

## Lesson Plans for Module AOCFG-17

# ABNORMAL OPERATING CONDITIONS – FIELD AND GAS

**Module AOCFG-17** describes how field personnel recognize and properly react to abnormal operating conditions (AOCs) that may occur during pipeline operations. Trainees will learn about the federal regulations and agencies governing the operation of gas and liquid pipelines.

### Objectives

#### Learning Objective 1

- Explain how to recognize abnormal operating conditions for both gas and liquid pipelines.
  - a. Explain how to recognize abnormal pipeline facility conditions.
  - b. Explain how to recognize the activation of a safety device.
  - c. Explain how to recognize a communications failure and a control system failure.
  - d. Explain how to recognize power interruptions.
  - e. Explain how to recognize a fire, explosion, and natural disaster occurring in the vicinity of the pipeline.
  - f. Explain how to recognize the unexpected release of hazardous liquid or gas.
  - g. Explain how to recognize unexplained pressure/flow rate changes.

#### Learning Objective 2

- Describe the proper reaction to abnormal operating conditions for both gas and liquid pipelines.
  - a. Describe the proper reaction to abnormal pipeline facility conditions.
  - b. Describe the proper reaction to the activation of a safety device.
  - c. Describe the proper reaction to a communications failure and a control system failure.
  - d. Describe the proper reaction to power interruptions.
  - e. Describe the proper reaction to a fire, explosion, and natural disaster occurring in the vicinity of the pipeline.
  - f. Describe the proper reaction to the unexpected release of hazardous liquid or gas.
  - g. Describe the proper reaction to unexplained pressure/flow rate changes.

#### Performance Tasks

- This is a knowledge-based module; there are no performance tasks.

### Teaching Time: 5 hours

(Two 2.5-Hour Classroom Sessions)

Session time may be adjusted to accommodate your class size, schedule, and teaching style.

### Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the PowerPoint presentations from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the Module Examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER's Registry is 70 percent or above for the Module Examination.



## **Safety Considerations**

This module does not include Performance Tasks, and as such, no PPE is required for completion of this module. However, trainees should consistently be reminded of all dangers presented by abnormal operating conditions in pipeline work. It should also be stressed that personnel safety is a priority.

## **Classroom Equipment and Materials**

Whiteboard/chalkboard

Markers/chalk

Pencils and paper

PowerPoint® Presentation Slides

Computer

Copies of the Module Examination

Vendor-supplied videos/DVDs showing abnormal operating conditions (*optional*)

TV/DVD player

## **Additional Resources**

The following recommended resources can provide additional helpful information related to the requirements for this covered task:

*Code of Federal Regulations 49, Parts 192 and 195*

*OSHA Occupational Safety and Health Standards 1910, Subpart L, Standard 1910.157.*

There are a number of online resources available for trainees who would like more information on abnormal operating conditions. A search for additional information may be assigned as homework to interested trainees.



# Lesson Plans for Module 20\_0-17

## Inspect Main-Line Valves

**Module 20\_0-17** describes the procedures for performing four different types of main-line valve inspections: a walk-around inspection, an external integrity inspection, a valve function test, and a valve leak test. The text describes the specific abnormal operating conditions (AOCs) that may occur during each type of inspection and the proper reaction for each.

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### Objectives

#### Learning Objective 1

1. Identify the types of main-line valves, and describe main-line valve inspection.

- a. Identify the types of valves used to start and stop flow.
- b. Identify the types of valves that regulate flow and pressure.
- c. Identify the types of valves that regulate the direction of flow.
- d. Describe how to inspect main-line valves.

#### Learning Objective 2

2. Describe the requirements and procedures for performing a main-line valve inspection (CT20\_0-17).

- a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting main-line valves.
- b. Describe the procedures used to perform a main-line valve inspection.

### Performance Tasks

#### Performance Task 1 (Learning Objective 2)

1. Inspect main-line valves (CT20\_0-17)

- Identify potential abnormal operating conditions that may occur during performance of this CT, and know the appropriate actions to take in response to them.
- Utilize the appropriate personal protective equipment according to relevant company procedures.
- Notify control center and/or affected personnel before work begins.
- Inspect the valve security and access control.
- Verify location and accessibility of valve to be inspected, and verify the valve number, valve type, manufacturer, and nameplate data.
- Ensure that emergency signs are posted and legible.
- Inspect the condition of the valve and the valve position indicator.
- Perform function test to check operation of the valve as per acceptable procedures, including remote operation, if capable.
- Operate and leak test the valve using the leak-by and leak-through rates.
- Re-establish proper valve status and security controls.
- Notify control center and/or affected personnel after completion of work.
- Complete appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 hours

(Three 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the PowerPoint® presentation), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the Performance Profile Sheets from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the Module Examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER's Registry is 70 percent or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees perform inspections of main-line valves. Safety is paramount in the pipeline industry and safe habits and practices must be emphasized whenever possible. Performance Tasks must be completed under your supervision. Each trainee must use required PPE and follow safe tool practices and procedures.

## Equipment, Materials, and Resources

- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- Pipeline Maintenance Level Two* PowerPoint® Presentation Slides
- Computer
- Vendor-supplied videos/DVDs showing the inspection of main-line valves (*optional*)
- TV/DVD player
- Example of a pipeline valve
- Fire retardant clothing
- Hard hat
- Hearing protection
- Safety glasses
- Safety shoes

# Lesson Plans for Module CT21\_1-17

## Repair Valve Actuator/Operator, Pneumatic

**Module CT21\_1-17** presents the skills and knowledge required for repairing pneumatic valve actuators. These devices are a crucial piece in pipeline operation, providing a means of controlling valves remotely and, in some cases, automatically. Pneumatic technology has been a mainstay of the pipeline industry for many decades and is known for its reliability.

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### Objectives

#### Learning Objective 1

1. Describe pneumatic actuator technology and the techniques involved in maintaining it.
  - a. Describe pneumatic actuators and the key ideas behind their operation.
  - b. Identify the various aspects of pneumatic actuator preventive maintenance.
  - c. Summarize the process of inspecting key pneumatic components.
  - d. List the techniques used to troubleshoot pneumatic actuators.
  - e. Describe the techniques used to work with pneumatic systems and actuators.

#### Learning Objective 2

2. Describe the requirements and procedures for repairing pneumatic actuators (CT 21\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions (AOCs) associated with repairing pneumatic actuators.
  - b. Describe the procedures used to repair pneumatic actuators.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Repair a pneumatic actuator/operator (CT 21\_1-17).
  - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the location and accessibility of the actuator/operator to be inspected, and verify the actuator/operator number, nameplate data, type, and manufacturer.
  - Notify control center and/or affected personnel before work begins.
  - Follow associated task-specific procedures (if applicable) and perform maintenance per manufacturer's or industry recommendations.
  - Use precautionary steps in removing actuator.
  - Disassemble actuator.
  - Inspect, repair, and/or replace worn or damaged parts as necessary.
  - Disassemble soft clutches and inspect, if applicable.
  - Reassemble actuator and reinstall according to manufacturer or company specifications.
  - Notify control center and/or affected personnel after completion of work.
  - Complete appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 Hours

(Three 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	
Dry-erase markers	Hearing protection
Pencils and paper	Natural fiber clothing with no metal fasteners
Poster board	Personal monitors (when required)
Flip chart	Proper footwear
<i>Pipeline Mechanical</i> PowerPoint®	Safety glasses
Presentations	Work gloves
LCD projector and screen	Pneumatic valve actuator
Computer (Internet access optional but recommended)	Actuator replacement parts/seals
Module Review Questions answer key	Appropriate lubricants and associated tools
Performance Profile sheets	Limit switches
Appropriate PPE as directed by the instructor or training facility provider:	Torque switches
Electrical insulated work gloves	Pneumatic test kit/meter
appropriate for voltages encountered	Common hand tools
Hard hat	Valve actuator manual
	Sample maintenance documentation

# Lesson Plans for Module CT21\_2-17

## Disassemble and Reassemble Valves

**Module CT21\_2-17** presents the skills and knowledge required to disassemble and reassemble a pipeline valve. Valves provide the control that any pipeline system requires, but their mechanical nature ensures that they require periodic maintenance. This task ranges from relatively simple for small valves to a significant undertaking for large ones. This module addresses the proper way to rig, hoist, and manipulate valves. Disassembly and reassembly procedures for several different valve types are examined.

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### Objectives

#### Learning Objective 1

1. Describe valve rigging hardware and the proper way to safely use it.
  - a. Describe the various types of valve rigging hardware and their functions.
  - b. Explain how to inspect and use valve rigging hardware correctly.

#### Learning Objective 2

2. Describe the requirements and procedures for disassembling and reassembling a valve (CT 21\_2-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with disassembling and reassembling valves.
  - b. Describe the preliminary procedures performed before disassembling a valve.
  - c. Describe the procedures used to disassemble and reassemble a slab-type gate valve.
  - d. Describe the procedures used to disassemble and reassemble an expanding plug valve from the bottom.
  - e. Describe the procedures used to disassemble and reassemble an expanding plug valve from the top.
  - f. Describe the procedures used to return a valve to service.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Disassemble and reassemble a valve (CT 21\_2-17).
  - Identify potential abnormal operating conditions that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the location of valve to be inspected.
  - Verify the accessibility of the valve.
  - Verify the valve number and nameplate data.
  - Verify the valve type and manufacturer.
  - Follow associated task-specific procedures (if applicable).
  - Follow manufacturer's or industry recommendations.
  - Disassemble valve.
  - Inspect, repair or replace worn or damaged parts as necessary.
  - Reassemble valve per manufacturer's specifications.
  - Apply proper external coatings.
  - Test valve.
  - Complete the appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and resources

Whiteboard	Natural fiber clothing with no metal fasteners
Dry-erase markers	Personal monitors (when required)
Pencils and paper	Proper footwear
Poster board	Safety glasses
Flip chart	Work gloves
<i>Pipeline Mechanical</i> PowerPoint® Presentations	Example hoisting equipment (shackles, hooks, slings, etc.)
LCD projector and screen	Examples of damaged or worn rigging equipment
Computer (Internet access optional but recommended)	Example valves of various types
Module Review Questions answer key	Valve replacement parts/seals/rings
Performance Profile sheets	Appropriate lubricants and associated tools
Appropriate PPE as directed by the instructor or training facility provider:	Specialized valve tools
Electrical insulated work gloves appropriate for voltages encountered	Common hand tools
Hard hat	Valve manuals or internal diagrams
Hearing protection	Sample maintenance documentation

# Lesson Plans for Module CT21\_3-17

## Internal Inspection of Valves and Their Components

**Module CT21\_3-17** presents the skills and knowledge required to inspect a valve internally after it has been disassembled. Valves provide the control that any pipeline system requires, but their mechanical nature ensures that they require periodic maintenance. This task ranges from relatively simple for small valves to a significant undertaking for large ones. This module addresses the proper way to rig, hoist, and manipulate valves. Internal inspection is then covered, giving the trainee a good idea of what to look for when deciding what kind of maintenance is required.

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### Objectives

#### Learning Objective 1

1. Describe valve rigging hardware and the proper way to safely use it.
  - a. Describe the various types of valve rigging hardware and their functions.
  - b. Explain how to inspect and use valve rigging hardware correctly.

#### Learning Objective 2

2. Describe the requirements and procedures for inspecting a valve internally (CT 21\_3-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions (AOCs) associated with inspecting a valve internally.
  - b. Describe the procedures used to inspect a valve internally.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Inspect a valve and its components internally (CT 21\_3-17).
  - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify location of valve to be inspected.
  - Verify the accessibility of the valve.
  - Verify the valve number and nameplate data.
  - Verify the valve type and manufacturer.
  - Verify the proper isolation of the valve prior to performing inspection.
  - Follow associated task-specific procedures (if applicable).
  - Follow manufacturer's or industry recommendations.
  - Inspect valve and components.
  - Perform the necessary notifications of results of the inspection and items for repair upon completion.
  - Complete the appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 Hours

(Three 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style)

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	Hearing protection
Dry-erase markers	Natural fiber clothing with no metal fasteners
Pencils and paper	Personal monitors (when required)
Poster board	Proper footwear
Flip chart	Safety glasses
<i>Pipeline Mechanical</i> PowerPoint®	Work gloves
Presentations	Example hoisting equipment (shackles, hooks, slings, etc.)
LCD projector and screen	Examples of damaged or worn rigging equipment
Computer (Internet access optional but recommended)	Example valves of various types
Module Review Questions answer key	Valve replacement parts/seals/rings
Performance Profile sheets	Appropriate lubricants and associated tools
Appropriate PPE as directed by the instructor or training facility provider:	Specialized valve tools
Electrical insulated work gloves appropriate for voltages encountered	Common hand tools
Hard hat	Valve manuals or internal diagrams
	Sample maintenance documentation

# Lesson Plans for Module CT21\_4-17

## Repair Valve Actuator/Operator, Hydraulic

**Module CT21\_4-17** presents the skills and knowledge required for repairing hydraulic valve actuators. These devices are a crucial piece in pipeline operation, providing a means of controlling valves remotely and, in some cases, automatically. Hydraulic technology can provide significant power in a fairly compact package, making it useful for managing large valves.

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### Objectives

#### Learning Objective 1

1. Describe hydraulic actuator technology and the techniques involved in maintaining it.
  - a. Describe hydraulic actuators and the key ideas behind their operation.
  - b. Identify the various aspects of hydraulic actuator preventive maintenance.
  - c. Summarize the process of inspecting key hydraulic components.
  - d. List the techniques used to troubleshoot hydraulic actuators.
  - e. Describe the techniques used to work with hydraulic systems and actuators.

#### Learning Objective 2

2. Describe the requirements and procedures for repairing hydraulic actuators (CT 21\_4-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions (AOCs) associated with repairing hydraulic actuators.
  - b. Describe the procedures used to repair hydraulic actuators.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Repair a hydraulic actuator/operator (CT 21\_4-17).
  - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the location of the valve actuator/operator to be repaired.
  - Verify the accessibility of the valve actuator/operator.
  - Verify the valve actuator/operator number and nameplate data.
  - Verify the valve actuator/operator type and manufacturer.
  - Notify control center and/or affected personnel.
  - Follow associated task-specific procedures (if applicable).
  - Follow manufacturer's or industry recommendations.
  - Use precautionary steps in removing actuator.
  - Disassemble actuator.
  - Inspect, repair, and/or replace worn or damaged parts as necessary.
  - Reassemble actuator.
  - Install actuator.
  - Properly adjust hydraulic actuator.
  - Notify control center and/or affected personnel.
  - Complete the appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 Hours

(Three 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	Hard hat
Dry-erase markers	Hearing protection
Pencils and paper	Natural fiber clothing with no metal fasteners
Poster board	Personal monitors (when required)
Flip chart	Proper footwear
<i>Pipeline Mechanical</i> PowerPoint®	Safety glasses
Presentations	Work gloves
LCD projector and screen	Hydraulic valve actuator
Computer (Internet access optional but recommended)	Actuator replacement parts/seals
Module Review Questions answer key	Appropriate lubricants and associated tools
Performance Profile sheets	Limit switches
Appropriate PPE as directed by the instructor or training facility provider:	Torque switches
Electrical insulated work gloves	Common hand tools
appropriate for voltages encountered	Valve actuator manual
	Sample maintenance documentation

# Lesson Plans for Module CT21\_5-17

## Repair Valve Actuator/Operator, Electric

**Module CT21\_5-17** presents the skills and knowledge required for repairing electric valve actuators. These devices are a crucial piece in pipeline operation, providing a means of controlling valves remotely and, in some cases, automatically.

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### Objectives

#### Learning Objective 1

1. Describe electric actuator technology and the techniques involved in maintaining it.
  - a. Describe electric actuators and the key ideas behind their operation.
  - b. Identify the various aspects of electric actuator preventive maintenance.
  - c. Summarize the process of inspecting key electric components.
  - d. List the techniques used to troubleshoot electric actuators.
  - e. Describe the techniques used to work with electric systems and actuators.

#### Learning Objective 2

2. Describe the requirements and procedures for repairing electric actuators (CT 21\_5).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with repairing electric actuators.
  - b. Describe the procedures used to repair electric actuators.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Repair an electric actuator/operator (CT 21\_5-17).
  - Identify potential abnormal operating conditions that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the location of the valve actuator/operator to be inspected.
  - Verify the accessibility of the valve actuator/operator.
  - Verify the valve actuator/operator number and nameplate data.
  - Verify the valve actuator/operator type and manufacturer.
  - Notify control center and/or affected personnel.
  - Follow associated task-specific procedures (if applicable).
  - Follow manufacturer's or industry recommendations.
  - Use precautionary steps in removing actuator.
  - Disassemble actuator.
  - Inspect, repair, and/or replace worn or damaged parts as necessary.
  - Disassemble soft clutches and inspect, if applicable.
  - Reassemble actuator.
  - Notify control center and/or affected personnel.
  - Complete the appropriate documentation as required by operator's procedures.

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### Teaching Time: 7.5 Hours

(Three 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	Hearing protection
Dry-erase markers	Natural fiber clothing with no metal fasteners
Pencils and paper	Personal monitors (when required)
Poster board	Proper footwear
Flip chart	Safety glasses
<i>Pipeline Mechanical</i> PowerPoint® Presentations	Work gloves
LCD projector and screen	Electric valve actuator
Computer (Internet access optional but recommended)	Actuator replacement parts/seals
Module Review Questions answer key	Appropriate lubricants and associated tools
Performance Profile sheets	Limit switches
Appropriate PPE as directed by the instructor or training facility provider:	Torque switches
Electrical insulated work gloves	Multimeter
appropriate for voltages encountered	Common hand tools
Hard hat	Valve actuator manual
	Sample electrical prints
	Sample maintenance documentation

# Lesson Plans for Module CT22\_1-17

## Inspect Tank Pressure / Vacuum Breakers

**Module CT22\_1-17** presents the skills and knowledge required to inspect tank pressure and vacuum breakers. These devices protect storage tanks from damage caused by excessive internal or external pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to inspect these devices to confirm that they are operating properly and reliably.

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### Objectives

#### Learning Objective 1

1. Describe tank pressure relief and the technologies used to provide it.
  - a. Describe the causes and effects of pressure conditions occurring within tanks.
  - b. Identify the technologies used to provide tank pressure relief.

#### Learning Objective 2

2. Describe the requirements and procedures for inspecting tank pressure / vacuum breakers (CT 22\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting tank pressure / vacuum breakers.
  - b. Describe the procedures used to inspect tank pressure and vacuum breakers.

## Performance Task

### Performance Task 1 (Learning Objective 2)

1. Inspect tank pressure and vacuum breakers (CT 22\_1-17).
    - Identify potential abnormal operating conditions that may occur during performance of this CT, and know the appropriate actions to take in response to them.
    - Utilize the appropriate personal protective equipment according to relevant company procedures.
    - Verify location of valve to be inspected, and verify the valve number, valve type, manufacturer, and nameplate data.
    - Notify the control center and any other affected personnel that work is beginning.
    - Follow all applicable task-specific procedures to ensure safety, efficient performance, standardization, and appropriate documentation.
    - Obtain the necessary test equipment.
    - Isolate the tank from the process and relieve pressure, if appropriate.
    - Perform a complete visual inspection.
    - Remove the valve cover and examine the valve, gasket, nozzle, and valve outlet.
    - Disassemble the access port on the vacuum breaker (or combination valve, if applicable). Inspect and test the vacuum breaker pallet weights, seat, spider arm (if present), and diaphragm.
    - Disassemble the access port on the tank pressure relief valve. Inspect and test the tank pressure relief valve pallet weight, seat, and diaphragm.
    - Replace or repair all worn parts so the valves are in top condition.
    - Reassemble the valves and remove lockout/tagout, if applicable.
    - Perform a function test.
    - Apply a security seal showing the test date and any other related information required by company procedures.
    - Notify the control center and any affected personnel to verify the integrity of the system for return to normal operation.
    - Complete appropriate documentation as required by operator's procedures.
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## Teaching Time: 5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

Using your access code, download the Performance Profile sheets from [www.nccerirc.com](http://www.nccerirc.com). For information and updates about accessing the Module Examinations, visit [www.nccer.org/testing](http://www.nccer.org/testing). The passing score for submission into NCCER's Registry is 70% or above for the Module Examination; all Performance Tasks are graded pass or fail.

## **Safety Considerations**

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## **Equipment, Materials, and Resources**

- Whiteboard
- Dry-erase markers
- Pencils and paper
- Poster board
- Flip chart
- Pipeline Mechanical* PowerPoint® Presentations
- LCD projector and screen
- Computer (Internet access optional but recommended)
- Module Examinations
- Performance Profile sheets
- Appropriate PPE as directed by the instructor or training facility provider:
  - Electrical insulated work gloves appropriate for voltages encountered
  - Hard hat
  - Hearing protection
  - Natural fiber clothing with no metal fasteners
  - Personal monitors (when required)
  - Proper footwear
  - Safety glasses
  - Work gloves
- Example tank pressure valves and vacuum breakers
- Valve weights
- Valve replacement parts/seals
- Digital scale
- Common hand tools
- Valve manuals or internal diagrams
- Sample maintenance documentation

# Lesson Plans for Module CT22\_2-17

## Inspect, Test, and Calibrate HVL Tank Pressure Relief Valves

**Module CT22\_2-17** presents the skills and knowledge required to inspect, test, and calibrate pressure relief valves for highly volatile liquid (HVL) storage tanks. These devices protect storage tanks from damage caused by excessive internal pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to inspect, test, and calibrate these devices to confirm that they are operating properly and reliably.

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### Objectives

#### Learning Objective 1

1. Describe tank pressure relief and the technologies used to provide it.
  - a. Describe the causes and effects of pressure conditions occurring within tanks.
  - b. Summarize the technologies used to provide tank pressure relief.

#### Learning Objective 2

2. Describe the requirements and procedures for inspecting, testing, and calibrating HVL tank pressure relief valves (CT 22\_2-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions (AOCs) associated with inspecting, testing, and calibrating HVL tank pressure relief valves.
  - b. Describe the procedures used to inspect, test, and calibrate HVL tank pressure relief valves.

## Performance Task

### Performance Task 1 (Learning Objective 2)

1. Inspect, test, and calibrate HVL tank pressure relief valves (CT 22\_2-17).
    - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
    - Utilize the appropriate personal protective equipment according to relevant company procedures.
    - Verify that the test equipment has been calibrated prior to performing any calibrations.
    - Notify the control center and any other affected personnel prior to performing any test, according to operator's procedures.
    - Verify the device number and the nameplate data on the tank.
    - Verify the device type and the manufacturer.
    - Visually inspect the device and its associated equipment to determine the following:
      - Appropriateness for intended service
      - Physical/mechanical condition
      - Presence of corrosion
      - Presence of erosion
      - Presence of leakage
      - Inlet and outlet (if applicable) flange connections
      - Integrity of the device and its associated piping support
    - According to operator's and manufacturer's procedures, make any appropriate notifications regarding necessary repairs, maintenance, or replacements before continuing with the procedure.
    - Isolate the device from the process system and relieve pressure, if appropriate. (If performing dynamic condition testing, the device is not isolated from the system, at least not fully.)
    - Connect the test equipment and inspect all connections for leakage.
    - Apply the test medium pressure and determine the device setpoint or range "as found." Document the results.
    - If the device calibration is required, reapply the test medium to the desired setpoint or range. Adjust it according to the device manufacturer's specifications to the operator's documented setpoint.
    - Document the final setpoint value "as-left" results.
    - Remove the test equipment, return the device to normal operating condition, and verify the integrity of the system per operator's procedures.
    - Apply a security seal to the device, if required, according to operator's procedures.
    - Notify the control center and any affected personnel that the device is operational and the system is returning to normal operation.
    - Complete the appropriate documentation as required by operator's procedures.
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## Teaching Time: 5.0 Hours

### (Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	appropriate for voltages encountered
Dry-erase markers	Hard hat
Pencils and paper	Hearing protection
Poster board	Natural fiber clothing with no metal
Flip chart	fasteners
<i>Pipeline Mechanical</i> PowerPoint®	Personal monitors (when required)
Presentations	Proper footwear
LCD projector and screen	Safety glasses
Computer (Internet access optional but recommended)	Work gloves
Module Review Questions answer key	Example HVL tank pressure relief valves
Performance Profile sheets	Pressure calibration test kit
Appropriate PPE as directed by the instructor or training facility provider:	Calibration test medium
Electrical insulated work gloves	Common hand tools
	Valve manuals or internal diagrams
	Sample maintenance documentation

# Lesson Plans for Module CT23\_1-17

## Maintain and Repair Relief Valves

**Module CT23\_1-17** presents the skills and knowledge required to maintain and repair pipeline pressure relief valves. These devices protect the pipeline from damage caused by excessive internal pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to maintain and repair these devices so they continue to operate properly and reliably.

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### Objectives

#### Learning Objective 1

1. Describe pipeline overpressure conditions and the technologies used to prevent them.
  - a. Describe pipeline overpressure conditions and the ways in which they are managed.
  - b. Summarize the technologies used to protect the pipeline from overpressure conditions.

#### Learning Objective 2

2. Describe the requirements and procedures for maintaining and repairing relief valves (CT 23\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with maintaining and repairing relief valves.
  - b. Describe the procedures used to maintain and repair relief valves.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Maintain and repair relief valves (CT23\_1-17).
  - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the accessibility of the valve.
  - Verify the valve number and nameplate data.
  - Verify the valve type and manufacturer.
  - Notify control center and/or affected personnel.
  - Follow associated task-specific procedures (if applicable).
  - Follow manufacturer's or industry recommendations.
  - Disassemble valve using manufacturer's specifications.
  - Visually inspect valve for wear and corrosion.
  - Reassemble the valve per manufacturer's specifications.
  - Test and calibrate valve.
  - Apply security seal to valve as required by procedures.
  - Notify control center and/or affected personnel.
  - Complete the appropriate documentation as required by operator's procedures.

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### Teaching Time: 5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	appropriate for voltages encountered
Dry-erase markers	Hard hat
Pencils and paper	Hearing protection
Poster board	Natural fiber clothing with no metal
Flip chart	fasteners
<i>Pipeline Mechanical</i> PowerPoint®	Personal monitors (when required)
Presentations	Proper footwear
LCD projector and screen	Safety glasses
Computer (Internet access optional but recommended)	Work gloves
Module Review Questions answer key	Example pipeline pressure relief valves
Module Examinations	Valve replacement parts/seals
Performance Profile sheets	Pressure calibration test kit
Appropriate PPE as directed by the instructor or training facility provider:	Calibration test medium
Electrical insulated work gloves	Common hand tools
	Valve manuals or internal diagrams
	Sample maintenance documentation

# Lesson Plans for Module CT23\_2-17

## Inspect, Test, and Calibrate Relief Valves

**Module CT23\_2-17** presents the skills and knowledge required to inspect, test, and calibrate pipeline pressure relief valves. These devices protect the pipeline from damage caused by excessive internal pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to inspect, test, and calibrate these devices so they continue to operate properly and reliably.

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### Objectives

#### Learning Objective 1

1. Describe pipeline overpressure conditions and the technologies used to prevent them.
  - a. Describe pipeline overpressure conditions and the ways in which they are managed.
  - b. Identify the technologies used to protect the pipeline from overpressure conditions.

#### Learning Objective 2

2. Describe the requirements and procedures for inspecting, testing, and calibrating relief valves (CT 23\_2-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting, testing, and calibrating relief valves.
  - b. Describe the procedures used to inspect, test, and calibrate relief valves.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Inspect, test, and calibrate relief valves (CT 23\_2-17).
  - Identify potential abnormal operating conditions that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify location and accessibility of relief valve to be inspected, and verify the device number, device type, manufacturer, and nameplate data.
  - Notify control center and/or affected personnel before work begins.
  - Follow associated task-specific procedures (if applicable).
  - Verify the correct device setpoint, determine the correct test medium and method, and obtain the necessary test equipment.
  - Isolate the device from the process and relieve pressure, if appropriate.
  - Perform a complete visual inspection and make any necessary repairs or replacements before continuing with the procedure.
  - Connect the appropriate test equipment. Apply the test medium at the correct pressure to verify the device's "as-found" setpoint and/or operating range. Document the results.
  - If required, reapply the test medium for the desired setpoint and/or operating range.
  - Document the "as-left" setpoint and/or operating range, following company procedures. Disconnect all test equipment.
  - Put all safety devices back in service. Remove lockout/tagout, if applicable.
  - Return the system to its normal operating state. Perform a function test to confirm that everything is working properly.
  - Apply security seal to the relief valve as required by procedures (if applicable).
  - Notify control center and/or affected personnel after completion of work.
  - Complete appropriate documentation as required by operator's procedures.

## Teaching Time: 5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

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## Equipment, Materials, and Resources

Whiteboard	appropriate for voltages encountered
Dry-erase markers	Hard hat
Pencils and paper	Hearing protection
Poster board	Natural fiber clothing with no metal
Flip chart	fasteners
<i>Pipeline Mechanical</i> PowerPoint®	Personal monitors (when required)
Presentations	Proper footwear
LCD projector and screen	Safety glasses
Computer (Internet access optional but recommended)	Work gloves
Module Review Questions answer key	Example pipeline pressure relief valves
Performance Profile sheets	Valve replacement parts/seals
Module Examinations	Pressure calibration test kit
Appropriate PPE as directed by the instructor or training facility provider:	Calibration test medium
Electrical insulated work gloves	Common hand tools
	Valve manuals or internal diagrams
	Sample maintenance documentation

# Lesson Plans for Module CT24\_1-17

## Maintain and Repair Pressure Limiting Devices

**Module CT24\_1-17** presents the skills and knowledge required to maintain and repair pipeline pressure limiting devices. This technology protects the pipeline from damage caused by excessive internal pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to maintain and repair these devices so they continue to operate properly and reliably.

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### Objectives

#### Learning Objective 1

1. Describe pipeline overpressure conditions and the technologies used to prevent them.
  - a. Describe pipeline overpressure conditions and the ways in which they are managed.
  - b. Summarize the technologies used to protect the pipeline from overpressure conditions.

#### Learning Objective 2

2. Describe the requirements and procedures for maintaining and repairing pressure limiting devices (CT 24\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions (AOCs) associated with maintaining and repairing pressure limiting devices.
  - b. Describe the procedures used to maintain and repair pressure limiting devices.

### Performance Task

#### Performance Task 1 (Learning Objective 2)

1. Maintain and repair pressure limiting devices (CT 24\_1-17).
  - Identify potential abnormal operating conditions (AOCs) that may occur during performance of this CT, and know the appropriate actions to take in response to them.
  - Utilize the appropriate personal protective equipment according to relevant company procedures.
  - Verify the location of the valve to be maintained or repaired.
  - Verify valve accessibility.
  - Verify the valve type and manufacturer. Obtain the appropriate manufacturer's manual. Also obtain a local electrical print or other schematics, if available.
  - Verify the valve number and the nameplate data.
  - Notify the control center and any other affected personnel that work is beginning.
  - All applicable task-specific procedures must be followed to ensure safety, efficient performance, standardization, and appropriate documentation. Procedures should also include work permit information and notification requirements (control center and any other appropriate personnel).
  - Coordinate with the control center to isolate, depressurize, and drain the valve and the affected system.
  - Disassemble the valve according to the manufacturer's guidelines.
  - Visually inspect the valve for wear and corrosion. Repair or replace worn parts as applicable.
  - Reassemble the valve according to manufacturer's guidelines.
  - Remove lockout/tagout, if applicable. Also remove lockout/tagout from any equipment associated with isolating the valve.
  - Perform a function test and calibrate the valve (if applicable) according to the manufacturer's guidelines and/or company procedures.
  - Apply a security seal showing the test date and any other related information required by company procedures.
  - Notify the control center and any affected personnel to verify the integrity of the system for return to normal operation.
  - Complete the appropriate documentation as required by operator's procedures.

## Teaching Time: 5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

As you prepare for each session, allow sufficient time to review the course objectives, content, visual aids (including the accompanying PowerPoint® presentations), and these lesson plans, and to gather the required equipment and materials. Consider time required for demonstrations, laboratories, field trips, and testing.

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## Safety Considerations

This module requires that trainees work in and around enclosed spaces, with pressurized gases and liquids, and with moderately high temperatures. They may also encounter electrically, hydraulically, or pneumatically energized equipment. Safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and give due respect to unseen hazards related to the pipeline environment. Any deficiencies must be corrected to ensure the future safety of all trainees. All practice sessions and Performance Tasks must be completed under your direct supervision.

## Equipment, Materials, and Resources

Whiteboard	Hearing protection
Dry-erase markers	Natural fiber clothing with no metal fasteners
Pencils and paper	Personal monitors (when required)
Poster board	Proper footwear
Flip chart	Safety glasses
<i>Pipeline Mechanical</i> PowerPoint®	Work gloves
Presentations	Example self-contained pressure regulator
LCD projector and screen	Example control valve regulator components (sensor, transmitter, controller, actuator)
Computer (Internet access optional but recommended)	Example control valves
Module Review Questions answer key	Valve replacement parts/seals
Performance Profile sheets	Pressure calibration test kit
Appropriate PPE as directed by the instructor or training facility provider:	Calibration test medium
Electrical insulated work gloves appropriate for voltages encountered	Common hand tools
Hard hat	Valve manuals or internal diagrams
	Sample maintenance documentation

## Additional Resources

The following recommended resources can provide additional helpful information related to the requirements for this covered task:

NCCER Module AOCFG-17, *Abnormal Operating Conditions Field and Gas*  
NCCER Module AOCCC-17, *Abnormal Operating Conditions Control Center*  
NCCER Module 12207-15, *Control Valves, Actuators, and Positioners*, from Instrumentation  
NCCER Module 62203-02, *Valve Inspection*  
NCCER Module 64102-02, *Pipeline E&I Safety*  
NCCER Module CT19\_5-17, *Adjust Actuator/Operator, Electric*  
NCCER Module CT19\_6-17, *Adjust Actuator/Operator, Pneumatic*  
NCCER Module CT19\_7-17, *Adjust Actuator/Operator, Hydraulics*  
NCCER Module CT25\_2-17, *Inspect, Test and Calibrate Pressure Transmitters*  
Emerson Electric Co., [www.emersonprocess.com](http://www.emersonprocess.com)

There are a number of online resources available for trainees who would like more information on pipeline pressure limiting devices and their maintenance. A search for additional information may be assigned as homework to interested trainees.

Instructors should view any videos that may be identified in the lesson plan to ensure their usability before using them. The videos can provide teachable moments in both proper and improper work processes and behaviors. Be prepared to stop the videos at appropriate times to point out and discuss both proper and improper conduct and techniques.

Numerous videos related to the topic are available on the Internet. These can be located by searching *pressure regulator*, or similar terms and using the Videos tab on the results page of your preferred search engine.

Instructors are encouraged to locate additional audiovisual aids available on the Internet, make personal videos, and take still pictures related to the subject matter and add them to the presentations throughout the program.

# Lesson Plans for Module CT24\_2-17

## Inspect, Test, and Calibrate Pressure Limiting Devices

**Module CT24\_2-17** presents the skills and knowledge required to inspect, test, and calibrate pipeline pressure limiting devices. This technology protects the pipeline from damage caused by excessive internal pressure. The concept of pressure-related damage is examined and the various technologies used to address it are discussed. The trainee is then instructed in how to inspect, test, and calibrate these devices so they continue to operate properly and reliably.

---

### Objectives

#### Learning Objective 1

1. Describe pipeline overpressure conditions and the technologies used to prevent them.
  - a. Describe pipeline overpressure conditions and methods used to prevent them.
  - b. Identify the technologies used to protect the pipeline from overpressure conditions.

#### Learning Objective 2

2. Describe the requirements and procedures for inspecting, testing, and calibrating pressure limiting devices (CT 24\_2-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting, testing, and calibrating pressure limiting devices.
  - b. Describe the procedures used to inspect, test, and calibrate pressure limiting devices.

## Performance Task

### Performance Task 1 (Learning Objective 2)

1. Inspect, test, and calibrate pressure limiting devices (CT 24\_2-17).
    - Identify potential abnormal operating conditions and the appropriate actions to take.
    - Utilize the appropriate personal protective equipment according to relevant company procedures.
    - Verify the location and accessibility of the valve to be inspected, and verify the valve type, valve number, manufacturer, and nameplate data.
    - Notify the control center and any other affected personnel that work is beginning.
    - Follow all applicable task-specific procedures to ensure safety, efficient performance, standardization, and appropriate documentation.
    - Verify the correct device setpoint before beginning and determine the correct test medium and testing method for the device.
    - Obtain the necessary test equipment.
    - Isolate the device from the process and relieve pressure, if appropriate.
    - Perform a complete visual inspection and make any necessary repairs or replacements before continuing with the procedure.
    - Connect the appropriate test equipment. Apply the test medium at the correct pressure to verify the device's "as-found" setpoint and/or operating range. Document the results.
    - If required, reapply the test medium for the desired setpoint and/or operating range.
    - Document the "as-left" setpoint and/or operating range, following company procedures. Disconnect all test equipment.
    - Put all safety devices back in service. Remove lockout/tagout, if applicable.
    - Return the system to its normal operating state. Perform a function test to confirm that everything is working properly.
    - Apply a security seal showing the test date and any other related information required by company procedures.
    - Notify the control center and any affected personnel to verify the integrity of the system for return to normal operation.
    - Complete appropriate documentation as required by operator's procedures.
- 

### Teaching Time: 5 Hours

(Two 2.5-hour sessions)

Session time and quantity may be adjusted to accommodate your class size, schedule, and teaching style.

## Before You Begin

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## Equipment, Materials, and Resources

Whiteboard	Hearing protection
Dry-erase markers	Natural fiber clothing with no metal fasteners
Pencils and paper	Personal monitors (when required)
Poster board	Proper footwear
Flip chart	Safety glasses
<i>Pipeline Mechanical</i> PowerPoint®	Work gloves
Presentations	Example self-contained pressure regulator
LCD projector and screen	Example control valve regulator components (sensor, transmitter, controller, actuator)
Computer (Internet access optional but recommended)	Example control valves
Module Review Questions answer key	Valve replacement parts/seals
Performance Profile sheets	Pressure calibration test kit
Appropriate PPE as directed by the instructor or training facility provider:	Calibration test medium
Electrical insulated work gloves	Common hand tools
appropriate for voltages encountered	Valve manuals or internal diagrams
Hard hat	Sample maintenance documentation