as the work being performed.

2. What are three elements that contractors must ensure through the change control process?
   Note: Any three of the following comprise a complete answer.
   Through the change control process, contractors must ensure the following:
   - 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.
   - Documents are revised consistent with the changes and the revised documents are provided to the users.

3. What are three conditions that comprise an equivalent change?
   Equivalent changes are hardware changes that
   continue to meet the design requirements for the equipment
   meet all interface requirements
   do not impact the safety basis

SECTION 3

Chapter 6, Document Control

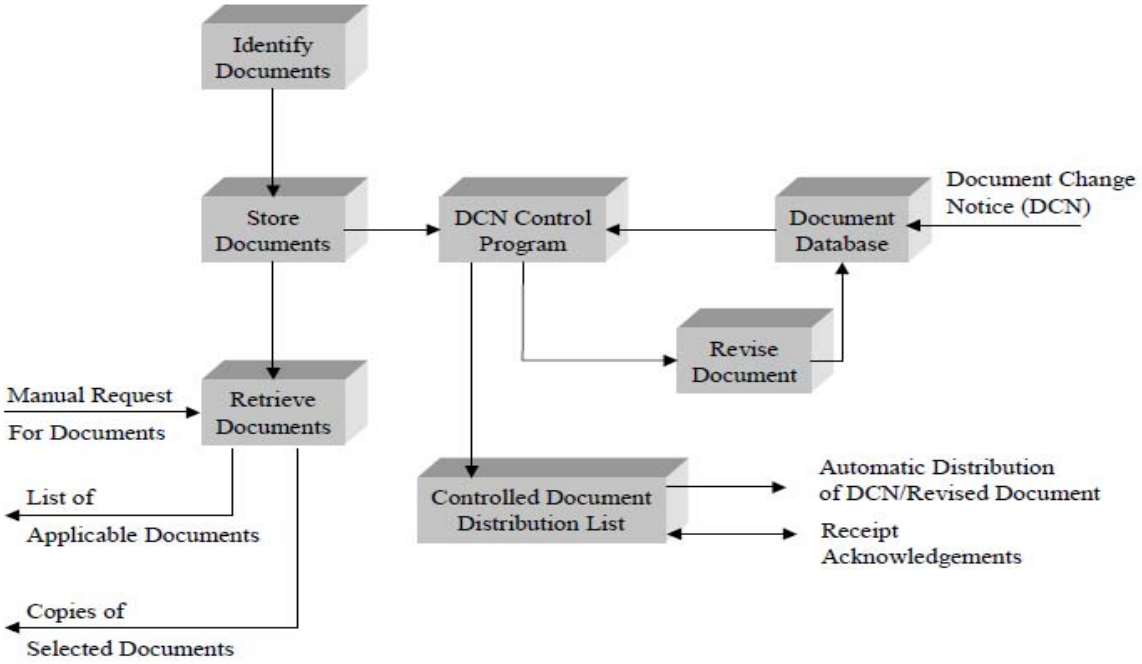
Document control ensures that only the most recently approved versions of documents are used in the process of operating, maintaining, and modifying the nuclear facility. Document control helps ensure that

- 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 the following:

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

A diagram of the features of document control functions is provided in figure 6.



Source: DOE-STD-1073-2003

Figure 6. Document control functions

Contractors must determine what documents need to be controlled. They also must define "document owners" who are responsible for developing and revising the technical content of the documents and ensuring they are maintained current. Document owners will also establish the

schedules for document revisions, distribution, and retrieval.

Typical controlled documents include

- DSAs
- authorization agreements and associated references
- safety management plans
- hazard controls
- documents that identify or define design requirements
- design specification and calculations
- accident analyses
- software data and manuals for operation and maintenance of critical software
- key procedures
- key drawings
- key vendor supplied documents

System design descriptions and other similar documents may contain specific information about preventive and mitigative SSCs that is too detailed to include in the DSA, but which facility personnel need to understand design, operation, and maintenance of the facility, activity, or operation. Whenever a change is initiated, the contractor should also review the applicable SDDs to determine if they need to be updated. The SDDs typically include

- detailed design and operating descriptions;
- diagrams, such as electrical schematics and piping and instrumentation diagrams; and
- load lists.

Controlled Document Distribution List

Contractors should establish and maintain controlled document distribution lists. The lists should identify the documents that are to be controlled and the individuals who are holders of copies of those documents. The document owner should determine the list of controlled document users to be included on the controlled document list. The distribution list should include any satellite document distribution centers. To ensure they are included on the distribution list for revised documents, controlled document users should inform the document owners of their need for specific documents. Whenever a document is superseded by a new revision, a copy of the new revision must be sent to each controlled document user of the document.

Distribution of Documents

Whenever a document is issued or superseded by a new revision, the contractor organization responsible for document control must send a copy of the new revision to each controlled document user of the document, along with a request for written receipt acknowledgment. Contractors can facilitate the return of receipt acknowledgments by sending a receipt acknowledgment form with the revised document. Document control procedures should specify guidelines for the maximum time between issuance of the revised controlled document and distribution.

The recipients should update their copy of the document, and discard any obsolete pages or copies of documents. The recipient must return a written acknowledgment of receipt to the document control organization. The controlled document users should periodically review controlled copies in use to ensure their accuracy and their consistency with the master copies.

Document Database
The document control process should include a database for tracking document status and pending changes. The contractor must assign a database owner for the document database with assigned roles and responsibilities. The database should contain basic information about the document, including

- the unique document identification number
- the document owner
- the document type
- the current revision number
- the current document status
- information regarding pending changes
- outstanding document change notices
- any other information necessary for control and tracking

The document database should have the capability to sort and identify documents based on

- their relationship to particular systems and components
- types of systems and components
- technical topics
- other relational data necessary for the adequate identification of documents

Chapter 7, Assessment

The quality assurance criteria of 10 CFR 830, subpart A, require DOE contractors for nuclear facilities to assess management processes and measure the adequacy of work performance.

Chapter 7 provides guidance on performing assessments directly related to CM. While contractors may perform these assessments of the CM process separate from other assessments, it may be more efficient to combine these assessments with other periodic assessments of the activity. All or part of the assessment of the adequacy of CM for an activity may be integrated into broader management and performance assessments, such as quality assurance, maintenance, or integrated safety management assessments. If the contractor decides to fold the assessment of CM into a broader assessment, it must consider the criteria in this chapter when developing the assessment criteria for the broader assessment.

Assessment Objectives
The objective of assessing CM is to detect, document, determine the cause of, and initiate correction of inconsistencies among design requirements, documentation, and physical configuration. Properly performed assessments should help identify inconsistencies between these areas, evaluate the root causes for these problems, and prescribe improvements to avoid similar inconsistencies in the future.

The five specific types of assessments discussed in chapter 7 are as follows:

1. Construction assessments are performed to ensure configuration is managed throughout the construction process for new construction or major modifications.
2. Physical configuration assessments are conducted to evaluate the consistency between the physical configuration and the facility documentation.
3. Design assessments are done to ensure that design documents have been updated to reflect changes and accurately reflect the physical configuration of the nuclear facility.
4. Post-construction, -modification, or -installation inspections and tests are performed either after construction, modification, or installation to verify operation is as expected.
5. Periodic performance assessments are conducted to verify that systems and components continue to meet design and performance requirements in their current configurations.

Construction Assessments

Because of the changing nature of the physical configuration of a facility under construction, the contractor may not impose a rigid change control process in early construction. DOE and the contractor must formally agree on the point when the CM process will be imposed and what process will be used. There should be a documented plan for CM during construction. It may be appropriate to use different processes as construction proceeds and the physical configuration approaches completion. Construction inspections/audits are performed throughout the construction process for new construction or major modifications, to ensure the quality of the construction and the conformance to design specifications. Adherence to the applicable CM process should be a part of the construction assessment process. In particular, the physical configuration should be assessed at construction turnover to ensure that the physical configuration is consistent with the design requirements and the documentation, including as-built drawings. Construction assessments may involve physical configuration assessments; design assessments; post-construction, -modification, or -installation inspections and tests; and/or periodic performance assessments.

Physical Configuration Assessment

Physical configuration assessments are performed to determine if the actual physical configuration agrees with the design requirements and the documentation. They also determine the effectiveness of CM in the field. Information is gathered through interviews with knowledgeable facility personnel, document reviews, and detailed walkdowns and observations of the actual facility configuration.

Two common types of physical configuration assessments are walkdowns and resolution of configuration and documentation discrepancies. While the processes of walkdowns and resolution of configuration and documentation discrepancies have significant overlaps, the distinctions between them need to be understood. One distinction is based on the products of these processes. A product of the walkdown process is a set of marked-up documents that reflect the actual physical configuration and identify discrepancies with the currently approved facility documentation. A product of the resolution of configuration and documentation discrepancies is as-built documents that have been field-verified and design-verified.

Design Assessments
Contractors should perform design assessments to determine the consistency among the documented design and system requirements, the system, and the physical configuration of the nuclear facility. The audit should confirm the completeness and accuracy of the design and system requirements documented in the DSA and other authorization basis documents. In particular, during these audits the contractor should verify that the safety basis and authorization basis documents accurately reflect any modifications made to the facility or changes made to the activity since the previous design assessment.

Post-Construction/ -Modification/ -Installation Assessments
Following completion of construction, modification, or installation, the contractor should perform inspections and tests to verify expected operation. DOE O 420.1B requires contractors to test systems following modifications to ensure that they continue to be capable of fulfilling system requirements. These inspections and tests ensure that the SSC is installed as documented, meets the design requirements, and is verified to be operable prior to being placed into service initially or returned to service. This function prevents unintended changes from being introduced through errors during design or construction. For physical changes, these inspections and tests serve as a final and independent adequacy check of the design and technical reviews for the change. If a changed SSC fails to meet its acceptance criteria, it should not be turned over for normal operations until either a technical review has been completed and any follow-up actions completed or the SSC is returned to its original condition and tested satisfactorily. For the post-modification tests to be effective test conditions should be consistent with normal and emergency operating conditions and acceptance criteria should demonstrate that the applicable design requirements are met. It is important to verify that inadvertent changes were not introduced during a modification. Depending on the extent and complexity of a modification, and the degree of work control, the contractor may need to perform inspections and tests on portions of the nuclear facility that were not modified to properly verify the expected operation after a modification.

Periodic Performance Assessments
Systems, and components within the CM process must be monitored and tested periodically to determine if they are still capable of meeting their design and performance requirements. Monitoring and testing may take the form of surveillance actions, periodic in-service inspections and tests, and other monitoring of systems and components to ensure safe and reliable operation of the facility. In addition to observing direct results, derived results may include reliability assessment, performance trending, and equipment aging characteristics. Contractors should use the results of this monitoring to identify and avoid inconsistencies between functional and performance requirements identified in the design and actual capability of systems and components. In addition, contractors should use trending of data to detect degradation of equipment due to aging or other causes.

By performing periodic performance monitoring, contractors should verify that selected systems and components continue to be able to perform their intended functions. Contractors should correct any deficiencies identified during the periodic performance assessments that cause the systems or

components to deviate from design requirements.

Resolution of Open Items
Contractors should document assessment findings as open items if they are validated to involve one or more of the following:

- Contradictory information from different source documents
- Unanswered technical questions
- Missing, undocumented or inaccurate information

The contractor should establish a formal, documented process for resolution of open items. That process should include tracking the open item to completion and closeout, including documentation of the resolution. Any identification or a potential inadequacy of the DSA should be assessed through the USQ process.

Note: You do not have to do example 3 on the following page, but it is a good time to check your skill or knowledge of the information covered. You may do example 3 or go to the practice.

EXAMPLE 3

Using the familiar level of this module and the resources, answer the following questions.

1. What is the purpose of document control?

2. What are three typical controlled documents?

3. What is the purpose of design assessments?

Note: When you have finished, compare your answers to those contained in the example 3 self-check. When you are satisfied with your answers, go to the practice.

EXAMPLE 3 SELF-CHECK

1. What is the purpose of document control?
   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.

2. What are three typical controlled documents?
   Note: Any three of the following comprise a complete answer.
   Typical controlled documents include
   - DSAs
   - authorization agreements and associated references
   - safety management plans
   - hazard controls
   - documents that identify or define design requirements
   - design specification and calculations
   - accident analyses
   - software data and manuals for operation and maintenance of critical software
   - key procedures
   - key drawings
   - key vendor supplied documents

3. What is the purpose of design assessments?
   Design assessments are done to ensure design documents have been updated to reflect changes and accurately reflect the physical configuration of the nuclear facility.

PRACTICE

This practice is required if your proficiency is to be verified at the familiar or general level. This practice will prepare you for the criterion test that will be required if your proficiency is to be verified at the general level. You will need to refer to the DOE directives to answer the questions in the practice correctly. The practice and criterion test will also challenge additional skills that you have acquired in other formal and on-the-job training.

1. What is the purpose of DOE-STD-1073-2003?

2. What are the objectives of configuration management?

3. To what type of DOE facility does DOE-STD-1073-2003 apply?

4. What is the first set of structures, systems, and components that must be included in a configuration management program?

5. What is a work control process?

6. What is the objective of change control?

7. What are three elements that a technical review is designed to verify?

8. What three elements should be included in a design basis review?

9. What is the purpose of document controls?

10. What is the purpose of a periodic performance assessment of a configuration management program?

Note: The course manager will check your practice and verify your success at the familiar level. When you have successfully completed this practice, go to the general level.

DOE-STD-1073-2003
CONFIGURATION MANAGEMENT
GENERAL LEVEL

OBJECTIVES

Given the familiar level of this module, a scenario, and an analysis, you will be able to answer the following questions:

1. What are the key elements you would look for in the contractor's action plan to correct the situation described in the scenario?
2. Which requirements, sections, or elements of DOE-STD-1073-2003 apply to the situation described in the scenario?

Note: If you think that you can complete the practice at the end of this level without working through the instructional material and/or the examples, complete the practice now. The course manager will check your work. You will need to complete the practice in this level successfully before taking the criterion test.

RESOURCES

DOE Orders Self-Study Program, DOE-STD-1073-2003, Familiar Level. July 2011.

INTRODUCTION

The familiar level of this module introduced the objectives and basic requirements of DOE-STD-1073-2003. In the general level of this module, students are asked to apply the information contained in the familiar level and the standard to a scenario related to the standard. Each scenario will include a situation, the actions taken to remedy the situation, and the requirements related to the situation. Students will be asked to review the contractor's actions and decide if they are correct. Students will also be asked to decide if the correct DOE requirements were cited in each situation. Please refer to the standard to make your analysis and answer the questions. You are not required to complete the example. However, doing so will help prepare you for the practice and criterion test.

Note: You do not have to do the example on the following page, but it is a good time to check your skill and knowledge of the information covered. You may do the example or go on to the practice.

EXAMPLE SCENARIO

Please review the following scenario, and then answer these questions.

1. Is the contractor's action plan correct? If not, state what should have been done.
2. Were the correct DOE documents or requirements cited? If not, state the correct documents or requirements.

Scenario

Three electricians were performing work in a high-voltage electrical vault. As the electrician placed a wrench near a bolt to remove the links off of the power side of a circuit interrupter, he heard a buzz and felt a tingling. He immediately released the wrench. The wrench arced as it contacted the cabinet. Power was lost to buildings fed by the feeder that had shorted out.

An investigation of the event revealed the following:

- The electrical worker failed to perform an absence-of-voltage check prior to starting work.
- The work control process does not impose requirements to develop specific controls for critical steps when activities are classified as minor maintenance.
- The work controls contain work codes and wording that allows use of "equivalent" practices.
- The procedures for electrical isolation have not been revised to reflect the current power system distribution. Redline drawings of the current power system configuration are not being maintained up-to-date.
- Use of a single minor maintenance work package for the entire scope of the modification did not meet the requirements.

The contractor's action plan included the following:
Immediate actions

- Electrical work being performed in this building was stopped.
- A safe condition was established.
- Worker was taken to medical and confirmed no injuries.
- Power was restored to the buildings that lost power.

Corrective actions

- The work packages for power distribution will contain controls for identifying the proper location or component to be worked on.
- No work will be performed until a zero energy check is performed at the nearest point where the work is to be conducted.
- High voltage work will be performed using a work package that is developed for that scope of work.

DOE requirements that apply to this scenario include the following:

- To ensure that work is appropriately evaluated and coordinated before it is performed, contractors must incorporate a work control process into their procedures. Work control is an administrative process by which work activities are identified, initiated, planned,

scheduled, coordinated, performed, approved, validated and reviewed for adequacy and completeness, and documented. Work control processes should ensure that when work activities are performed, consistency is maintained between the documents, the procedures, and the physical configuration of the nuclear facility. (DOE-STD-1073-2003. page 4.1)

- Contractors must establish and use a formal change control process as part of the configuration management 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. (DOE-STD-1073-2003, page 5-1)
- The change control process must include provisions for the initiator of the proposed change to document the proposed change. (DOE-STD-1073-2003, page 5-5)
- The change control process must contain provisions for a formal, multidisciplinary technical review to be performed for proposed changes to assess the impacts of the proposed changes to the facility, activity, or operation. (DOE-STD-1073-2003, page 5-6)

Take some time to review the example scenario and the actions the contractor took to correct the situation. Then decide if the contractor's actions were complete and correct. Finally, determine if the requirements, sections, or elements of DOE O 458.1 that were cited in this scenario are correct.

Write your answers below and then compare your answer to the one contained in the example self-check.

EXAMPLE SELF-CHECK

Your answer does not have to match the following exactly. You may have added more corrective actions or cited other requirements from the standard that apply. To be considered correct, you answer must include, at least the following.

All of the actions taken in this situation were appropriate. One additional action should have been taken.

- A work pause should have been called for all electrical work on high voltage equipment.

The correct requirements are cited.

PRACTICE

This practice is required if your proficiency is to be verified at the general level. The practice will prepare you for the criterion test. You will need to refer to the standard and the resources to answer the questions in the practice correctly. The practice and criterion test will also challenge additional analytical skills that you have acquired in other formal and on-the-job training for the facility representative position.

Please review the following scenario and answer the following questions.

1. Was the situation handled correctly? If not, what should have been done?
2. Was the list of requirements, sections, and elements complete and correct? If not, state the correct or omitted requirements.

Scenario

A construction oiler performing crane boom cable lubrication on a 225-ton mobile crane received a severe injury to the left hand that was pulled into a sheave pinch point.

Lubrication of the cable was performed by wrapping a lubricant soaked rag around the crane cable and holding the rag in place with the oiler's gloved left hand. Additional lubricant was applied to the cable and rag during the operation by pouring gear oil with the oiler's right hand. The cable lubrication was first conducted by slowly lowering the crane boom to allow crane cable travel while lubricant was applied. During this downward movement of the boom the cable is moving away from the adjacent sheave and pinch point.

After the crane boom was in the full down position the crane operator and oiler stopped and discussed transitioning to moving the crane boom back up to complete cable lubrication.

Shortly after moving the crane boom in the upward direction the oiler yelled to "boom down." The crane operator lowered the boom and then responded to the oiler's location outside the crane cab. The oiler told the crane operator that the lubricating rag caught on the cable and pulled his hand into the sheave. The action of booming down reversed the cable direction and had apparently released the oiler's hand.

The safety representative, the onsite emergency coordinator, and the operation center were immediately notified. The operation center dispatched an ambulance and the injured worker was transported to an area hospital where the worker was admitted. The injury caused severe damage to several fingers on his left hand requiring immediate medical treatment and subsequent surgery.

This accident resulted in the loss of three fingers and skin grafts for the oiler's left hand.

An investigation of the incident revealed the following:

- Roles and responsibilities for crane maintenance activities were not clearly defined.
- Crane maintenance activities were not identified in the applicable work package.

- The hand swabbing lubrication method with a moving wire rope was performed numerous times prior to the event yet it was never identified that the lubrication activity was not documented in the work package.
- The work package was not reviewed and the safe work brief checklist questions were not fully addressed.
- The safe work brief was deficient in that a worksite walkdown was not performed.

The contractor's action plan included the following:
Immediate actions

- The construction manager conducted a safety stand-down.
- Pending the results of the critique and initial investigation, all non-automatic cable lubrication was suspended.

Corrective actions

- Define the work steps with sufficient clarity, detail, and completeness to support the job hazard analysis.
- Ensure that the identified hazards are either removed or controlled.
- Existing and active work packages will be reviewed against the revised criteria.

The contractor concluded that DOE-STD-1073-2003 does not apply to this scenario as configuration management does not appear to be an issue in this case.

Write your answers to questions 1 and 2 below and on the next page and then bring the completed practice to the course manager for review.

Note: The course manager will check your practice and verify your success at the general level. When you have successfully completed this practice, the course manager will give you the criterion test.