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**. For information and updates about accessing the Module Examinations, visit **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 AOCCC-17

Abnormal Operating Conditions – Control Center

Module AOCCC-17 describes how control center 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 in a control center for both gas and liquid pipelines.
  - a. Explain how to recognize abnormal facility conditions and pipeline system damage.
  - 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 a pipeline.
  - f. Explain how to recognize hazardous liquid or gas encounters.
  - g. Explain how to recognize an unexplained flow rate/pressure change.

Learning Objective 2

- Describe the proper reaction to abnormal operating conditions in a control center for both gas and liquid pipelines.
  - a. Describe the proper reaction to abnormal facility conditions and pipeline system damage.
  - b. Describe the proper reaction to the activation of a safety device.
  - c. Describe the proper reaction to 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 a pipeline.
  - f. Describe the proper reaction to hazardous liquid or gas encounters.
  - g. Describe the proper reaction to unexplained flow rate/pressure change.

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**. For information and updates about accessing the Module Examinations, visit **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 CT19_1-17
Valve Body Winterization or Corrosion Inhibition

Module CT19_1-17 describes the many different types of valves found on a pipeline. It explains how to isolate and purge valves prior to maintenance, and presents the general procedures for winterizing valves.

Objectives

Learning Objective 1

1. Identify the types of valves used on a pipeline, and describe valve maintenance and 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 relieve pressure.
   d. Identify the types of valves that regulate the direction of flow.
   e. Describe how to inspect and maintain valves.

Learning Objective 2

2. Describe how to winterize valves (CT19_1-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with winterizing valves.
   b. Describe the procedure for isolating and purging a valve.
   c. Describe the procedure for winterizing a valve.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Winterize valves (CT19_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 and accessibility of valve to be inspected, and verify the valve number, valve type, manufacturer, and nameplate data.
   – 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.
   – Blowdown (depressurize) valve body, if body bleed is available.
   – Drain non-petroleum liquids (such as water) from the valve body, if applicable.
   – Operate injection equipment and inject appropriate antifreeze, 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 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**. For information and updates about accessing the Module Examinations, visit **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 work in the vicinity of hazardous liquids and vapors and high-pressure hoses. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials, and Resources

- Whiteboard and markers
- Pencils and paper
- *CT19_1-17* PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Vendor-supplied videos/DVDs showing pipeline valves and valve maintenance procedures *(optional)*
- Module Examinations
- Specific PPE required by the site
- Copies of manufacturers' instructions for a variety of pipeline valves
- Pipeline valves (or their cut-away diagrams or illustrations) and manufacturers' instructions, including:
  - Angle valves
  - Ball check valves
  - Ball valves
  - Butterfly check valves
  - Butterfly valves
  - Control valves
  - Diaphragm valves
  - Expanding-gate valves
  - Gate valves
  - Globe-type safety valves
  - Globe valves
  - Lift check valves
  - Pipeline relief valves
  - Piston-controlled check valves
  - Plug valves
  - Pressure-relief valves
  - Rupture-disc valves
  - Swing check valves
  - Y-type valves
- Antifreeze or corrosion inhibitor and injection equipment
- Drain receptacles
- Lockout devices and tags
- Rags
- Solvent
- Valve lubricant and applicators
- Wire brushes
- Copies of company's policies and procedure for responding to gas and liquid leaks
- Copies of company's policies and procedures for corrosion prevention, leak inspection, valve depressurization, and valve lubrication
- Copies of the Performance Profile Sheets

Lesson Plans for Module CT19_2-17
Valve Lubrication

Module CT19_2-17 describes the many different types of valves found on a pipeline. It explains how to isolate and purge valves prior to maintenance, and presents the general procedures for lubricating valves.

Objectives

Learning Objective 1

1. Identify the types of valves used on a pipeline, and describe valve maintenance and 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 relieve pressure.
   d. Identify the types of valves that regulate the direction of flow.
   e. Describe how to inspect and maintain valves.

Learning Objective 2

2. Describe how to lubricate valves (CT19_2-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with lubricating valves.
   b. Describe the procedure for isolating and purging a valve.
   c. Describe the procedure for lubricating a valve.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Lubricate valves (CT19_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 valve to be inspected, and verify the valve number, valve type, manufacturer, and nameplate data.
   – 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.
   – Understand the seat, injection fittings, and stem functionality.
   – Identify appropriate injection and lubrication product.
   – Operate injection equipment and inject appropriate products.
   – 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 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**. For information and updates about accessing the Module Examinations, visit **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 work in the vicinity of hazardous liquids and vapors and high-pressure hoses. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials, and Resources

- Whiteboard and markers
- Pencils and paper
- *CT19_2-17* PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Vendor-supplied videos/DVDs showing pipeline valves and valve maintenance procedures *(optional)*
- Module Examinations
- Specific PPE required by the site
- Copies of manufacturers' instructions for a variety of pipeline valves
- Pipeline valves (or their cutaway diagrams or illustrations) and manufacturers' instructions, including:
  - Angle valves
  - Ball check valves
  - Ball valves
  - Butterfly check valves
  - Butterfly valves
  - Control valves
  - Diaphragm valves
  - Expanding-gate valves
  - Gate valves
  - Globe-type safety valves
  - Globe valves
  - Lift check valves
  - Pipeline relief valves
  - Piston-controlled check valves
  - Plug valves
  - Pressure-relief valves
  - Rupture-disc valves
  - Swing check valves
  - Y-type valves
- Lockout devices and tags
- Rags
- Solvent
- Valve lubricant and applicators
- Wire brushes
- Copies of company's policies and procedure for responding to gas and liquid leaks
- Copies of company's policies and procedures for corrosion prevention, leak inspection, valve depressurization, and valve lubrication
- Copies of the Performance Profile Sheets

Lesson Plans for Module CT19_3-17
Valve Seat Sealing

Module CT19_3-17 describes the many different types of valves found on a pipeline. It explains how to isolate and purge valves prior to maintenance, and presents the general procedures for sealing valve seats.

Objectives

Learning Objective 1

1. Identify the types of valves used on a pipeline, and describe valve maintenance and 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 relieve pressure.
   d. Identify the types of valves that regulate the direction of flow.
   e. Describe how to inspect and maintain valves.

Learning Objective 2

2. Describe how to inject valve seat sealant (CT19_3-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with injecting valve seat sealant.
   b. Describe the procedure for isolating and purging a valve.
   c. Describe the procedure for injecting valve seat sealant.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Inject valve seat sealant (CT19_3-17).
   - 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 and accessibility of the valve to be inspected, and verify the valve number, type, manufacturer, and nameplate data.
   - 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.
   - Verify proper valve position.
   - Blowdown (depressurize) valve body.
   - Check for leak-by and leak-through sealing of valve.
   - Identify the appropriate type and amount of sealant per manufacturer's/company specifications.
   - Operate injection equipment with appropriate products. Inject appropriate sealant into seats per manufacturer or industry recommendations.
   - After need for maintaining a tight seal is past, flush sealant from injection ports and seats with grease cleaner/penetrant.
   - 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 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**. For information and updates about accessing the Module Examinations, visit **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 work in the vicinity of hazardous liquids and vapors and high-pressure hoses. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials and Resources

- Whiteboard and markers
- Pencils and paper
- *CT19_3-17* PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Vendor-supplied videos/DVDs showing pipeline valves and valve maintenance procedures *(optional)*
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Copies of manufacturers' instructions for a variety of pipeline valves
- Pipeline valves (or their cut-away diagrams or illustrations) and manufacturers' instructions, including:
  - Angle valves
  - Ball check valves
  - Ball valves
  - Butterfly check valves
  - Butterfly valves
  - Control valves
  - Diaphragm valves
  - Expanding-gate valves
  - Gate valves
  - Globe-type safety valves
  - Globe valves
  - Lift check valves
  - Pipeline relief valves
  - Piston-controlled check valves
  - Plug valves
  - Pressure-relief valves
  - Rupture-disc valves
  - Swing check valves
  - Y-type valves
- Seat sealant and injection equipment
- Drain receptacles
- Lockout devices and tags
- Rags
- Solvent
- Copies of company's policies and procedure for responding to gas and liquid leaks
- Copies of company's policies and procedures for corrosion prevention, leak inspection, valve depressurization, and valve seat sealing
- Copies of Performance Profile Sheets

Lesson Plans for Module CT19_4-17
Valve Stem Packing Maintenance

Module CT19.4-16 describes the many different types of valves found on a pipeline. It explains how to isolate and purge valves prior to maintenance, and presents the general procedures for valve stem packing maintenance.

Objectives

Learning Objective 1

1. Identify the types of valves used on a pipeline, and describe valve maintenance and 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 relieve pressure.
   d. Identify the types of valves that regulate the direction of flow.
   e. Describe how to inspect and maintain valves.

Learning Objective 2

2. Describe how to inject valve stem packing material (CT19_4-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with valve stem packing.
   b. Describe the procedure for isolating and purging a valve.
   c. Describe the procedure for injecting valve stem packing material.

Performance Tasks

Performance Task 1 (Learning Objective 2)

1. Perform valve stem packing maintenance (CT19_4-17).
   - 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 and accessibility of the valve to be inspected, and verify the valve number, type, manufacturer, and nameplate data.
   - 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.
   - Identify the appropriate type and amount of injection products per manufacturer's/company specifications.
   - Operate injection equipment with appropriate products.
   - Inject appropriate products into stem per manufacturer or industry recommendations.
   - 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 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**. For information and updates about accessing the Module Examinations, visit **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 work in the vicinity of hazardous liquids and vapors and high-pressure hoses. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials and Resources

- Whiteboard and markers
- Pencils and paper
- *CT19_4-17* PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Vendor-supplied videos/DVDs showing pipeline valves and valve maintenance procedures *(optional)*
- Copies of manufacturers' instructions for a variety of pipeline valves
- Pipeline valves (or their cut-away diagrams or illustrations) and manufacturers' instructions, including:
  - Angle valves
  - Ball check valves
  - Ball valves
  - Butterfly check valves
  - Butterfly valves
  - Control valves
  - Diaphragm valves
  - Expanding-gate valves
  - Gate valves
  - Globe-type safety valves
  - Globe valves
  - Lift check valves
  - Pipeline relief valves
  - Piston-controlled check valves
  - Plug valves
  - Pressure-relief valves
  - Rupture-disc valves
  - Swing check valves
  - Y-type valves
- Stem packing material and injection equipment
- Drain receptacles
- Lockout devices and tags
- Rags
- Solvent
- Copies of company's policies and procedure for responding to gas and liquid leaks
- Copies of company's policies and procedures for corrosion prevention, leak inspection, valve depressurization, and valve seat sealing
- Copies of Performance Profile Sheets

Lesson Plans for Module CT19_5-17
Adjust Actuator/Operator, Electric

Module CT19_5-17 describes the techniques used to inspect, maintain, and troubleshoot electric valve actuators. The general procedure for making adjustments to electric actuators is presented.

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 adjusting electric actuators (CT19_5-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with adjusting electric actuators.
   b. Describe the procedures used to adjust electric actuators.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Adjust an electric actuator/operator (CT19_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 and accessibility of the valve to be inspected, and verify the actuator number, type, manufacturer, and nameplate data.
   - 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.
   - Verify proper valve position.
   - Properly set the limit switches and/or torque switches, 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 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**. For information and updates about accessing the Module Examinations, visit **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 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. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials and Resources

Whiteboard and markers
Pencils and paper
Poster board
Flip chart
CT19_5-17 PowerPoint® Presentation
LCD projector and screen
Computer (Internet access optional but recommended)
Module Review answer key
Module Examinations
Specific PPE required by the site
Electric valve actuator
Limit switches
Torque switches
Multimeter
Common hand tools
Valve actuator manual
Sample electrical prints
Sample maintenance documentation
Copies of Performance Profile Sheets

Lesson Plans for Module CT19_6-17
Adjust Actuator/Operator, Pneumatic

Module CT19_6-17 describes the techniques used to inspect, maintain, and troubleshoot pneumatic valve actuators. The general procedure for making adjustments to pneumatic actuators is presented.

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 adjusting pneumatic actuators (CT19_6-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with adjusting pneumatic actuators.
   b. Describe the procedures used to adjust pneumatic actuators.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Adjust a pneumatic actuator/operator (CT19_6-17).
   - 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 and accessibility of the valve to be inspected, and verify the actuator number, actuator type, manufacturer, and nameplate data.
   - 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.
   - Verify proper valve position.
   - Properly set the limit switches and/or torque switches, 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 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**. For information and updates about accessing the Module Examinations, visit **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 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. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials and Resource

Whiteboard and markers
Pencils and paper
Poster board
Flip chart
CT19_6-17 PowerPoint® Presentation
LCD projector and screen
Computer (Internet access optional but recommended)
Module Review answer key
Module Examinations
Specific PPE required by the site
Pneumatic valve actuator
Limit switches
Torque switches
Pneumatic test kit/meter
Common hand tools
Valve actuator manual
Sample maintenance documentation
Copies of Performance Profile Sheets

Lesson Plans for Module CT19_7-17
Adjust Actuator/Operator, Hydraulic

Module CT19_7-17 describes the techniques used to inspect, maintain, and troubleshoot hydraulic valve actuators. The general procedure for making adjustments to hydraulic actuators is presented.

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 adjusting hydraulic actuators (CT19_7-17).
   a. Identify the prerequisites, competencies, and abnormal operating conditions associated with adjusting hydraulic actuators.
   b. Describe the procedures used to adjust hydraulic actuators.

Performance Task

Performance Task 1 (Learning Objective 2)

1. Adjust a hydraulic actuator/operator (CT19_7-17).
   - 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 and accessibility of the valve to be inspected, and verify the actuator type, number, manufacturer, and nameplate data.
   - 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.
   - Isolate the valve, actuator, and any associated components, and verify proper valve position.
   - Properly set the mechanical stops, limit switches and/or hydraulic actuator travel, if applicable.
   - Remove lockout/tagout, if applicable. Perform a function test and confirm that the actuator local and remote position indicators are functioning correctly.
   - 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 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**. For information and updates about accessing the Module Examinations, visit **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 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. Electrical and mechanical safety must be emphasized at all times. Trainees should be carefully observed to ensure that they wear the proper PPE, follow safe practices, and remain aware of any potential abnormal operating conditions. Any deficiencies must be corrected to ensure trainee safety in the future. Work performed on or in the vicinity of functioning equipment must be completed under the direct supervision of the instructor.

Equipment, Materials and Resources

Whiteboard and markers
Pencils and paper
Poster board
Flip chart
CT19_7-17 PowerPoint® Presentation
LCD projector and screen
Computer (Internet access optional but recommended)
Module Review answer key
Module Examinations
Specific PPE required by the site
Hydraulic valve actuator
Limit switches
Torque switches
Common hand tools
Valve actuator manual
Sample maintenance documentation
Copies of Performance Profile Sheets