

## 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 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](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 CT15\_1-17

## Visually Inspect Surface Conditions of Right-of-Way

**Module CT15\_1-17** describes right-of-way inspection by aerial, vehicle, and foot patrols. Reportable observations and reporting procedures are explained. It also describes how to perform a leak survey and monitor for pressure loss.

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### Objectives

#### Learning Objective 1

1. Describe the purpose of right-of-way inspections, how to locate the line to be inspected, and methods used to perform inspections.
  - a. Describe the regulatory requirements for surface right-of-way inspections.
  - b. Describe how to locate the pipeline to be inspected.
  - c. Describe aerial patrol and vehicle/foot patrol methods of inspection.

#### Learning Objective 2

2. Identify reportable conditions that may be observed during a visual inspection of ROW surface conditions, and describe reporting procedures.
  - a. Identify the reportable conditions that may be observed during a visual inspection.
  - b. Describe types of reporting procedures.

#### Learning Objective 3

3. Describe how to perform a leak survey and monitor for pressure loss.
  - a. Describe the procedures for conducting a leak survey.
  - b. Describe how to monitor the pipeline for pressure loss.

#### Learning Objective 4

4. Describe how to visually inspect surface conditions of the right-of-way (CT15\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with visually inspecting surface conditions of the right-of-way.
  - b. Describe procedures for visually inspecting surface conditions of the right-of-way.

### Performance Task

#### Performance Task (Learning Objective 4)

1. Visually inspect surface conditions of right-of-way (CT15\_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.
  - Accurately identify the right-of-way to be inspected from alignment sheets and/or pipeline maps.
  - Perform the visual inspection/patrol of the right-of-way.
  - Make proper notifications.
  - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees inspect surface conditions of the right-of-way. Safety is paramount in the pipeline industry and safe habits and practices must be emphasized whenever possible. 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. Performance Tasks must be completed under the direct supervision of the instructor.

## Equipment, Materials, and Resources

- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- CT15\_1-17 PowerPoint® Presentation
- LCD projector and screen
- Vendor-supplied videos/DVDs showing surface right-of-way inspections (*optional*)
- TV/DVD player
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Examples of alignment sheets
- Photographs of reportable pipeline conditions
- Blank ROW inspection forms
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT16\_1-17

## Inspect Navigable Waterway Crossing

**Module CT16\_1-17** describes navigable waterway crossing inspections and reportable observations and reporting procedures for these inspections.

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### Objectives

#### Learning Objective 1

1. Explain how to inspect and report on navigable waterway crossings.
  - a. Explain how to locate the pipeline.
  - b. Explain how to perform a surface and submarine inspection.
  - c. Identify reportable observations for navigable waterway crossing inspections.
  - d. Identify reporting procedures for navigable waterway crossing inspections.

#### Learning Objective 2

2. Describe the procedure used to inspect or simulate inspecting a navigable waterway crossing (CT16\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting a navigable waterway crossing.
  - b. Describe the general procedure used to inspect a navigable waterway crossing.

### Performance Task

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

1. Inspect or simulate inspecting a navigable waterway crossing (CT16\_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.
    - Locate the landfall of the pipeline crossing to establish a reference point.
    - Determine the amount of cover by using a probe or specialized equipment to verify the depth of the submerged pipeline.
    - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees inspect, or simulate inspecting, a navigable waterway crossing. Safety is paramount in the pipeline industry and safe habits and practices must be emphasized whenever possible. 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. Performance Tasks must be completed under the direct supervision of the instructor.

## Equipment, Materials, and Resources

- Whiteboard/chalkboard
- Markers/chalk
- Pencils and paper
- CT16\_1-17 PowerPoint® Presentation
- LCD projector and screen
- Vendor-supplied videos/DVDs showing navigable waterway crossing inspections (*optional*)
- TV/DVD player
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Examples of alignment sheets and as-built river profiles
- Photographs of reportable pipeline conditions
- Blank ROW inspection forms
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT27\_1-17

## Routine Inspection of Breakout Tanks

### (API 653 Monthly or DOT Annual)

Module CT27\_1-17 describes the purpose of breakout tank inspections, and explains frequency requirements for the inspections. It presents the general procedure for inspecting breakout tanks, including conditions and elements to look for and report on. It also describes general reporting procedures.

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## Objectives

### Learning Objective 1

1. Identify the purpose of breakout tanks, and describe breakout tank inspections.
  - a. Identify the purpose of a breakout tank.
  - b. Describe the conditions that are examined during a tank inspection.

### Learning Objective 2

2. Describe the requirements and procedures for performing breakout tank inspections (CT27\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with inspecting breakout tanks.
  - b. Describe the procedures used to perform a breakout tank inspection.

## Performance Tasks

### Performance Task 1 (Learning Objective 2)

1. Perform routine inspection of a breakout tank (API 653 monthly or DOT annual) (CT27\_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.
  - Perform a walk-around inspection to verify security and to determine that no AOCs exist.
  - Visually inspect the foundation for defects.
  - Visually inspect the shell for defects.
  - Visually inspect shell appurtenances for defects, including manways, nozzles, tank piping manifolds, and the autogauge system.
  - Visually inspect roofs for defects, including deck plate external corrosion, roof deck drainage, floating roof seal systems, and pontoons.
  - Visually inspect roof and tank shell appurtenances for defects, including the sample hatch, autogauge inspection hatch, autogauge float well cover, external floating roof ladder, and the stairway.
  - Inspect the area for buildup of trash, vegetation, or other flammable material that could pose a fire or other safety hazard.
  - 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 PowerPoint® presentation), 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 perform an inspection of a breakout tank. 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
- CT27\_1-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing breakout tank inspections (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Copies of a generic or company-specific tank inspection report form
- Copies of API standard 653
- Copies of PHMSA Breakout Tank Inspection Form (Form 10)
- Handouts of the tank inspection procedure outlined in the Trainee Guide
- PHMSA requirements for monthly inspections
- Photographs of conditions found during routine tank inspections
- Copies of Performance Profile sheets

# Lesson Plans for Module CT28\_0-17

## Provide Security for Pipeline Facilities

**Module CT28\_0-17** describes the general procedures for performing security inspections, visual facility inspections, and building inspections for pipeline facilities. While inspection procedures for each company may vary, the purpose of all inspections is to ensure the safety of the entire pipeline facility.

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### Objectives

#### Learning Objective 1

1. Describe how to provide security to pipeline facilities.
  - a. Identify pipeline facility security requirements.
  - b. Explain how to safely perform a security inspection.

#### Learning Objective 2

2. Describe the procedures used to provide security to pipeline facilities (CT28\_0-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with providing security to a pipeline facility.
  - b. Describe the general procedure used to provide security to a pipeline facility.

### Performance Task

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

1. Provide security for pipeline facilities (CT28\_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.
  - Deactivate the security alarm prior to entering the pipeline facility, if applicable, and notify appropriate personnel prior to entering a remotely monitored pipeline facility.
  - Inspect the pipeline facility perimeter.
  - Inspect all locks for possible damage and ensure that locks are in working order.
  - Inspect signage for proper placement, visibility to the public, and legible and correct information.
  - Inspect local monitoring devices (motion sensors, alarms, and cameras) for operability, damage, or required maintenance.
  - Test intrusion devices to ensure operability.
  - Perform repairs to facility security equipment as appropriate or prepare a facility repair order.
  - Reactivate facility security system or notify appropriate personnel upon leaving remotely monitored facilities.
  - Verify closure to prevent call-out.
  - 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 PowerPoint® presentation), 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 inspect a facility building. 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
- CT28\_0-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing proper procedures for security and facility inspections (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT32\_0-17

## Observation of Excavation Activities

**Module CT32\_0-17** describes the responsibilities of the designated observer/spotter prior to the start of an excavation project as well as during the excavation itself. It addresses the permits, notifications, and line locating that must be completed before excavation, excavation hazards and associated safety regulations, excavation tools, sloping techniques and soil types, pipeline support methods, and the abnormal operating conditions that may occur during an excavation.

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### Objectives

#### Learning Objective 1

Describe the tasks required of the designated excavation observer/spotter that must occur before excavation begins.

- a. Describe the appropriate permits and notifications required before excavation begins.
- b. Describe the pipeline marking process that must be completed before excavation begins.
- c. Describe the clearance requirements for underground pipelines.
- d. Explain the Occupational Safety and Health Administration (OSHA) regulations that pertain to excavation.

#### Learning Objective 2

Describe the tasks required of the designated excavation observer/spotter during an excavation.

- a. Explain the dangers associated with excavation.
- b. Identify the tools used for excavation and the appropriate use for each.
- c. Describe the technique of sloping during excavation work.
- d. Identify methods used to protect the pipeline during excavation.

#### Learning Objective 3

Describe the procedures for measuring pipe clearance and observing an excavation (CT32\_0-17).

- a. Identify the prerequisites, competencies, and abnormal operating conditions associated with observation of excavation activities.
- b. Describe the general procedures for measuring pipe clearance.
- c. Describe the general procedures for observing excavation activities.

## Performance Task

### Performance Task 1 (Learning Objective 3)

#### 1. Observe excavation activities (CT32\_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 the control center of the beginning and end of work as required by company procedures.
  - Identify and mark hazards related to the pipeline that surround the excavation site (including underground hazards such as appurtenances to the pipeline).  
Determine the method of installation for the pipe or foreign structure. If the directional drilling or boring method was used, determine the depths of the pipelines or other structures and compare the depths to determine clearance.
  - Ensure that the spoil pile is placed in a location that does not affect the integrity of the pipeline.
  - Require proper preparation of mechanical equipment for safe digging around the pipeline.
  - Ensure that soil excavated above, below, or on either side of the pipeline meets the company-specified clearance distance.
  - Require hand or vacuum excavation of the soil nearest the pipeline.
  - Ensure that the pipe is supported as necessary while soil is being removed.
  - Keep area safe from encroachment.  
Verify the excavation is safe to enter.  
If structures are in an open trench, measure the distance between the pipeline and nearest foreign structure.  
Approve the excavation for backfilling by notifying a supervisor, local crew leader, or other appropriate company personnel.
  - 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 PowerPoint® presentation), 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 explain how to serve as a designated observer/spotter at an excavation site. 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/chalkboard
- Markers/chalk
- Pencils and paper
- CT32\_0-17 PowerPoint® Presentation
- Computer
- Vendor-supplied videos/DVDs showing excavating (*optional*)
- TV/DVD player
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Sample One-Call ticket
- Tolerance zone information for the state in which the training takes place
- Sample forms for excavation documentation
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT34\_0-17

## Inspect Existing Pipe Following Movement

**Module CT34\_0-17** describes the processes and general procedures for inspecting existing pipe following movement.

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### Objectives

#### Learning Objective 1

1. Explain the process for inspecting existing pipe following movement.
  - a. Explain the purpose and procedures for inspecting existing pipe.

#### Learning Objective 2

2. Describe the procedure used to inspect pipe following movement (CT34\_0-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with pipe inspection following movement.
  - b. Describe the procedure used to inspect pipe following movement.

### Performance Task

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

1. Inspect existing pipe following movement (CT34\_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.
    - Visually inspect entire length of exposed pipeline to ensure there are no wrinkles, gouges, or other apparent physical damage.
    - Visually inspect entire length of exposed pipeline to ensure the coating has not been damaged during the move.
    - Inspect ditch and backfill spoil to ensure materials capable of damaging the coating are not present.
    - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## **Safety Considerations**

This module may require trainees to work in the vicinity of functioning 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
- CT34\_0-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (optional)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Copies of your company's inspection documentation
- Alignment sheet/strip maps
- Copies of your company's procedures for inspecting pipe following movement and/or copies of Covered Task Performance Verification CT34\_0-17
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT37\_0-17

## Install or Repair Support Structures on Existing Aboveground Components

**Module CT37\_0-17** describes the general procedures for installing or repairing pipeline support structures on existing aboveground components.

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### Objectives

#### Learning Objective 1

1. Describe pipeline repair criteria.
  - a. Identify pipeline repair standards.
  - b. Identify pipe support structures and components.

#### Learning Objective 2

2. Describe how to repair or install support structures (CT37\_0-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with repairing or installing support structures.
  - b. Describe the procedure for repairing or installing support structures.

### Performance Task

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

1. Repair or install support structures on existing aboveground components (CT37\_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.
  - Determine proper construction, spacing, and design of pipe support, including support structure foundation in accordance with company practice, standards or engineering design.
  - Obtain proper tools and equipment to complete the installation.
  - Install temporary support (if applicable).
  - Lower internal pipe pressure to 50% of maximum operating pressure if pipe movement is required.
  - Lift pipe with a jack using pipe protective device (pipe saddles) and hoist with proper rigging techniques or another appropriate lift technique (if applicable).
  - Remove existing pipe support (if applicable).
  - Perform a pipe wall inspection, and measure pipe wall thickness, if applicable.
  - Repair pipe support in accordance with company practice, standards, or engineering design (if applicable).
  - Install repaired or replacement support and insulator.
  - Lower pipe to desired position and remove temporary pipe support (if applicable). Adjust support height to insure a level pipe run (if using adjustable support).
  - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees use welding equipment, operate hand-operated and powered cutting devices, and work around pipelines that may contain hazardous product. 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
- CT37\_0-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Construction-grade silicone sealant
- Copies of the contact information for your local One-Call notification center
- Copy of a permanent repair report
- Damage-prevention sliders
- Hoist with proper rigging (*optional*)
- Leveling tools
- Pipe supports
- Protective devices such as pipe saddles
- Sections of pipe, including one or more sections mounted on aboveground support structures
- Copies of Performance Profile sheets

# Lesson Plans for Module CT38\_1-17

## Visually Inspect Pipe and Pipe Components Prior to Installation

**Module CT38\_1-16** describes the purpose of visual inspections, types of visual inspections, and the general procedures for performing a visual inspection of pipe and pipe components prior to installation.

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### Objectives

#### Learning Objective 1

1. Explain the purpose for visually inspecting pipes and pipe components and identify types of visual inspections.
  - a. Explain the purpose for visually inspecting pipe and pipe components.
  - b. Identify and describe the types of visual inspections for pipe and pipe components.

#### Learning Objective 2

2. Describe the procedures used to visually inspect pipes and pipe components prior to installation (CT38\_1-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with visually inspecting pipes and pipe components.
  - b. Describe the general procedures used to visually inspect pipes and pipe components.

### Performance Task

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

1. Visually inspect pipes and pipe components prior to installation (CT38\_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.
  - Inspect pipe and components for corrosion; mechanical defects such as cracks, grooves, gouges, dents, or out-of-round pipe; or coating damage such as cuts, scratches, or holidays.
  - Inspect bends for buckles and/or wrinkles.
  - Ensure that components are rated for the intended service through visual verification of the markings on the pipe and components.
  - Make appropriate notifications to resolve any unsatisfactory conditions.
  - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module may require trainees to work in the vicinity of functioning 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
- CT38\_1-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Hi-Lo gauge
- Borescopes, including flexible fiberscopes with the operator's manuals and interchangeable viewing heads
- Copies of the operator's manual for a borescope
- Copies of your company's inspection documentation
- Holiday detector
- Copies of the Performance Profile sheets

# Lesson Plans for Module CT39\_0-17

## Backfilling a Trench Following Maintenance

**Module CT39\_0-17** This module describes the tasks involved in properly backfilling a trench after maintenance has been completed on a pipeline.

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### Objectives

#### Learning Objective 1

1. Identify and describe the safety considerations and tasks involved in backfilling a trench following maintenance.
  - a. Identify the potential hazards associated with excavation sites and the associated Occupational Safety and Health Administration (OSHA) regulations.
  - b. Explain the visual inspection and preparation of fill material.
  - c. Explain methods used to support pipe during backfilling.
  - d. Explain the process of placing bedding.
  - e. Explain the process of compacting soil.

#### Learning Objective 2

2. Describe the requirements and procedures for safely backfilling a trench following maintenance (CT39\_0-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with safely backfilling a trench following maintenance.
  - b. Describe the general procedure used to safely backfill a trench following maintenance.

### Performance Tasks

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

1. Backfill a trench following maintenance (CT39\_0-17).
  - 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 (PPE) according to relevant company procedures.
  - Identify foreign objects that could damage the pipeline system.
  - Perform a visual inspection of backfill material, using a shovel or other tool to spot check backfill material.
  - Take appropriate action to remove foreign material or objects. In regard to safety, beware of trenching and excavation hazards.
  - Identify unsuitable backfill material around the pipeline. Soft material must be used near the coating. Replace if de-rocking is not feasible, or if backfill contains too much brush, roots, or other foreign material to remove cost-effectively.
  - Place suitable backfill material within six inches of pipe or within the distance specified by company policy, whichever is greater.
  - Demonstrate ability to compact soil for proper pipe support, size of support, and spacing of support. Use tamping tool, backhoe, or any other required tools to compact soil.
  - 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](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 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/chalkboard

Markers/chalk

Pencils and paper

*Pipeline Maintenance* PowerPoint® Presentation Slides

Computer

Copies of the Module Examination and Performance Profile Sheets

Vendor-supplied videos/DVDs showing backfilling (*optional*)

TV/DVD player

# Lesson Plans for Module CT52\_1-17

## Conduct Vegetation Survey

Module CT52\_1-17 describes leakage survey requirements for gas pipelines, and presents the general procedures for conducting a vegetation survey.

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### Objectives

#### Learning Objective 1

1. Describe the factors that impact leakage survey frequency.
  - a. Describe the factors that impact leakage survey frequency.

#### Learning Objective 2

2. Describe procedures for conducting a vegetation survey on gas pipelines (CT52\_1-17).
  - a. Describe the prerequisites, competencies, and abnormal operating conditions associated with conducting a vegetation survey.
  - b. Describe the procedures for conducting a vegetation survey.

### Performance Task

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

1. Conduct a vegetation survey (CT52\_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.
    - Identify the portion of the pipeline system to be surveyed to ensure that the intended system is the one that will be surveyed.
    - Ensure that you understand the growth characteristics of the local plants so that you can correctly identify a plant problem that is caused by a natural gas leak.
    - Locate the centerline of the pipeline being surveyed to ensure that the area immediately above the pipe is surveyed. Use a calibrated line locator if necessary.
    - Visually survey the surface conditions over the pipeline, looking for signs of abnormal changes in vegetation growth to identify possible points of natural gas leakage. Also look for changes in the soil condition, unusual sounds, or concentrations of insects, which may indicate the presence of a leak.
    - If a leak is detected, attempt to pinpoint the source of the leak to further determine the severity.
    - If the appropriate leakage detection equipment is available, calibrate the instrument before using. Classify the leak based on the percentage of gas, volume, and location per company leak grading criteria. If the leak classification is serious, follow company procedures.
    - 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](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; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees survey a pipeline for leaks. 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
- CT52\_1-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Pens and notebooks
- Electronic pipe locator
- Google Maps satellite maps of different class locations
- Copies of company's policies and procedure for responding to gas leaks
- Access to pipeline right-of-way to conduct survey
- Copies of Performance Profile sheets

# Lesson Plans for Module CT52\_2-17

## Conduct a Leak Survey With a CGD

**Module CT52\_2-17** describes parameters for performing post-blasting leak surveillance. It also describes procedures for conducting a leak survey, and explains how to use a combustible gas detector (CGD) to pinpoint leaks along the pipeline route.

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### Objective

#### Learning Objective 1

1. Describe the purpose and procedures for conducting a leak survey on gas pipelines.

#### Learning Objective 2

2. Describe procedures for conducting a leak survey with a combustible gas detector (CGD) on a gas pipeline (CT52\_2-17).
  - a. Identify prerequisites and competencies associated with surveying with a CGD.
  - b. Identify abnormal operating conditions associated with surveying with a CGD.
  - c. Explain the procedures for surveying with a CGD.

### Performance Task

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

1. Conduct a leak survey with a CGD (CT52\_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.
    - Identify the portion of the pipeline system to be surveyed.
    - Locate the centerline of the pipeline to be surveyed.
    - Determine what equipment is needed for the survey, and turn on and calibrate any instruments to be used.
    - Survey in available openings along pipeline ROW and pinpoint leaks when leak indications are found.
    - Classify the grade of the leak following company criteria.
    - If leak is classified as the most serious, follow company response procedures.
    - 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](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; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees survey a pipeline for leaks. 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
- CT52\_2-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing leak survey techniques (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Combustible gas detector and manufacturer's instructions
- Pens and notebooks
- Electronic pipe locator
- Copies of Performance Profile sheets

# Lesson Plans for Module CT52\_3-17

## Conduct a Leak Survey with a Flame Ionization Unit

Module CT52\_3-17 describes leakage survey requirements for gas pipelines and presents the general procedures for conducting a leak survey with a flame ionization unit.

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### Objectives

#### Learning Objective 1

1. Describe the factors that impact leak survey frequency.

#### Learning Objective 2

2. Describe procedures for conducting a leak survey with a flame ionization unit (CT52\_3-17).
  - a. Describe the prerequisites, competencies, and abnormal operating conditions associated with conducting a leak survey with a flame ionization unit.
  - b. Describe the flame ionization unit leak survey procedure.

### Performance Task

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

1. Conduct a leak survey with a flame ionization unit (CT52\_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.
    - Identify the portion of the pipeline system to be surveyed and locate the centerline.
    - Determine what equipment is to be used with the survey.
    - Turn on and calibrate the instrument to be used, if necessary.
    - For a walking survey, check in available openings along pipeline right-of-way (ROW), including bar holes.
    - For a driving survey, drive the survey vehicle at the speed recommended by company procedures.
    - Pinpoint leaks when leak indications are found and classify the grade of the leak following company criteria.
    - If leak is classified as the most serious, follow company response procedures.
    - 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](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; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees survey a pipeline for leaks. 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
- CT52\_3-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Pens and notebooks
- Electronic pipe locator
- Flame ionization unit and instruction manual
- Copies of company's policies and procedure for responding to gas leaks
- Access to pipeline right-of-way to conduct survey
- Copies of Performance Profile sheets

# Lesson Plans for Module CT59\_0-17

## Vault Maintenance

**Module CT59\_0-17** identifies safety requirements and hazards of confined-space entry, and presents the general procedures for performing vault inspections and maintenance.

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### Objectives

#### Learning Objective 1

1. Explain the hazards associated with confined-space entry.
  - a. Identify the types of confined spaces.
  - b. Explain the use of ventilation in confined spaces.
  - c. Explain the hazards associated with flammable atmospheres.
  - d. Explain the hazards associated with toxic atmospheres.
  - e. Explain the hazards associated with irritant atmospheres.
  - f. Explain the hazards associated with asphyxiating atmospheres.
  - g. Explain other general/physical hazards encountered during confined-space entry.

#### Learning Objective 2

2. Explain the requirements for confined-space entry.
  - a. Explain the permits required for confined-space entry.
  - b. Explain the safety requirements for confined-space entry.
  - c. Explain the duties and responsibilities of personnel required for confined-space entry.
  - d. Explain the emergency preparation required for confined-space entry.

#### Learning Objective 3

3. Explain how to perform vault maintenance (CT59\_0-17).
  - a. Explain safety requirements for vault inspections.
  - b. Explain vault inspection procedures.

### Performance Task

#### Performance Task 1 (Learning Objective 3)

1. Perform vault maintenance (CT59\_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.
    - Test the atmosphere around the vault for the presence of a flammable or toxic atmosphere.
    - Before entry, test the atmosphere at various locations inside the vault for a flammable or toxic atmosphere before removing the vault cover.
    - Enter the vault and inspect for any physical damage to the piping leaving or entering the vault.
    - If applicable, inspect the vault ventilation equipment for proper operation.
    - Inspect the vault for proper ventilation.
    - Inspect the vault cover for adequate load support.
    - 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](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; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees enter confined spaces and maintain vaults. 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
- CT59\_0-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing confined-space entry and vault inspections (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Copies of OSHA Publication No. 3138
- Duct tape
- Empty 2-liter plastic bottles
- Portable equipment, such as fans or power tools
- Small fan
- Smoke source
- Tape measure
- Utility knife
- Ventilation system (air mover, hose)
- Blank confined-space entry permits
- Copy of your company's confined-space written plan
- Safety data sheets (SDSs) for variety of substances or chemicals
- Combustible-gas indicator (CGI)
- Vault
- Copies of Performance Profile sheets

# Lesson Plans for Module CTCC-17

## Cold Cutting

**Module CTCC-17** describes the safety requirements and tools used for cold cutting. It also presents the general procedures used to drain a pipe, perform cold cutting, replace the pipe, and fill the line.

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### Objectives

#### Learning Objective 1

1. Explain the safety requirements and identify tools used for cold cutting.
  - a. Explain the safety requirements for cold cutting.
  - b. Identify the tools used for cold cutting.

#### Learning Objective 2

2. Describe how to drain a pipe before performing cold cutting.
  - a. Describe how to estimate drain volumes.
  - b. Describe the procedure for draining a pipe.

#### Learning Objective 3

3. Describe the procedure used to perform cold cutting of pipe (CTCC-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with cold cutting.
  - b. Describe the procedure used to perform cold cutting.
  - c. Describe the procedure for replacing pipe.
  - d. Describe the procedure for line filling.

### Performance Task

#### Performance Task 1 (Learning Objective 3)

1. Cold cut pipe according to your instructor's specifications (CTCC-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.
    - Determine where the cold cut(s) will be made on the pipe, allowing extra pipe for hot cuts and fit-up.
    - Remove the pipeline coating, and clean the immediate area.
    - Install bonding cables between the upstream and downstream pipe sections.
    - Mount the cutter on the pipeline and cold cut the pipe. When the cut is complete, remove the cutter.
    - Complete the draining if there is any product remaining in the pipe, and make additional cuts as necessary to remove the pipe section.
    - Roll or lift the pipe out of position, remove the bonding cables, and remove the pipe from the area.
    - File sharp edges of the pipe, or cover with a split rubber hose to prevent lacerations.
    - 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](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; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees work with hand-operated and powered cutting tools, and may require them to work near high-pressure systems and ignition hazards. 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
- CTCC-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing cold cutting safety and techniques (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Atmospheric multigas monitors and manufacturers' operating instructions
- Bonding cables
- Copies of a chart showing American Wire Gauge diameters
- Copies of a safety data sheet (SDS) for cutting liquid
- Manual and pneumatic rotary pipe cutters and operator's manuals
- Powered wheel cutter and operator's manual
- Sections of pipe
- Copies of a draining plan
- Copies of your company's fire safety procedures
- Cutting liquid
- Grounding clamps
- Magnets
- Oxyacetylene torch and igniter
- Copies of Performance Profile sheets

# Lesson Plans for Module CTFB-17

## Flange Bolting

**Module CTFB-17** describes how to join pipe segments using flange fittings, as well as how to store and protect components prior to joining.

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### Objectives

#### Learning Objective 1

1. Describe the proper way to store and protect pipe and fittings.
  - a. Describe the proper way to store pipe and materials.
  - b. Describe the proper way to protect pipe and fittings.

#### Learning Objective 2

2. Identify and describe the flanges used in pipeline applications.
  - a. Identify and describe types of flanges.
  - b. Identify and describe types of flange facings.

#### Learning Objective 3

3. Identify and describe types of flange gaskets and gasket materials.
  - a. Identify and describe types of flange gaskets.
  - b. Identify and describe gasket materials.

#### Learning Objective 4

4. Explain the procedures for installing pipe flanges.
  - a. Explain the basic techniques involved in torquing and tensioning.
  - b. Explain the preparation and procedures involved in installing gaskets.
  - c. Explain the preparation and procedures involved in tightening flanges.

#### Learning Objective 5

5. Describe the procedures used to perform flange bolting/assembly (CTFB-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with flange bolting/assembly.
  - b. Describe the procedures used to perform flange bolting/assembly.

## Performance Task

### Performance Task 1 (Learning Objective 5)

1. Perform flange bolting/assembly (CTFB-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.
    - Ensure that the proper tools, materials, and equipment are present and that tools are in good working order.
    - Verify ANSI ratings of materials, as specified.
    - Inspect and prepare facing of the flange.
    - Inspect and clean threads on nuts and bolts.
    - Insert lineup pins to align flanges.
    - Place two bolts in bottom part of flange and drop in gasket.
    - Install remaining bolts and hand tighten nuts.
    - Verify proper flange tightening sequence and tightening procedure to attain specified torque and tighten accordingly.
    - Bolt up the flange to attain specified torque and tighten accordingly.
    - 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](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; performance testing is graded pass or fail.

### Safety Considerations

This module requires that trainees perform welding, use power torquing and tensioning tools, and potentially work in hazardous atmospheres that include asbestos. 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  
CTFB-17 PowerPoint® Presentation  
DVD player  
Vendor-supplied videos/DVDs showing techniques for joining pipe segments using flange fittings  
(*optional*)  
LCD projector and screen  
Computer  
Internet access during class (*optional*)  
Module Review answer key  
Module Examinations  
Specific PPE required by the site  
Copies of a bolt chart  
Copies of excerpts from the latest edition of ANSI/ASME standard B16.5,  
*Pipe Flanges and Flanged Fittings*, covering:  
• Flange faces and flange facing finishes  
• Primary pressure ratings  
Copies of manufacturers' instructions for torquing and tensioning tool(s) used in your company  
for handling fasteners and nuts on pipelines  
Copies of your company's asbestos abatement procedures  
Copies of your company's policies and procedures for storing and protecting pipe and materials  
Copies of your company's procedures for performing flange bolting/assembly  
Disk fasteners such as straps, bolts, and clips  
Drive ratchets  
Fastener lubrication  
Fasteners  
Flange fasteners  
Flange tightening tools, such as wrenches, drift and line up pins, and sockets  
Multifunctional hydraulic or pneumatic torquing and tensioning tools  
Ohmmeter  
Prefabricated insulated flange  
Protective disks made of various materials  
Sections of flanged pipe, including with and without threaded ends  
Thread protectors, such as press-on plastic and light metal caps  
Copies of the Performance Profile sheets

# Lesson Plans for Module CTMP-17

## Mud Plugging

**Module CTMP-17** describes the vapor-isolation method known as mud plugging. The general procedures for safely and properly mixing the mud, forming the mud balls, and installing the mud plug is presented in this module.

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### Objectives

#### Learning Objective 1

1. Explain the proper procedures for preparing the mud mixture.
  - a. Explain how to determine the Bentonite-to-water ratio.
  - b. Explain how to mix the mud and form the mud balls.
  - c. Explain how to store the mud balls properly.

#### Learning Objective 2

2. Describe the procedures used to form and install a mud plug (CTMP-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with installing a mud plug
  - b. Describe the procedures used to install a mud plug.

### Performance Task

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

1. Form and install a mud plug (CTMP-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.
  - Prepare the mud balls.
  - Monitor the inside of the pipe and surrounding area for hazardous vapors.
  - Clean the interior of the pipe.
  - Determine the starting point of the mud plug inside the pipe.
  - Mark the beginning and ending point of the mud plug.
  - Create an initial ring of mud balls around the inside perimeter of the pipe.
  - Working toward the pipe opening, continue packing mud balls into the pipe in a series of rings until the desired length of the mud plug is reached.
  - Perform atmospheric testing at the pipe opening with a multi-gas monitor.
  - Check upstream vents to make sure they are open and free of product.
  - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

## Safety Considerations

This module requires that trainees properly form and install a mud plug. 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
- CTMP-17 PowerPoint® Presentation
- DVD player
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- 3.75 gallons of water
- 31.25 lbs of Bentonite
- Baseball
- Clean bucket, washtub, or wheelbarrow
- Cooler
- Dusk mask
- Eye protection
- Hand protection
- Measuring utensils
- Scale
- Spade
- Three-foot section of 10-inch pipe
- Copies of the Performance Profile sheets

# Lesson Plans for Module CTTB-17 Tubing

**Module CTTB-17** describes the sizes and types of tubing commonly used in pipeline maintenance, and the safe and proper way to store and handle tubing. The general methods and procedures for cutting, bending, joining, and installing tubing are presented.

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## Objectives

### Learning Objective 1

1. Describe the general properties of tubing and explain the proper and safe methods of storing and handling tubing.
  - a. Describe the properties and advantages of tubing.
  - b. Describe sizing measurements.
  - c. Describe tubing materials used in the pipeline industry.
  - d. Describe tubing standards and specifications.
  - e. Explain the proper and safe methods for storing tubing.
  - f. Explain the proper and safe methods for handling tubing.

### Learning Objective 2

2. Describe the procedures and components used in tubing fabrication.
  - a. Describe the tools and methods used to cut tubing.
  - b. Describe the tools and methods used to bend tubing.
  - c. Describe the tools and methods used to connect tubing.

### Learning Objective 3

3. Describe the procedures used to inspect, install, and test tubing (CTTB-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with installing tubing.
  - b. Describe the procedures used to inspect, install, and test tubing.

## Performance Task

### Performance Task 1 (Learning Objective 3)

1. Install tubing (CTTB-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.
    - Inspect the tubing and components prior to installation.
    - Install the tubing, providing support as needed.
    - Perform a gap inspection test.
    - Perform a leak and pressure test.
    - 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 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% or above for the Module Examination; performance testing is graded pass or fail.

### Safety Considerations

This module requires that trainees properly install tubing with associated fittings and supports. 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
- CTTB-17 PowerPoint® Presentation
- DVD player
- Vendor-supplied videos/DVDs showing the cutting, bending, installation, and inspection of tubing (*optional*)
- LCD projector and screen
- Computer
- Internet access during class (*optional*)
- Module Review answer key
- Module Examinations
- Specific PPE required by the site
- Compression-type hand bender
- Different types and sizes of tubing cutters and reamers
- Examples of good and poor tubing bends
- Examples of various types of fittings, including flare, compression, socket-welded, and butt-welded
- Gap inspection gauge
- Hat or cloth bag
- One-inch diameter tubing or smaller
- Pre-swaging tool
- Rule, outside caliper, or vernier caliper
- Sharp pencil, colored felt-tip pen, or silver marking pencil
- Small brush
- Soap solution
- Various types and sizes of tubing
- Wrench
- Copies of the Performance Profile sheets

# Lesson Plans for Module CTPP-17

## Threaded Pipe Fabrication

**Module CTPP-17** describes the materials used in threaded piping systems. It presents the general procedures for determining pipe lengths between threaded pipe fittings, preparing the pipe and fittings for fit-up, and assembling the piping system.

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### Objectives

#### Learning Objective 1

1. Describe the materials used in threaded pipe systems.
  - a. Describe the types of pipe used in threaded pipe systems.
  - b. Explain the sizing of pipe used in threaded pipe systems.
  - c. Identify schedules and wall thicknesses of pipe used in threaded pipe systems.
  - d. Explain pipe threads used in threaded pipe systems.

#### Learning Objective 2

2. Identify and explain the purpose of pipe fittings.
  - a. Identify and explain the purpose of elbows, offsets, and return bends.
  - b. Identify and explain the purpose of branch connections.
  - c. Identify and explain the purpose of caps and plugs.
  - d. Identify and explain the purpose of line connections.
  - e. Identify and explain the purpose of nipples.
  - f. Identify and explain the purpose of flanges.

#### Learning Objective 3

3. Explain how to determine pipe lengths between fittings.
  - a. Explain how to use the center-to-center method to determine pipe lengths between fittings.
  - b. Explain how to use the center-to-face method to determine pipe lengths between fittings.
  - c. Explain how to use the face-to-face method to determine pipe lengths between fittings.
  - d. Explain how to calculate offsets.

#### Learning Objective 4

4. Explain the processes and tools used to thread and assemble threaded pipe.
  - a. Explain how to cut and ream pipe.
  - b. Explain how to thread pipe manually and by machine.
  - c. Identify types of pipe joint compounds and explain how to use them.
  - d. Explain how to fit screwed pipe and fittings.
  - e. Explain how to install threaded valves.

#### Learning Objective 5

5. Describe the procedures used to thread and fit pipe (CTPP-17).
  - a. Identify the prerequisites, competencies, and abnormal operating conditions associated with threaded pipe fabrication.
  - b. Describe the procedures used to thread and fit pipe.

## Performance Task

### Performance Task 1 (Learning Objective 5)

1. Thread and fit pipe (CTTP-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 type, size, length, and schedule (grade) of pipe.
    - Cut the pipe to the desired length and ream the ends.
    - Thread the pipe.
    - Select the proper size, shape, and type of fittings needed.
    - Clean the pipe and fittings thoroughly.
    - Test fit pipe to assure proper fit and thread compatibility.
    - Apply joint compound or tape to pipe threads.
    - Join piping and fittings as required.
    - 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 PowerPoint® presentation), 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 thread pipe and make up pipe and fittings. 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  
CTTP-17 PowerPoint® Presentation  
DVD player  
Vendor-supplied videos/DVDs showing how to measure pipe length and thread  
and assemble a pipe system (*optional*)  
LCD projector and screen  
Computer  
Internet access during class (*optional*)  
Module Review answer key  
Module Examinations  
Specific PPE required by the site  
Calculators  
Cutting fluid  
Drawings for a pipeline assembly  
Examples of the following items:  
    NPT pipe  
    Branch connections  
    Caps and plugs  
    Elbows, offsets, and return bends  
    Flanges  
    Line connections  
    Nipples  
Framing square  
Makeup charts from various manufacturers  
Manual pipe threader and threading dies  
Pipe cutter  
Pipe dope  
Pipe reamer  
Pipe stands  
Pipe wrenches  
Powered pipe-threading machine, with manufacturer's literature  
PTFE tape  
Rags  
Safety Data Sheets for pipe joint compounds  
Samples of threaded pipe and fittings  
Small brush  
Vise  
Copies of Performance Profile sheets