

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

## DOE Order 422.1

CONDUCT OF OPERATIONS



**DOE O 422.1  
CONDUCT OF OPERATIONS  
FAMILIAR LEVEL**

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**OBJECTIVES**

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

1. What is the purpose of DOE O 422.1, *Conduct of Operations*?
2. What are the typical methods of implementing DOE O 422.1 guidelines?
3. What are the specific requirements as described in attachment 2 of DOE O 422.1?
4. How do the DOE Technical Standards support the specific requirements in DOE O 422.1

**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 O 422.1, Conduct of Operations, 6/29/10
- DOE-STD-1029-92 CH1, *DOE Standard: Writer' Guide for Technical Procedures*. December 1998.
- DOE-STD-1030-96, *DOE Standard: Guide to Good Practices for Lockouts and Tagouts*. May 1996.
- DOE-STD-1031-92 CH1, *DOE Standard: Guide to Good Practices for Communications*. December 1998.
- DOE-STD-1032-92 CH1, *DOE Standard: Guide to Good Practices for Operations Organization and Administration*. December 1998.
- DOE-STD-1033-92 CH1, *DOE Standard: Guide to Good Practices for Operations and Administration Updates through Required Reading*. December 1998.
- DOE-STD-1034-93 CH1, *DOE Standard: Guide to Good Practices for Timely Orders to Operators*. December 1998.
- DOE-STD-1035-93 CH1, *DOE Standard: Guide to Good Practices for Logkeeping*. December 1998.
- DOE-STD-1036-93 CH1, *DOE Standard: Guide to Good Practices for Independent Verification*. December 1998.
- DOE-STD-1037-93 CH1, *DOE Standard: Guide to Good Practices for Operations Aspects of Unique Processes*. December 1998.
- DOE-STD-1038-93, *DOE Standard: Guide to Good Practices for Operations Turnover*. December 1998.
- DOE-STD-1039-93 CH1, *DOE Standard: Guide to Good Practices for Control of Equipment and System Status*. December 1998.
- DOE-STD-1040-93 CH1, *DOE Standard: Guide to Good Practices for Control of On-Shift Training*. December 1998.
- DOE-STD-1041-93 CH1, *DOE Standard: Guide to Good Practices for Shift Routines and Operating Practices*. December 1998.
- DOE-STD-1042-93 CH1, *DOE Standard: Guide to Good Practices for Control Area Activities*. December 1998.
- DOE-STD-1043-93 CH1, *DOE Standard: Guide to Good Practices for Operator Aid Postings*. December 1998.
- DOE-STD-1044-93 CH1, *DOE Standard: Guide to Good Practices for Equipment and Piping Labeling*. December 1998.
- DOE-STD-1045-93 CH1, *DOE Standard: Guide to Good Practices for Notifications and Investigation of Abnormal Events*. December 1998.

## **INTRODUCTION**

The familiar level of this module is divided into three sections. In the first section, we will discuss the purpose of DOE O 422.1 and some general requirements and responsibilities. In the second section, we will discuss the specific requirements that are contained in attachment 2. The DOE technical standards that are listed in the Resources section of this module are summarized in section three. We have provided examples and a practice in the module to help familiarize you with the material. The practice will help prepare you for the criterion test.

Before continuing, you should obtain a copy of DOE O 422.1 and be familiar with the DOE technical standards. Copies of the Orders are available at <https://www.directives.doe.gov/directives> or through the course manager. Copies of the DOE technical standards are available at <http://www.hss.doe.gov/nuclearsafety/ns/techstds/standard/standard.html>. You should have access to these resources and be familiar with their contents. You may need to refer to the Order to complete the examples, practice, and criterion test.

## **SECTION 1, DOE O 422.1**

### **Purpose**

The objective of DOE O 422.1 is to define the requirements for establishing and implementing conduct of operations programs at DOE, including National Nuclear Security Administration (NNSA), facilities and projects.

### **General Requirements**

The general approach to implementing DOE O 422.1 is for contractors 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 necessary to provide a conduct of operations matrix, which is a list of CRD requirements, citing the specific documentation that implements each item, or providing justification for each item that is not implemented.

DOE line management must determine which facilities, other than hazard category 1, 2, and 3 nuclear facilities, require implementation of DOE O 422.1, considering the hazards, consequences of operational mishaps, and impact of disruptions to mission. Hazard category 1, 2, and 3 nuclear facilities are subject to DOE O 422.1r automatically.

DOE line management must provide appropriate oversight of conduct of operations. Field organizations must assign DOE facility representatives to oversee conduct of operations in accordance with DOE-STD-1063-2011, *Facility Representatives*.

DOE line management must review and approve documentation prepared by the contractor

demonstrating conformance to the requirements in the CRD.

When reviewing the documentation, DOE line management must refer to DOE O 422.1 and should be familiar with the cited DOE technical standards that detail applicable good practices for each of the specific requirements areas in the CRD.

DOE line management must review and approve the documentation when changes in conditions require changes in the documentation, and at least every three years or as directed by the field element manager.

### **Responsibilities**

#### Heads of Field Elements

Notify contracting officers to incorporate the CRD into the affected contracts via the Laws, regulations, and DOE directives clause (DEAR 970.5204-2) for those contracts that contain this clause. For contracts that do not contain DEAR 970.5204-2, request that the contracting officer attempt to get the CRD incorporated into the contract via a contract modification. Notify contracting officers in advance to include the requirements of the CRD in the terms and conditions of any request for proposals for any new contracts.

Provide direction and oversight for the development and implementation of conduct of operations applicability matrices, manuals, plans, procedures, and programs consistent with the provisions of DOE O 422.1. Perform oversight of the contractor's conduct of operations performance.

Review and approve the documentation prepared by the contractor demonstrating conformance to the specific requirements stated in the CRD.

Assign DOE facility representatives to oversee conduct of operations in accordance with DOE-STD-1063-2011.

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



**EXAMPLE 1 SELF-CHECK**

1. What is a conduct of operations matrix?  
The conduct of operations matrix is a list of CRD requirements, citing the specific documentation that implements each item, or providing justification for each item that is not implemented.
2. How frequently should DOE line management review the contractor's documentation related to conduct of operations?  
DOE line management must review and approve the documentation when changes in conditions require changes in the documentation, and at least every three years or as directed by the field element manager.
3. Whose responsibility is it to review and approve the documentation prepared by the contractor demonstrating conformance to the specific requirements stated in the CRD?  
Heads of field elements

## **SECTION 2, SPECIFIC REQUIREMENTS**

This section summarizes the specific requirements cited in attachment 2. You should review the actual Order to optimize your knowledge of the material presented as it may be required to answer the questions in the practice and in the criterion test.

### **Organization and Administration**

The operator must establish policies, programs, and procedures that define an effective operations organization.

### **Shift Routines and Operating Practices**

The operator must establish and implement operations practices to ensure that shift operators are alert, informed of conditions, and operate equipment properly.

### **Control Area Activities**

The operator must establish and implement operations practices that promote orderly, business-like control area operations.

### **Communications**

The operator must establish and implement operations practices that ensure accurate, unambiguous communications among operations personnel.

### **On-shift Training**

The operator must establish and implement operations practices that control on-shift training of facility operators, and prevent inadvertent or incorrect trainee manipulation of equipment.

### **Investigation of Abnormal Events, Conditions, and Trends**

The operator must establish and implement operations practices for investigating events to determine their impact and prevent recurrence.

### **Notifications**

The operator must establish and implement operations practices to ensure appropriate event notification for timely response.

### **Control of Equipment and System Status**

The operator must establish and implement operations practices for initial equipment lineups and subsequent changes to ensure facilities operate with known, proper configuration as designed.

### **Lockout/Tagouts**

The operator must establish and implement operations practices that address the elements for the



installation and removal of lockout/tagouts for the protection of personnel.

### **Verification**

The operator must establish and implement operations practices to verify that critical equipment configuration is in accordance with controlling documents.

### **Logkeeping**

The operator must establish and implement operations practices to ensure thorough, accurate, and timely recording of equipment information for performance analysis and trend detection.

### **Turnover and Assumption of Responsibilities**

The operator must establish and implement operations practices for thorough, accurate transfer of information and responsibilities at shift or operator relief to ensure continued safe operation.

### **Control of Interrelated Processes**

The operator must establish and implement operations practices to ensure that interrelated processes do not adversely affect facility safety or operations.

### **Required Reading**

The operator must establish and implement operations practices for an effective required reading program to keep operators updated on equipment or document changes, lessons learned, or other important information.

### **Timely Instructions/Orders**

The operator must establish and implement operations practices for timely written direction and guidance from management to operators.

### **Technical Procedures**

The operator must establish and implement operations practices for developing and maintaining accurate, understandable written technical procedures that ensure safe and effective facility and equipment operation.

### **Operator Aids**

The operator must establish and implement operations practices to provide accurate, current, and approved operator aids.

### **Component Labeling**

The operator must establish and implement operations practices for clear, accurate equipment labeling.

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



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

## EXAMPLE 2 SELF-CHECK

1. What are three elements that should be addressed to meet the specific requirements associated with organization and administration?

The operator must establish policies, programs, and procedures that define an effective operations organization, including the following elements:

- organizational roles, responsibilities, authority, and accountability;
  - adequate material and personnel resources to accomplish operations;
  - monitoring and self-assessment of operations;
  - management and worker accountability for the safe performance of work;
  - management training, qualification, succession, and, when appropriate, certification;
  - methods for the analysis of hazards and implementation of hazard controls in the work planning and execution process; and
  - methods for approving, posting, maintaining, and controlling access to electronic operations documents (procedures, drawings, schedules, maintenance actions, etc.) if electronic documents are used.
2. What are three elements that should be addressed to meet the specific requirements associated with shift routines and operating practices?
- The operator must establish and implement operations practices to ensure that shift operators are alert, informed of conditions, and operate equipment properly, addressing the following elements:
- prompt notification to operating personnel and supervisors of changes in the facility status, abnormalities, or difficulties encountered in performing assigned tasks;
  - adherence by operating personnel and other workers to established safety requirements;
  - awareness by operating personnel of the status of equipment through inspection, conducting checks, and tours of equipment and work areas;
  - procedures for completing round sheets or inspection logs, responding to abnormal conditions, and periodic supervisory reviews of round sheets or inspection logs;
  - procedures for protecting operators from personnel hazards, e.g. chemical, radiological, laser, noise, electromagnetic, toxic or nano-scale materials;
  - prompt response to instrument indications, including the use of multiple indications to obtain parameters;
  - procedures for resetting protective devices;
  - authorization to operate facility equipment;
  - designating shift operating bases and providing equipment for them; and
  - professional and disciplined operator performance of duties.

3. What are three elements that should be addressed to meet the specific requirements associated with control area activities?

The operator must establish and implement operations practices that promote orderly, business-like control area operations and address the following elements:

- control-area access,
- formality and discipline in the control and at-the-controls areas,
- surveillance of control panels and timely response to determine and correct the cause of abnormalities/out-of-specification conditions,
- limitation of the number of concurrent evolutions and duties, and
- authorization to operate control area equipment.

### **SECTION 3, DOE TECHNICAL STANDARDS**

This section of the module addresses the DOE technical standards that support the specific requirements of DOE O 422.1. The information provided in the following paragraphs introduces the content of each standard. You should be familiar with the criteria, policies, and guidance provided in each of the standards.

#### **DOE-STD-1032-92 CH-1, *Guide to Good Practices for Operations Organization and Administration***

The organization and administration of facility operations should clearly define the process for providing and supporting safe, reliable, and efficient conduct of all facility activities. Emphasis must be placed on teamwork to ensure this occurs. A clear understanding by personnel of their authorities, responsibilities, accountabilities, and interfaces is essential to proper functioning of the organizational team. The organizational structure must be clearly defined, and the administrative controls implementing the structure must be formally documented to achieve this understanding.

Management must emphasize performance standards and individual accountability in adhering to policies and accomplishing goals. When personnel are aware of the performance standards required to meet the goals, they will be more inclined to acknowledge their accountability. In addition, personnel must be allowed the opportunity to supply input to the policies, goals, and standards so that they have a sense of ownership of the facility. Given this opportunity, personnel will more willingly support standards and accept accountability.

Personnel must have the resources needed to perform their jobs. Restricting or delaying resources will only hinder operational effectiveness and may result in adverse consequences.

Because personnel are one of the resources required to operate a facility, a plan to retain sufficient personnel to safely and efficiently operate the facility must be developed. To ensure that resources are being properly used and operating activities are directed towards goals, management must monitor operations. Monitoring facility operating performance is the best way to measure the facility's effectiveness in accomplishing goals.

Monitoring activities such as audits, reviews, tours, and self-assessments are part of the checks and balances needed in an effective operating program to ensure that management obtains a clear picture of facility operations. Touring also allows management to interface with facility personnel and reinforce policies and goals. Audits, reviews, investigations, and self-assessments supply information for facility performance reports. These reports provide evidence of the operating performance of the facility. Facility performance reports enable tracking and trending of performance indicators and can be used to adjust goals. When operating problems or undesirable performance trends are noted during monitoring, corrective actions must be developed and implemented to redirect performance. Follow-up monitoring activities allow management to verify

the effectiveness of the corrective actions.

Managers must be trained to effectively monitor operations and manage resources.

A management development program will enhance the skills and knowledge of upcoming managers and supervisors.

Management must strive to develop and maintain a proper safety attitude in all facility personnel. A comprehensive safety program must include planning for safety. If safety planning accompanies work planning, safety issues will be confronted before actual work is started. Planning will minimize work holdups and operating schedule delays that result from correcting safety issues. Personnel must also be trained in safe operating practices and the need to identify potential personnel hazards at their work stations. Management monitoring of performance, stressing safety and planning for safety will reinforce this attitude.

**DOE-STD-1041-93 CH-1, DOE Standard: *Guide to Good Practices for Shift Routines and Operating Practices***

DOE-STD-1041-93 addresses the professional conduct and good work station practices that result in appropriate attention to facility conditions. It discusses the authority to operate equipment and the status control that is essential to controlling and coordinating facility activities. Emphasis is also placed on effective equipment monitoring and data recording, including notifying supervisors promptly of unusual or unexpected situations. This notification process ensures proper attention is given to changing and off-normal conditions. Industrial safety practices, including radiological and hazardous material protection, are also addressed.

Industrial, military, and commercial utility operating experience has shown that professional conduct and sound operating practices result in a safer, more efficiently run facility. Two key principles to professional conduct and sound operating practices are formality and ownership. Formality is performing all duties according to approved practices and procedures. It ensures a more alert work force and business-like atmosphere. Ownership is an attitude whereby individuals accept total responsibility for maintaining their assigned work station in the best possible operating condition.

The responsibility for safely operating a DOE facility rests with the on-shift personnel. Safe operation is accomplished through adherence to procedures, technical safety requirements and sound operating practices. The authority and responsibility for facility operations should be vested in the cognizant supervisor or manager and be transferred only through formal turnover to a qualified relief.

Establishing clear lines of authority and responsibility for controlling facility operations, including equipment and systems, will enhance facility operations. The authority for operating certain



equipment and systems may be given to specific work stations, however the supervisor maintaining ultimate responsibility for the equipment must be notified prior to changes in status. During emergencies, operators should be authorized to take the necessary actions to place the facility in a safe operating or shutdown condition. In this case, the change in status would be reported to the supervisor after the fact.

During special tests, evolutions, or abnormal conditions, personnel should be aware that the responsibility and authority to decide corresponding operating conditions, system alignments, or equipment manipulations rests fully with the on-duty supervisor. This supervisor should not permit any individual to bypass or overrule his/her operational judgment without bringing the matter to the attention of a higher operational authority.

An effective equipment and area monitoring program will help ensure that abnormal conditions and adverse trends are detected in a timely manner. The program should address the equipment and areas to be monitored and the monitoring frequency. This monitoring or inspecting can be accomplished through operator inspection tours. A list of areas and associated equipment under an operator's control should be used to assist personnel in performing inspection tours.

Round inspection sheets can also be used to record equipment parameters during inspection tours. Recording these parameters will assist personnel in detecting trends and serve as a historical record of facility operations. Trending is necessary to detect abnormal conditions or adverse trends so appropriate action can be taken before equipment malfunction occurs. Establishing procedures that specify when to take readings; how to record readings, how to identify out-of specification readings, how to make corrections on the round sheets; and what actions to take for out of specification readings will improve the accuracy, completeness, and neatness of round sheets. Procedures should also specify a program for developing and maintaining round inspection sheets. Training on these procedures will ensure the proper round sheet information is communicated to all affected personnel.

Sound operating practices also include a strong emphasis on personnel safety practices required to perform a job. Following personnel safety practices should keep personnel alert to detect, prevent, and mitigate all possible hazards. The correct safety practices should be demonstrated to personnel during their initial training and during refresher training, and reinforced continuously, by all personnel, while on the job. Safe work station practices also include maintaining exposure to personnel hazards as low as reasonably achievable (ALARA).

**DOE-STD-1042-93 CH1, DOE Standard: Guide to Good Practices for Control Area Activities**

The control area of a DOE facility is the focal point of safe and efficient facility operations. It is a central operating base and coordination point for important facility activities. A control area may range in size from a desk or computer terminal to a room of instrumentation and control panels. Whatever the size, a professional atmosphere must be maintained so activities performed in the

control area remain focused on the operation of the facility. A properly organized and structured control area should enhance safe and efficient operations.

Large facilities may have a central control area for coordinating overall facility operations and several other areas designated as control areas for specific portions of the facility. Similarly, small facilities may have only one designated area that controls operations.

Control of access is the key to limiting the number of personnel in the control area. By limiting the number of personnel in the control area, the associated noise, confusion, and possible distractions will be minimized. Access must be controlled to maintain a formal, disciplined atmosphere that promotes teamwork and professionalism.

Professional, businesslike behavior by personnel will enhance the quality of control area activities. These professional practices embody high standards of technical and ethical performance and help build a foundation for safe and reliable facility operation. Professional behavior during normal operations carries over to handling off-normal and emergency situations safely and efficiently. Maintaining a clean, quiet, neat and orderly environment enhances control area professionalism. Also, this type of environment makes it easier to operate and makes a positive statement about the personnel working there.

Monitoring the instrumentation and control panels in the control area provides personnel with current facility operating information and a means of detecting abnormal conditions before they become problem situations. Although some of the parameters displayed in the control area may also be displayed locally, the control area provides a central area for displaying and monitoring these parameters.

Besides providing an area for consolidating remote indications, the control area may have controls for operating facility equipment. These controls could be used to operate remote equipment in areas with high personnel hazards or emergency equipment. In either case, unauthorized operation of controls may hinder facility operation, stop facility operation, or create an adverse environmental, safety, or health situation. These situations can be avoided by identifying who has the authority and responsibility to operate control area equipment.

Monitoring and operating the instrumentation and control panels are the primary responsibilities of control area personnel. When ancillary responsibilities are assigned, they compete with the primary responsibilities for the time and attention of control area personnel. Overburdening control area personnel with ancillary responsibilities will distract them from properly monitoring facility parameters. A structured program for assigning ancillary duties will prevent this situation.

**DOE-STD-1031-92, DOE Standard: Guide to Good Practices for Communication**

Depending on the job, an individual may be responsible for transmitting or receiving information in

the form of operating instructions, feedback on the results of operations, reports of operational data, or emergency warnings and instructions. Whether face-to-face or electronic communication, this information has to be transmitted and received; it has to be accurate and complete; most importantly, it has to be understood. Communication problems have caused many adverse situations in DOE facilities. Inadequate communication can be identified as a causal or contributing factor in human performance-related events. Principal areas in which poor communications can cause problems include shift turnover, pre-job briefings, and during job performance. Facilities can reduce the contribution to adverse situations by ensuring that verbal communications are conducted in a formal and disciplined manner and that communication systems are properly used. Formality in communication is especially important when personnel safety is involved or complex evolutions are performed.

Just as there are different messages to be communicated, there are different methods of audible communication. Each method requires the use of specific techniques to effectively communicate the necessary information. DOE-STD-1031-92 presents communication techniques that have proved successful in the commercial industry, government, and the military.

**DOE-STD-1040-93, *DOE Standard: Guide to Good Practices for Control of On-Shift Training***

On-shift training provides the mechanism for applying the knowledge and skills learned in the classroom, through self-study, and in the laboratory to operating the facility. On-shift training activities are required to provide the trainee with hands-on experience, because neither an outstanding classroom presentation of fundamentals and facility-specific knowledge nor specific laboratory exercises sufficiently prepares an operator to operate a facility safely and efficiently. Since on-shift training allows unqualified personnel the opportunity to operate the facility, controls must be implemented during the performance of on-shift training to ensure that the facility is operated safely and reliably. These controls should prevent accidental, inadvertent, or incorrect manipulation of components, equipment, or systems by trainees. On-shift instructors and trainees must understand the controls that regulate the performance of on-shift training.

On-shift training is commonly conducted using the instructional method of on-the-job training (OJT). This form of training has proven very effective in qualifying trainees. OJT addresses the steps necessary to successfully train an individual in the performance of a task, but does not specifically address the controls of the training process and their relationship to the operation of the facility.

DOE-STD-1040-93 addresses the formal, disciplined controls that are required in the operating environment to ensure that on-shift training is conducted safely and efficiently. On-shift training includes activities that a trainee performs in the operating environment under supervision, as well as training activities that are performed in the operating environment as part of the operator continuing training program. The primary purpose of on-shift training is to allow personnel to acquire first-

hand experience by performing or observing operations, special processes, tests, inspections, and other work activities.

In addition to the necessary administrative controls, qualified instructors are also important to the successful control of on-shift training. Competent instructors ensure quality and consistent training of potential operators without compromising the safety and reliability of facility operations. Trainees receive the best and most consistent training concurrent with meeting the production goals of the facility when the instructors are proficient in performing their assigned operational duties while conducting on-shift training. These instructors are best able to interrupt the training when a compromise to safety is becoming evident.

***DOE-STD-1045-93, DOE Standard: Guide to Good Practices for Notifications and Investigation of Abnormal Events***

An effective notification program provides a positive means for the facility to respond to public health and safety concerns. DOE policy encourages a positive attitude toward reporting occurrences. Facilities should develop notification guidelines that are directed toward ensuring uniformity, efficiency, and thoroughness of notifications.

The need for facility-specific notification guidelines is apparent if one considers the situation of a supervisor during, and immediately after, a serious operating event. The supervisor's first priority is to ensure safety. This may involve implementing emergency operating procedures, reassigning operating personnel, and/or personally supervising immediate actions. In the midst of this activity, the supervisor requires concise notification guidelines that clearly indicate the appropriate level of notification for the specific event, based on an evaluation of its potential to impact safety, health, the environment, or operations. The supervisor also needs to know the time available to make the notification within regulatory requirements, the individuals to be notified, and the method to be used to notify each.

Well-designed guidelines will ensure that notifications do not interfere with the immediate actions that are needed in response to abnormal conditions. They should also ensure that notifications are regarded as an integral part of the response, not an action to be considered after conditions have returned to normal.

A manager has overall responsibility for the event investigation process. However, the manager may delegate specific tasks in the investigation process to other personnel as appropriate.

Prompt investigation of abnormal events and conditions is important so facilities can assess the impact of each event or condition, determine the root cause, and identify corrective actions to prevent recurrence. Abnormal events and conditions include all occurrences requiring formal notification. Additionally, investigation is appropriate for all events, conditions, near misses, or other indications of situations within or outside the operations organization that, if uncorrected, can

impact safety or reliability. Acts of actual or suspected sabotage represent a special case for investigation.

The investigative process described in DOE-STD-1045-93 is intended to assist the operating organization in evaluating and responding to operational abnormalities. These investigations are not intended to replace the formal accident investigations that are required for certain occurrences.

To ensure consistency, facilities should provide written guidelines to address all aspects of the investigative process. Concise instructions will aid the supervisor in properly collecting and/or preserving physical evidence that may be needed in the investigation. Standard forms, or an example format, will aid in documenting statements from the personnel present during the event. Checklists may be useful for ensuring that all appropriate operating records are collected or copied for use in the investigation. Finally, clear instructions for conducting the investigation will make effective use of time and will aid personnel in evaluating the corrective actions taken and the results of those actions. This process will enable personnel to determine the current safety status of the facility and the capability for continued operation.

***DOE-STD-1039-93, DOE Standard: Guide to Good Practices for Control of Equipment and System Status***

DOE facilities are required to establish administrative programs to control equipment and system status. A program for controlling equipment and system status, or status control, must be broad in scope. It should incorporate measures to ensure awareness by operating personnel concerning the physical configuration and operating status of equipment and systems. It should contain methods to maintain system operability in accordance with design requirements

Proper control of equipment and systems requires clear lines of responsibility and authority. The facility status control program should clearly designate the authority and responsibility for controlling status to ensure proper configuration. All personnel must understand the importance of keeping the operations supervisor and other designated operations personnel informed of activities that could affect the status or operability of equipment.

Effective control of equipment and system status also means coordinating operations and maintenance activities. Equipment deficiencies must be promptly identified for correction in the work control system. Locking and tagging should be performed by qualified operations personnel to ensure that all energy and hazardous material sources are properly isolated, and required safety functions are not inadvertently disabled. The operations supervisor should sign the work control documents to authorize the start of all maintenance activities, including testing, calibration, and related activities. A process for post-maintenance testing should be in place to ensure that all operation of equipment is controlled by approved operating procedures and that appropriate maintenance and operations personnel are represented during the testing. The status or alignment of equipment should be verified as part of restoring the equipment to service following outages for

maintenance or design modifications.

Special administrative controls are required whenever equipment must be operated with temporary modifications in place. These controls should include methods for ensuring that operators are aware of the modified status of the equipment and its operating limitations. The controls should provide for appropriate safety and technical reviews, documentation, updating of procedures and drawings, and training.

The status control program requires specific methods for verifying and documenting the configuration of equipment and systems, changes in equipment status, and compliance with operational and safety limits. Status control documentation may include checklists, logs, status boards, or a combination of these. Requirements for status control documentation should be coordinated with other documentation requirements to avoid unnecessary forms or duplication of information. This ensures that status information is updated as a regular part of the job, not treated as an added administrative task. It also provides those personnel having operating responsibility with simple, direct access to current status information.

**DOE-STD-1030-96, *DOE Standard: Guide to Good Practices for Lockouts and Tagouts***

A program for lockout and/or tagout is of primary importance for ensuring worker safety in DOE facilities. The overall program for safety at DOE facilities is described in guidelines published by the Department of Energy, Office of Environment, Safety, and Health. Lockout/tagout is an essential part of this overall safety program.

A lockout/tagout program is designed to identify sources of energy and hazardous materials that could adversely affect maintenance activities, isolate all such sources from the work area, and ensure that the isolation remains effective until the work is completed. Lockout/tagout should be applied whenever workers are performing maintenance on facility equipment or systems where there is any possibility of injury or damage as a result of release of energy or hazardous materials.

If a facility's lockout/tagout program is to be effective, it must be understood by all affected personnel; it must be applied uniformly in every job; and it must be respected by every worker and supervisor. The requirements for lockout/tagout in U.S. industry are identified in Occupational Safety and Health Act regulations.

The lockout/tagout procedures in many DOE facilities, like the procedures used in electric utility power plants, must apply to situations requiring special control measures. In these facilities, measures to protect the individual worker must be integrated with the operation of larger safety systems designed to protect the public, the environment, and the facility. The procedures used in these facilities address protecting personnel from injuries resulting from unexpected operation or energizing of equipment. They also address preventing the unexpected or inadvertent loss of essential safety systems and operating facility systems.

Operation of equipment in these facilities is usually performed by an operations organization. Qualifications for operations personnel are distinct from the qualifications of maintenance or other service personnel. The specialized knowledge operators must possess regarding system functions and interactions mandates that only qualified operators may manipulate facility controls for any purpose, including lockout/tagout.

Two methods of lockout/tagout implementation are discussed in DOE-STD-1030-96. For facilities or situations where the application of lockout/tagout is limited and has no effect on the overall facility safety or environmental systems, the method is called an individual-controlled lockout/tagout. For facilities where the application of a lockout/tagout is far-reaching and may alter an integrated process, the method is called centrally controlled lockout/tagout.

DOE-STD-1030-96 identifies many lockout/tagout practices that apply to both methods. It also identifies many additional or alternative practices that apply to only one method. DOE facilities may have operating characteristics addressed by either method. As part of the implementation of a lockout/tagout program, each facility must determine which guidelines are most applicable to the facility's own function and organization. The goal of the lockout/tagout program is the same for all DOE facilities: the control of potentially hazardous energy sources and hazardous materials to ensure safety.

**DOE-STD-1036-93, *DOE Standard: Guide to Good Practices for Independent Verification***

Independent verification compensates for the human element in facility operation. It recognizes that any operator, no matter how proficient, can make a mistake. However, the chance that two operators will independently make the same mistake is unlikely. Therefore, independent verification provides an extra measure of safety and reliability to facility operations. Industry experience shows that verifying, or double-checking, important operating parameters and component alignments reduces the occurrence of unintended operational events.

Independent verification is an activity designed to enhance the reliability of facility operations and safety functions, and to aid in the control of equipment and system status. Its intent is similar to the quality assurance and engineering checks that are performed during design and installation of facility systems. However, independent verification is an ongoing process performed by operations personnel during operations. Independent verification activities are built on the two concepts portrayed through their name: verification and independence.

Verification is the act of checking that an operation, the status of equipment, a calculation, or the position of a component conforms to established criteria. Verification only checks for conformance with the criteria; it does not alter the status of equipment or the position of components. The criteria used for verification are normally contained in operating procedures or alignment checklists. All persons performing verification must receive specific training and qualification on the systems they will verify, and on techniques for verifying component position or status.

Independence means that the person performing the verification will not be influenced by observation of, or involvement in, the activity that establishes the component position or status. For most operating activities, independence can best be achieved by separating the operation and the verification by time and distance.

For some operating activities, separating the operation and the verification by time and distance may not be possible. For example, verifying the position of a throttle valve or other control may require observation of the positioning activity. Verification for the installation or removal of jumpers may require checking the intended action before it is performed, because incorrect performance could cause a shutdown of critical equipment or actuation of a safety system. For these types of operating activities, the operator and verifier should independently identify the component and then concur on the action to be performed. The verifier should observe that the operation is performed correctly. This method is termed concurrent dual verification.

Independent verification will be most effective if it is incorporated into existing operating activities. Each facility's operating guidelines should identify the specific systems, structures, and components that require independent verification. Within those systems, structures, and components, the guidelines should identify the occasions when independent verification should be performed. Facility procedures should provide instructions for the independent verification techniques appropriate to specific systems and components. These instructions are necessary to ensure that verification is performed consistently, and that verification activities do not change the component status or upset the process. Independent verification requirements should be addressed in pre-job briefings, to identify the personnel involved and to clarify the methods that will be used. Facility training programs should include subjects related to independent verification, such as development of a questioning attitude, selfchecking techniques, and methods to avoid undue influences while acting as the performer or verifier.

Separate from the requirement for independent verification of specific operations activities, the concepts of independent verification can be applied to other functions or activities that can affect operations. Personnel should apply the principles of independent verification to all operating systems in their work areas, not just those having safety functions. System parameters should be checked against each other and against expectations. When problems are identified, individuals should notify supervision and initiate corrective action in accordance with applicable procedures. This process helps ensure that problems are identified early and corrected before they cause larger problems.

**DOE-STD-1035-93, *DOE Standard: Guide to Good Practices for Logkeeping***

DOE-STD-1035-93 has been prepared to aid facilities and individuals in maintaining logs as working documents used in the daily conduct of facility operations and as permanent legal records.

Logs have many characteristics in common with round sheets, in that both provide information



concerning the condition and status of equipment, and both are treated as legal records. Round sheets normally record only data collected from instruments.

Logs are used to record an understandable account of the changes in the status of equipment, information obtained from sources in addition to instruments, and explanations for unusual data readings. This information makes logs a valuable tool in reconstructing events. If an unusual event occurs, its precursors and its progress can often be traced by analyzing logs, round sheets, and other records.

Logs provide a method for transferring information from one person or shift, to another, and are an important part of the operations turnover.

The transfer of information through logs enables current personnel to benefit from the experiences of previous operators of the equipment. The record of problems and attempted solutions may be reviewed whenever a new or similar problem occurs. The lessons learned can save time and effort in the search for solutions to current problems, and can help personnel avoid situations that caused problems in the past. The information contained in logs is also often used by engineers to track the performance of components or processes, by training personnel to provide examples for instruction, and by others requiring specific information concerning operations.

Logkeeping enhances the formality that must be a part of good operating practices and encourages individual accountability for operating decisions and actions. Logkeeping may also reduce paperwork by providing a single location and format for documenting operating activities.

Since logs are regarded as legal documents, they should meet high standards for accuracy and consistency. Facility guidelines should specify the positions required to maintain logs, the type of information to be recorded, and the requirements for format, timeliness, and legibility. Facility guidelines should also provide instructions for correcting errors in logs, periodic review of logs, and disposition of completed logs.

**DOE-STD-1038-93, *DOE Standard: Guide to Good Practices for Operations Turnover***

An operations shift turnover (turnover) is the process of transferring duties and responsibilities of facility job positions between personnel. Thorough turnovers are crucial to the safety of DOE facility operation. Turnover activities ensure that on-coming personnel have an accurate picture of current facility status and provide a review of past and scheduled operations. The information obtained by on-coming personnel during turnovers promotes safe, efficient, and continuous operation. To ensure the most efficient and productive transfer of facility information, the turnover should be strictly focused on the work station status and operation.

The turnover process should be conducted in a formal, businesslike manner because it prepares on-coming personnel to operate the facility. Consistent with facility policy, oncoming personnel are

responsible for arriving at the facility in a condition ready to work.

A turnover checklist enhances the turnover process by serving as a guide for the on-coming person. Used properly, the checklist will take the on-coming person through the turnover process step-by-step. The turnover process will thus become a standard routine, thereby minimizing the possibility of missing important information during the turnover.

Documents specified by management should be reviewed by on-coming personnel before accepting their assigned responsibility. Reviewing these documents will augment the information obtained during the remainder of the turnover. The review will refresh and supplement the on-coming person's knowledge of past operations, as well as present and scheduled operational commitments. It can also provide information about work station status. This is especially important when a person has been absent for several days.

A pre-shift walkdown allows the on-coming person to inspect the work station before accepting responsibility. It provides the on-coming person an opportunity to check the status of the area and associated equipment. The walkdown is most beneficial when the off-going person accompanies the on-coming person. This enables the on-coming person to ask questions regarding work station status and also obtain immediate feedback.

A discussion of all information concerning the work station must be accomplished and the oncoming and off-going personnel must be confident that an appropriate information exchange has taken place prior to transferring responsibility. If properly focused, this discussion is the most effective method of communicating work station information to the on-coming person.

After the discussion, a formal transfer of the duties and responsibilities of the work station should conclude the turnover. This will officially end the duties and responsibilities of the offgoing person and start those of the on-coming person.

Personnel briefings reinforce information communicated during the turnover. During the briefing, the appropriate supervisor has the chance to provide personnel with a picture of overall facility operations, both current and planned, including support group activities. A briefing of all personnel is the best way to quickly disseminate information important to everyone, and also address questions personnel have concerning the facility.

In addition to turnovers to persons working a rotating schedule, turnovers to a staffed/unstaffed condition should also be considered. These single-shift positions should be considered because illness, vacation, or other instances may require that a work station be filled by an alternate person. The alternate must have sufficient knowledge of work station status to maintain operational continuity during the other person's absence. In this case, the transfer of information may only require written communication, but should still be communicated.

***DOE-STD-1037-93, DOE Standard: Guide to Good Practices for Operations Aspects of Unique Processes***

A unique process is a separate process that is not directly controlled by operations personnel, but can affect, or be affected by, an operator's activities. It could be directly related to the safety or reliability of the facility, compliance with environmental and health requirements, fulfillment of the facility mission, or unrelated to any of these. A unique process may be the result of a specialized procedure and performed only once, or it may be an established routine. The operations aspects of unique processes can be described as the effects unique processes or activities may have on interrelated systems, and the actions that must be taken to avoid an adverse impact on operations.

Interactions between operations and unique processes can affect the safety and reliability of DOE facilities. In some cases, interactions with unique processes are anticipated in procedures and other operating documents. However, in many cases, an otherwise appropriate and permissible response to parameters in one system can produce an adverse effect in another system. To correctly interpret indications in a system, and to determine the best response, the operator must have an integrated knowledge of unique process interactions within the facility.

Effective operation also requires communication of relevant information between operators and process support personnel. In some cases, the operator must communicate intended actions to the process support personnel to prevent problems in the unique process. In other cases, the unique process is capable of affecting operations, therefore requiring two-way communication between process support personnel and operators.

Facilities should ensure that personnel at all levels have sufficient knowledge of interfacing or unique processes to ensure safety and efficiency in the working environment. Training, job experience, and direct communication with process support personnel are all methods to provide this integrated knowledge to operators. Facilities should encourage personnel to be technically inquisitive, to detect, understand, and anticipate problems while monitoring process parameters, and to communicate effectively with process support personnel so appropriate and timely corrective action can be initiated.

***DOE-STD-1033-92, DOE Standard: Guide to Good Practices for Operations and Administration Updates Through Required Reading***

A properly administered program for updating personnel with operations and administration information through required reading is essential to the safety of personnel, equipment, and the environment. Required reading provides a method for employees to be made aware of information related to their job assignments. It includes information such as lessons learned from industry operating experience, facility equipment and system changes, procedure changes, company policies, and human resource information. A required reading program can also supplement employee training by providing information that is not routinely included in a formal training program or

information that may be trained on at a later date. The decision on how the required reading program will be used in conjunction with the facility training program must be carefully considered for each reading assignment. The system used to enact the required reading program provides tracking of the information supplied to employees and the completion status of the reading assignments. Personnel should be informed of the importance of questioning any information received through required reading when it is not understood. Essential to an effective required reading program is the administrative procedure governing the program. This procedure provides the necessary guidance to the manager or supervisor responsible for administering this program.

**DOE-STD-1034-93, *DOE Standard: Guide to Good Practices for Timely Orders to Operators***

Management often finds it necessary to provide written guidance and direction to employees, such as outlining activities during periods of maintenance or providing notice of an immediate document review located in the required reading file. This guidance needs to be provided in a formal and timely manner. Operator orders are designed to provide a means for management to communicate guidance and short-term information to personnel. They may be used whenever it is necessary to disseminate information to personnel concerning special operations, administrative details, or environmental, safety, and health issues, but should never be used to replace or change facility procedures.

Establishing an administrative policy or procedure that specifically addresses the requirements for content, format, issuing, segregating, reviewing, and removal of timely orders will ensure the process is standardized throughout the facility. Such a policy should provide managers and supervisors an effective means to communicate appropriate guidance and information in a timely manner.

**DOE-STD-1029-92, *DOE Standard: Writer's Guide for Technical Procedures***

A primary objective of operations conducted in the DOE complex is safety. Procedures are a critical element of maintaining a safety envelope to ensure safe facility operation.

DOE-STD-1029-92 addresses the content, format, and style of technical procedures that prescribe production, operation of equipment and facilities, and maintenance activities.

Successful procedures assist users by presenting actions clearly, concisely, and in the proper sequence. DOE-STD-1029-92 provides a method for writers to ensure the following key questions are addressed and that procedures contribute to maintaining safe operations:

- What technical and administrative requirements are to be met?
- Who is the user and what is the user's level of experience and training?
- How does this document relate to other procedures for this equipment and facility?
- What materials, equipment, and facilities are to be used?
- What tasks are to be accomplished?

- Why, when, where, and how are the tasks to be accomplished?

**DOE-STD-1043-93, DOE Standard: Guide to Good Practices for Operator Aid Postings**

Operator aid postings provide information for personnel to use during the performance of tasks. This information may be in the form of a system drawing, copy of a procedure, information tag or sheet, curve, chart, or graph. Posted copies of procedures or portions of procedures that are used as operator aids may be useful when the performance of a task makes it impractical to refer to a procedure in a manual.

Operator aids may help the operator identify problems that might be encountered during performance of a task, or they may present a simple diagram of equipment, systems, or areas.

Operator aids must reflect the most current information and they must not conflict with any procedures or requirements. Using operator aids containing outdated or incorrect information may cause harm to personnel or damage to the equipment, system, area, or facility. Also, if operator aids are developed for other than normal operations, it is a good practice to clearly identify the circumstances under which they apply.

Developing useful operator aids may require intensive research and forethought. The information presented in the operator aid must be factual, and organized in a manner usable for all intended users. A thoroughly developed operator aid will ensure that the approver and reviewers better understand its need and usefulness. During the development process, reviews by applicable technical personnel may be helpful to ensure clarity.

An initial review and approval process verifies that the information contained in an operator aid is accurate and useful. This process officially authorizes its use. Periodic reviews will help ensure that the information is kept up-to-date and will verify the continued usefulness of the operator aid. It is important to remove obsolete, conflicting, or non-useful operator aids as quickly as possible to eliminate personnel confusion when performing tasks.

Documentation of operator aids is essential to their control. Maintaining a centrally located file of all operator aids will enhance the periodic review process. This file will help personnel quickly review and take action to correct, update, or remove obsolete operator aids as necessary. Listing reference documents used in the development process facilitates finding and updating operator aids when reference information changes.

Placing an operator aid in a conspicuous place that will allow the user to access controls or instrumentation is essential to posting. If the operator aid blocks instruments or controls, it will be more of a hinderance than a help. Affixing operator aids to the desired location using an attachment device suitable to the posting surface and the environment will ensure that the operator aid remains posted. An operator aid will be of little use if it comes loose and falls from its desired location.

The operator is one of the most important elements in ensuring the success of the operator aid program. Using only approved and current operator aids will help ensure the operator aid promotes safe and efficient operation. Operators must identify and report unapproved or incorrect operator aids at their work stations. This will ensure that the operator aids remain a useful tool in conducting business safely at their facility.

**DOE-STD-1044-93, DOE Standard: Guide to Good Practices for Equipment and Piping Labeling**

An effective labeling program will clearly identify each component required in the operation of the facility, warn of specific hazards, and clearly identify emergency equipment. Effective labeling will enhance training effectiveness and help reduce operator and maintenance errors resulting from incorrect identification of facility equipment. Effective labeling will help reduce personnel exposure to radiation or hazardous materials by reducing the time spent identifying components. Piping labels that identify the contents, or at least the type of hazard represented by the contents, and the normal direction of flow will aid in preventing or mitigating leaks and spills. Labels on electrical equipment identifying the applicable feeder panel or breaker will aid in isolation for lockout/tagout, and will aid in quick and accurate response to equipment emergencies.

Labels should be designed to present information in a manner that will enhance operations and maintenance. The equipment names and number designations used on labels should be consistent with those used in procedures and drawings. Label size, placement, arrangement, fabrication materials, color coding, lettering size and type style can all affect the usability of labels.

To remain effective, the labeling program must be an ongoing process. Maintenance activities involving removal or replacement of equipment may also result in loss or misplacement of component labels. Spills, passage of time, or other environmental factors may cause labels to become damaged or unreadable. Equipment modifications may result in new label requirements. Facility procedures should provide instructions for temporarily labeling components, and a central point of contact to ensure timely response to ongoing labeling requirements.

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



**EXAMPLE 3 SELF-CHECK**

1. What are three monitoring activities that can be used to ensure that management obtains a clear picture of facility operations?  
Monitoring activities such as audits, reviews, tours, and self-assessments are part of the checks and balances needed in an effective operating program to ensure that management obtains a clear picture of facility operations.
2. What are two key principles to professional conduct and sound operating practices as described in DOE-STD-1041-93?  
Two key principles to professional conduct and sound operating practices are formality and ownership.
3. What is the primary purpose of on-shift training?  
The primary purpose of on-shift training is to allow personnel to acquire first-hand experience by performing or observing operations, special processes, tests, inspections, and other work activities.



**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 orders 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 O 422.1, *Conduct of Operations*?
2. What is the purpose of a conduct of operations matrix?
3. What DOE position is responsible to review and approve the documentation prepared by the contractor demonstrating conformance to the specific requirements?
4. What are three elements that must be addressed in on-shift training?



9. What is meant by the term “unique process” as it applies to conduct of operations?

10. What is meant by the term “ownership” as it applies to conduct of operations?

**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 module.**

**DOE O 422.1  
CONDUCT OF OPERATIONS  
GENERAL LEVEL**

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**OBJECTIVES**

Given the familiar level of this module, and a scenario, 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 O 422.1 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 O 422.1, Familiar Level, May 2011.

DOE O 422.1, *Conduct of Operations*, 6/29/10.

DOE-STD-1029-92 CH1, *DOE Standard: Writer's Guide for Technical Procedures*. December 1998.

DOE-STD-1030-96, *DOE Standard: Guide to Good Practices for Lockouts and Tagouts*. May 1996.

DOE-STD-1031-92 CH1, *DOE Standard: Guide to Good Practices for Communications*. December 1998.

DOE-STD-1032-92 CH1, *DOE Standard: Guide to Good Practices for Operations Organization and Administration*. December 1998.

DOE-STD-1033-92 CH1, *DOE Standard: Guide to Good Practices for Operations and Administration Updates through Required Reading*. December 1998.

DOE-STD-1034-93 CH1, *DOE Standard: Guide to Good Practices for Timely Orders to Operators*. December 1998.

- DOE-STD-1035-93 CH1, *DOE Standard: Guide to Good Practices for Logkeeping*. December 1998.
- DOE-STD-1036-93 CH1, *DOE Standard: Guide to Good Practices for Independent Verification*. December 1998.
- DOE-STD-1037-93 CH1, *DOE Standard: Guide to Good Practices for Operations Aspects of Unique Processes*. December 1998.
- DOE-STD-1038-93, *DOE Standard: Guide to Good Practices for Operations Turnover*. December 1998.
- DOE-STD-1039-93 CH1, *DOE Standard: Guide to Good Practices for Control of Equipment and System Status*. December 1998.
- DOE-STD-1040-93 CH1, *DOE Standard: Guide to Good Practices for Control of On-Shift Training*. December 1998.
- DOE-STD-1041-93 CH1, *DOE Standard: Guide to Good Practices for Shift Routines and Operating Practices*. December 1998.
- DOE-STD-1042-93 CH1, *DOE Standard: Guide to Good Practices for Control Area Activities*. December 1998.
- DOE-STD-1043-93 CH1, *DOE Standard: Guide to Good Practices for Operator Aid Postings*. December 1998.
- DOE-STD-1044-93 CH1, *DOE Standard: Guide to Good Practices for Equipment and Piping Labeling*. December 1998.
- DOE-STD-1045-93 CH1, *DOE Standard: Guide to Good Practices for Notifications and Investigation of Abnormal Events*. December 1998.

## INTRODUCTION

The familiar level of this module introduced the purpose of DOE O 422.1 and the DOE standards that support that Order. Several requirements and guidelines associated with the Order were discussed. In the general level of this module, students are asked to apply the information contained in the familiar level, the Order, and DOE standards to a scenario related to the Order. Please refer to the resources listed on the previous page 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

On March 16, 2011, electricians partially cut into an energized 120-volt cable. Demolition of cables was being performed under an approved work order. The cable was not identified at the load center as part of the system to be de-energized and consequently it was not de-energized. Also, after the cable was cut, its breaker was discovered in the tripped position. The breaker was switched to the off position and work activities continued. This action violated the facility's requirement to properly lock and tagout energized circuits before starting work. There were no personnel injured and no property damage associated with the incident.

An investigation of the situation revealed the following.

- A spark was observed when the cable was cut, which stopped the demolition work on the project. The project supervisor was notified who inspected the load center and switched the breaker for the 120-volt cable from the tripped position to the off position.
- The employees did not maintain the knowledge and skills necessary to successfully perform assigned tasks. The training department confirmed that the employee who should have performed the lockout/tagout requirements was formally trained on 8/28/08 with no refresher training to date. This certification was performed to the facility's lockout/tagout procedure. The procedure has since been revised and the designated person's training remains current. The subordinates had not received formal training, but had participated in toolbox presentations on the established requirements.
- The safety task assignment that was noted during the investigation only addressed work assignments.
- The facility did not provide the necessary tools to ensure the success of the job objectives. These tools include defining, disseminating and enforcing lockout/tagout policies.
- The administrative controls that are established in procedures were either not provided or not adequately emphasized.
- The supervisor and electricians collectively did not understand the work scope.
- A discussion was performed before starting work to address job safety conditions. Based on statements in the investigation and the deficiencies, it is perceived that the discussion on lockout/tagout was limited.
- The actions of investigating the electrical panel and switching the breaker to the off position to continue demolition on the project were not correct. However, they were immediate and did eliminate a potential shock incident. For this reason, the possible effects on the site were minimized.

Actions taken by contractor.

- The facility manager suspended all electrical work activities at the site that require energized systems to be isolated, locked and tagged out of service.
- The facility manager disciplined the supervisor in charge of this work order.

Requirements that apply to this scenario

- Locks and tags should be placed on controls when controls must be established for safety or other special administrative reasons.
- A list of components that should be locked must be established and approved by the operations supervisor. Criteria for locking additional components and necessary authorization should be provided. Specific techniques for verifying the position of locked components should be established.
- Specific procedural steps for isolating, blocking, and securing machines or equipment for hazardous energy should be included in the facility's procedures for lockout/tagout. [
- A lockout/tagout must isolate all sources of energy or hazardous material that may cause personnel injury or equipment damage. Only controlled drawings, controlled system schematics, or other controlled documents should be used as references to determine or verify isolation points. In the absence of controlled drawings, a qualified person should perform a physical walkdown to ensure that isolation will be achieved by the planned lockout/tagout.

Take some time to review the example scenario and the actions the contractor took or did not take to correct the situation. Then decide if the contractor's actions were complete and correct. Finally, determine if the requirements cited were complete and correct.

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



DOE O 422.1  
Conduct of Operations  
General Level  
June 2011

### **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 Order that apply. To be considered correct, your answer must include at least the following.

The actions taken by the contractor were appropriate.

Additional actions not mentioned in the scenario include the following.

- All personnel should be trained on lockout/tagout procedures to ensure consistency in the understanding of job requirements.
- Procedures should be changed to ensure that meetings conducted before starting work include all work-related objectives and direction including hazards and lockout procedures.

The requirements cited were appropriate. Additional requirements that apply include the following.

- All personnel authorized to isolate equipment or install locks and tags should know, through training and qualification, the type and magnitude of hazards involved in work on the equipment or system. They should understand what methods will be used to control those hazards, and they should know how to verify that the protection is adequate. (DOE-STD-1030-96, page 20)

## **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 Order and DOE standards 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.

Please review the following scenario and then 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**

On June 3, 2010, a construction worker lost breathing air to his plastic suit, creating a potential for contamination and suffocation. The worker exited the area and received assistance removing the suit. A maintenance mechanic closed the valve supplying breathing air to a manifold supplying the suit to change a filter.

An investigation of the situation revealed the following.

- When work that requires breathing air is being performed, a health protection inspector and a standby operator are required by a training and reference procedure to be present at all times. The standby operator is required to notify the facility control room before starting work requiring use of breathing air, but did not do so because the operator thought a supervisor had notified the control room.
- The mechanic contacted the control room before closing the isolation valve to the air manifold. The control room log sheet did not reflect that anyone requiring breathing air was in the area, so permission to close the valve was granted.
- Before closing the valve, the mechanic walked down the breathing air system to the point of the manifold. A temporary hose ran from the manifold through the floor to another level. The mechanic did not walk down the temporary line.
- The construction employee immediately notified the health protection inspector when he lost breathing air pressure and was instructed to report to the airlock to be cutout of the plastic suit by the standby operator. The air in the suit was sufficient for about five minutes of breathing air.
- Subsequently, contrary to procedure, the standby operator left the area to investigate why the breathing air had been lost instead of immediately helping the construction employee remove the suit. When the standby realized that the filter was being changed, she returned to the hut and removed the employee from the hut
- Operations and control room personnel were unaware of the temporary hose connection used to supply breathing air to the lower level. This occurred because the facility was under construction and was not required to report to operations personnel or the control room.

Actions taken by the contractor

- Standby operators will be required to review the procedure for standby operator responsibilities before performing their duties.
- Standby operator's procedures will require operators to notify the control room of the number of people working on breathing air, the length of time, and the manifold to which breathing air is connected.

Requirements that apply to this scenario:

- Technical procedures should include a process for training personnel on new, revised, or changed procedures; (DOE O 422.1, attachment 2, page 9).
- Control of equipment and system status should include initial system alignment, and maintaining control of equipment and system status through startup, operation, and shutdown, and documentation of status; (DOE O 422.1, attachment 2, page 6)  
Take some time to review the scenario and the actions the contractor took or did not take 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 422.1 cited in the scenario were correct.

Write your answers 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.**