

## Lesson: Equipment Control

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### Conduct of Operations Course

#### **Lesson:**

#### **Equipment Control**

**Time Required:** 90 minutes

**Reference:**

- (a) DOE 5480.19, Conduct of Operations Requirements for DOE Facilities, Chapters 8,9,10,18
- (b) DOE-STD-1039-93, Guide to Good Practice for Control of Equipment and System Status
- (c) DOE-STD-1030-92, Guide to Good Practice for Lockouts and Tagouts
- (d) DOE-STD-1036-93, Guide to Good Practice for Investigation Verification
- (e) DOE-STD-1044-93, Guide to Good Practice for Equipment ant Piping Labeling

**Objectives:** Upon completion of this lesson:

#### **(VG-7-1)**

1. Understand the requirements of DOE 5480.19 regarding equipment control at DOE facilities and associated impact on safety and efficiency of operations. (1.b)
2. Refer to a copy of DOE 5480.19 and locate applicable guidelines and requirements for specific activities. (1.a)
3. Describe the key elements of a lockout and tagout system. (1.o)

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### Instructional Aids/Materials:

1. Overhead projector, projection screen and viewgraphs
2. Instructor Guide and Student Workbooks
3. DOE-EM-STD-550596, Operations Assessments

**Presentation Method:** Lecture, Class Discussion

### Instructor Notes:

1. Instructors should read the contents of this instructor guide and the student workbook, and review applicable portions of the listed references (as needed) when preparing for the lecture. Instructors are free to personalize, however, the key points made in the instructor guide must be covered.
2. The student guide is designed to promote note taking. There are many items in the student guides which do not have the corresponding information filled in, particularly, areas where guidelines are reviewed. The instructor should cover the corresponding information during the lecture and encourage students to take sufficient notes.
3. The italicized words are for instructors only and do not appear in the student workbook.
4. **VG** indicates that there is a viewgraph associated with the information and it should be displayed on the overhead projector.

**I: Guidelines**

A. Components: DOE 5480.19 Chapters 8, 9, 10, 18

- 1. Control of Equipment and System Status:** Establishes formal guidance to ensure that the configuration of all equipment is maintained and operators know the status at all times. This ensures that personnel, equipment, and environmental safety is maintained through proper component, system, and equipment configuration management.

**(VG-7-2)**

- Status Change Authorization and Reporting:  
*Operations Supervisors are responsible for maintaining a broad overview of operations and proper configuration, authorizing status changes to major equipment and systems, and communicating status changes to operators.*
- Equipment and System Alignment:  
*Equipment and systems are aligned or checked for proper alignment prior to operations. Alignments are performed using checklists, and records of alignments and any related deviations are maintained.*
- Equipment Locking and Tagging:  
*Locks and tags are used on components requiring special administrative control for safety or other reasons. Locks and tags provide some security that a component will be operated only by authorized facility personnel during required evolutions in a controlled fashion.*

### **(VG-7-3)**

- **Operational Limits Compliance:**  
*Operating Personnel are apprised of limiting conditions for operations and actions for which they may be responsible. Operations Supervisors ensure that actions taken to comply with operational limits are appropriate and correct or that they mitigate adverse consequences to the facility.*
- **Equipment Deficiency Identification and Documentation:**  
*Equipment deficiencies are noted by facility operating personnel and identified in the work control system for correction. Methods that identify deficient equipment to operating personnel (such as deficiency tags, logs, status sheets, or caution tags) should be established.*
- **Work Authorization and Documentation:**  
*The operations supervisor or his/her designee should authorize all shift activities (including maintenance) on equipment that is important to safety, affects operations, or changes control indications or alarms. This authorization should be in writing on the document controlling the work, and should be available in the control area for review by operating personnel.*
- **Equipment Post-Maintenance Testing and Return to Service:**  
*Equipment is tested following maintenance to demonstrate that it is capable of performing its intended function. Testing should include performance of all functions that may have been affected by the maintenance.*

## **(VG-7-4)**

- Alarm Status:  
*The status of control panel and/or local panel alarms are readily available to appropriate operating personnel, including: alarms that are totally disabled, alarms with individual inputs disabled, alarms with temporarily changed setpoints, alarms that are normally lighted during power operation, and multiple input alarms that do not reflash when more than one input is activated.*
- Temporary Modification Control:  
*Administrative control systems are established for installation of temporary modifications such as electrical jumpers, lifted leads, pulled circuit boards, disabled annunciators/alarms, mechanical jumpers/bypasses, etc.*
- Distribution and Control of Equipment and System Documents:  
*A system is established to ensure that operations personnel receive and utilize the latest revisions of engineering drawings and specifications.*

- 2. Lockout and Tagout (LO/TO):** Establishes a method of equipment control through locking and tagging to protect personnel from injury, protect equipment from damage, maintain operability, and maintain physical boundaries.

**(VG-7-5)**

- Lockout/Tagout Use:  
*Locks and Tags should be placed on controls for when controls must be established for safety or other special administrative reasons. Lockout is the application of a lock (built-in or external) on a control to render the control inoperative. Tagout is the application of a danger or warning device on the control, which indicates that the control is not to be used except under conditions indicated by the tag.*
- Lockout and Tagout Implementation:  
*Administrative controls include: Approved lists of components requiring lockout; criteria for locking additional components; restricted access to keys for locks; techniques for locked component position verification; lockout deviation authorization and documentation; and periodic checks of locked components.*
- Protective Materials and Hardware:  
*Locks, tags, chains, wedges, key blocks, adapter pins, self-locking fasteners, etc., are provided for isolating equipment from energy sources. LO/TO devices are the only devices used for controlling energy and are not used for other purposes, and are durable, standardized, substantial, identifiable, and provide warnings.*
- Lockout/Tagout Program:  
*A program is established which consists of procedures to control potentially hazardous energy and materials and personnel training.*

## **(VG-7-6)**

- Procedures for Lockout/Tagout:  
*Procedures clearly and specifically state the scope, purpose, authorization, rules, and techniques of the LO/TO program.*
- Application of Lockout/Tagout:  
*LO/TO procedures cover the following sequence of actions:  
Prepare for shutdown; equipment shutdown; equipment isolation; affix LO/TO; relieve stored energy; verify isolation and de-energization; secure LO/TO.*
- Testing or Positioning of Equipment or Components:  
*Temporary removal of LO/TO devices is discouraged, but if the situation arises it can be accomplished as follows:  
clear equipment of tools and materials; clear personnel from equipment area; remove the LO/TO device per procedure; energize the equipment and perform test or positioning; and de-energize all systems and reapply LO/TO.*
- Periodic Inspections:  
*Periodic inspections should be conducted by authorized personnel to determine whether or not procedures are being followed, and to correct any observed deficiencies.*
- Caution Tags:  
*The administration of caution tags can be accomplished through the LO/TO program or separately. The use of caution tags should be restricted to those situations in which a component or system is functional, but a precaution or item of information is needed prior to operation.*

## **(VG-7-7)**

- Training and Communication:  
*Training is provided and documented to ensure that all personnel understand the purpose, function, and limitations of the LO/TO program, and understand hazards and techniques, such that they can safely apply, use, and remove lockouts and tagouts.*
- Lockout or Tagout Implementation:  
*Accomplished by authorized, qualified personnel.*
- Notification of Personnel:  
*Supervisors notify affected personnel of the application of LO/TO, before devices are applied, and removal of LO/TO, after devices are removed.*
- Outside Contractors:  
*Facilities and outside contractors inform each other of their respective LO/TO procedures and ensure that their personnel are aware of any changes.*
- Group Lockouts or Tagouts:  
*Groups performing maintenance use a procedure that will provide for equivalent safety provided by the personal LO/TO device.*
- Shift or Personnel Changes:  
*Specific procedures are used during shift or personnel changes to ensure continuity of LO/TO protection, including orderly transfer of LO/TO devices between personnel or shifts.*



- 3. Independent Verification:** Establishes a method to ensure that facility components are positioned correctly, so that every facility system operates as required. *Independent verification is the act of checking that a given operation conforms to established operational criteria, as well as checking a component position independently of activities related to establishing the component's position.*

### **(VG-7-8)**

- **Components Requiring Independent Verification:**  
*Components critical to ensuring safe and reliable operation are identified in facility procedures or other official documents, and receive an independent verification of their position when warranted. These components include:*  
  
*System and Components with safety related functions - except when mispositioning would not affect system performance, the mispositioning would be known immediately to the operator, or significant radiation exposure would be received by the person(s) performing the independent verification.*  
  
*Non-safety related components - which if mispositioned, could cause unplanned shutdowns, challenges to safety systems, or radioactive/toxic material release.*
- **Occasions Requiring Independent Verification:**  
*Components receive independent verification when associated equipment must be available and the chance that the component was mispositioned exists. Situations include: return of equipment to service after maintenance or test; removal of equipment from service; system lineups; and periodic checks during operation.*

**(VG-7-9)**

- Verification Techniques:

Facility instructions, ensure trained operators use approved methods for verifying component positions. The following guidelines apply to verification techniques:

Independence - *interaction between personnel operating components and those performing independent verification is minimized.*

Remote Position Indicators - *since remote indications can fail, local verification is performed unless precluded by ALARA or other factors.*

Process Parameters - *process parameters can be misleading indications of component position; and should not normally be used as the only means of verification.*

Throttled Valves - *position indicators, scribe marks, etc., are used to verify throttled valve position.*

Surveillance Testing - *surveillance tests frequently will not serve to verify the position of all components that are important to subsequent system operation, however, they may be used in some cases.*

Operations Self-Appraisal and Verification - *programmatic operations appraisals are independently conducted/verified to ensure that environment, safety, and health considerations, and operations functions (such as training) are being conducted in accordance with established operational criteria.*

- 4. Equipment and Pipe Labeling:** ensures positive identification of facility components.

**(VG-7-10)**

- Components Requiring Labeling:  
*Valves; major equipment; switches; circuit breakers; instruments and gages; emergency equipment; etc.*
- Label Information:  
*Information is consistent with that found in facility procedures, valve lineup sheets, and diagrams, and incorporates standard nomenclature which is understood by personnel.*
- Label Placement:  
*Labels are placed on or as near as practicable to the equipment, and are oriented so that they are easy to read and enable correct identification of components.*
- Replacing Labels:  
*Procedures are established to ensure that misplaced or damaged labels are replaced and that labeling deficiencies are promptly identified and corrected.*

**NOTE: Have the students turn to page VII-8 (Module CONOPS review) in the Student Workbook, and refer them to the copy of DOE 5480.19 and its table of contents. Remind them of the specific chapters under review. Allow 15 minutes to complete the following questions. The questions are clustered together by chapters but do not follow the guidelines in sequence. Remind them to ask for help if they have ANY questions because —**

**THIS IS A REVIEW EXERCISE AND NOT AN ATTEMPT TO DETERMINE THEIR LEVEL OF KNOWLEDGE IN CONDUCT OF OPERATIONS GUIDELINES.**

**At the end of this period, review the answers to the questions with the class. You may do this in any way you choose as long as you ensure that the correct answer in the Instructor Guide is discussed and that the review is completed in the time allotted. (Attempt to obtain as much student participation as possible.)**

**WHEN REVIEWING THE ANSWERS TO THESE QUESTIONS, HAVE THE STUDENTS TURN TO THE APPROPRIATE PAGE IN THE ORDER.**

## **II: CONOPS Review**

1. An equipment temperature alarm is disabled. Describe the required actions to ensure proper monitoring and plant safety.

**(pg. I-50, Ch. 8, guideline 8)**

- **Take appropriate action to monitor equipment parameters for abnormal conditions.**
- **Log the deficiency into operations logs and equipment deficiency log or equivalent.**
- **Place a tag or sticker on the disabled alarm informing operators of the status.**
- **Take action to have the alarm repaired.**

2. What is the purpose of a system alignment?

*(pg. I-48, Ch. 8, guideline 2)*

***Systems alignments are used to ensure that individual components are aligned or checked prior to placing a system or equipment into operation,. By conducting a proper alignment, one ensures that systems or equipment are ready to be placed into proper and safe operation.***

3. Describe the administrative controls required if a temporary system is to be installed.

*(pg. I-51, Ch. 8, guideline 9)*

***The administrative control system should provide for communicating the installation of temporary modifications to the design authority to allow for technical oversight and an evaluation of the impact on current design activities, and approval of the design modification. The control systems should make provisions for safety reviews, installation, approval, independent verification of correct installation and removal, documentation of the modification, update of operating procedures and documents, training, marking of installed modifications, and periodic audits of outstanding modifications.***

4. Briefly describe the terms "lockout" and "tagout".

*(pg. I-53, Ch. 9, guideline 1)*

***Lockout is the application of a lock on a control a to render the control inoperative. Tagout is the application of a danger or warning device on the control, which indicates that the control is not to be used except under conditions indicated by the tag.***

5. What guidance is provided for "Group Lockouts or Tagouts"?

**(pg. I-63, Ch. 9, guideline 14)**

***When servicing or maintenance is being done by multiple groups on the same system, they should use a procedure that provides for equivalent safety as the "personal" LO/TO device.***

6. What types of administrative measures should be established that would define controls over "locked components"?

**(pg. I-54, guideline 2, part d, (1) thru (6))**

- . A list of components required to locked (separate from the standard alignment checklists)***
- . Criteria for locking of additional components and necessary authorizations***
- . Restricted access to keys for key operated locks (authorized personnel only)***
- . Techniques for verify the position of locked components (hands-on physical check for critical equipment or observation of reliable position indicator)***
- . Authorize and document deviations to locked components (unlocked or placed in position other than normal)***
- . Periodic checks of locked components to ensure proper attachment of locking devices and proper component positioning.***

7. What actions are necessary, if any, if the person who applied a LO/TO device is not available to remove it?

**(pg. I-59, Ch. 9, guideline 6, part g(3))**

***Each LO/TO device should be removed by the person who applied the device. When that person is unavailable, the device may be removed under the direction of the appropriate supervisor/manager, provided that specific procedures and training for such removal have been developed and incorporated into the facility LO/TO program.***

8. Can any available lock or tag be used to lockout an energy isolation device? Explain.

**(pg. I-55, Ch. 9, guideline 3, parts a and b)**

***No. Locks and tags should be provided for isolating, securing, or blocking machines or equipment from energy sources. Lockout and tagout devices should be durable, standardized, substantial, identifiable, and warn against hazardous conditions.***

9. Who is responsible for reviewing the record of all active caution tags? What does this review consist of?

**(pg. I-61, Ch. 9, guideline 9, part c)**

***The recorded and associated tags should be reviewed by qualified personnel. The review should verify the continued need and applicability for each caution tag and ensure that all active tags match the index. The review should be documented. The operations supervisor/manager should determine what action is needed to resolve the continued use of caution tags being used for extended periods (e.g., three months).***

10. Is it allowable to temporarily remove a LO/TO device?

*(pg. I-60, Ch. 9, guideline 7)*

***Temporary removal of LO/TO devices should be discouraged. If it's necessary to temporarily remove them, then the following sequence should be followed:***

- . clear the equipment of tools and materials.***
- . clear personnel from the area.***
- . remove LO/TO device per the procedure.***
- . energize and proceed with testing, positioning, etc.***
- . de-energize all systems and reapply the LO/TO device.***

11. Is training required for a LO/TO program? What should it include?

*(pg. I-61 & 62, Ch. 9, guideline 10)*

***Training should be provided and documented to ensure that the purpose and function of the LO/TO program is understood by all personnel and that they have the knowledge and skills required for safe application, use, and removal of lockouts and tagouts. Training should include:***

- . Recognition of applicable hazardous energy sources, type and magnitude of energy or materials involved, and methods to isolate and control.***
- . Instruction in the purpose and use of LO/TO procedures.***
- . Recognition of a LO/TO and procedure and prohibition related to attempts to restart or re-energize machines or equipment.***



12. Are there any requirements concerning the orderly transfer of Lockout or Tagout devices between personnel or shifts?

*(pg. I-63, Ch. 9, guideline 15)*

***Yes. All facilities should establish specific procedures for the orderly transfer of responsibility and protection under LO/TO to ensure personnel safety and work boundary isolation during shift or personnel changes.***

13. What is independent verification and why is it important?

*(pg. I-65, Ch. 10, B (Discussion))*

***Independent verification is the act of checking that a given operation conforms to established operational criteria, as well as checking a component position independently of activities related to establishing the components position (i.e., it's much more than a "time and distance" second check.) It is important because this concept recognizes the human element of any operation. Any operator, no matter how proficient, can make a mistake.***

14. Describe three situations where independent verification would be appropriate.

***(pg. I-67, Ch. 10, guideline 2)***

- (1) returning equipment to service following maintenance/testing***
- (2) removing equipment from service***
- (3) system lineups***
- (4) periodic checks during facility operations***

15. What are some of the methods to ensure that misplaced or damaged labels are replaced?

***(pg. I-99, Ch. 18, guideline 4, part a)***

- Include a check as part of post-maintenance testing procedures;
- Include a check as part of valve lineups; and
- Have operators check for missing or damage labels during their tours and routine activities.

**NOTES**