**Instructor Guide**

Piping

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Overview and Goals

Plastic pipe is often used to transport gas in buried pipeline systems. Plastic pipe is an exceptional value, with strong reliability and long service because of its resistance to corrosion and abrasion, and joint performance.

Plastic pipe is typically installed via direct burial or insertion. Common installation methods include: trenching, plowing, boring, and insertion in a casing or abandoned pipeline. Proper installation is essential to pipeline integrity.

In this unit of work the instructor will:

* Highlight the concepts introduced in the online course.
* Demonstrate how to use the relevant tools and reference guides, applicable to the content and activities.
* Guide the participants through hands-on activities to work safely with natural gas, as a qualified operator would on the job.

Upon completion of this unit of work, participants will be able to:

* Install a plastic pipe in a ditch.
* Install a tracer wire.

Preparation – Facilitation Guidelines

Ensure the participants have completed:

* ASME-0901 Installation of Plastic Pipe in a Ditch, including the pre-test and the 20 question course assessment
* ASME-0941 Install Tracer Wire with Plastic Pipe, including the pre-test and the 20 question course assessment

Conduct this training in a classroom setting, with a simulated lab and/or field site allowing the participants to work independently or in groups (dependent on number of participants) and then present findings to the workshop for further discussion.

Use a flipchart to capture key lessons learned from the group discussions, or to identify questions that will be answered in upcoming units of work or that require further research and discussion.

Reinforce the importance of damage prevention programs and the best practices and guidelines of the Compressed Gas Association (CGA), the Occupational Safety and Health Administration (OSHA), and the Federal Government.

Ensure the participants have a copy of the Common Ground Alliances (CGA) Best Practices guide: <http://www.commongroundalliance.com>

Review the following regulations as tasks are introduced, demonstrated, and practiced.

|  |  |
| --- | --- |
| §192.59 Plastic pipe. | §192.321 Installation of plastic pipe. |
| §192.121 Design of plastic pipe. | §192.513 Test requirements for plastic pipelines |
| §192.123 Design limitations for plastic pipe. | §1926.652 Requirements for protective systems |
| §192.307 Inspection of materials |  |

Materials

Provide the following to each participant:

* A copy of the Activity Worksheets and Appendix 2.
* Access to the Internet, as needed, for OSHA, federal, and industry resources/references supporting course related discussions, demonstrations, and hands-on activities.
* Access to manufacturers’ instructions as needed.

Provide the following materials and tools used locally for the lab demonstrations and hands-on practice:

* Plastic Pipe
* Examples of pipes showing the following methods to join plastic pipes:
  + Conventional socket heat fusion
  + Electrofusion
  + Butt fusion
  + Mechanical joint
* Pipe and tubing cutters
* Protection tools: insulators, casing, shields, and/or spacers
* Examples of “good” backfill
* Examples of “poor” backfill
* Personal Protective Equipment (PPE)

***Note****:**These items, and any other materials used for demonstrations and participant activities, will be determined by the materials and tools used at the training facility.*

Schedule

|  |  |
| --- | --- |
| **Time** | **Topics for Discussion, Demonstrations, and Activities** |
| **30 minutes** | **Introduction**   * Explain that this unit of work focused on installation methods using plastic pipe. * Point out how proper handling can prevent damage, including the impact temperature has on plastic pipe. * Discuss:   + How plastic pipe is stored, transported, and handled.   + Typical trench requirements for plastic pipe installations to avoid pipeline leaks or failures. * Encourage questions based on discussion and online course work. * Present “real-world” examples when plastic pipes are used. * Review:   + The federal regulations and safety procedures to follow during handling and installation of plastic pipe: (§ 192.59, § 192.121, §192.123, and § 192.321).   + OSHA requires employees are trained in the use of the PPE.   ***Note****: The tools, PPE and materials used in the demonstrations will be determined by the materials and tools used at the training facility.* |
| **30 minutes** | **Plastic Pipes-Physical Characteristics**  **Demonstration**  Show participants examples of plastic pipes, and point out the information on the outside of the pipe, for example:   * + The ASTM number   + Outside diameter   + Manufacture, date of manufacturer   + Thickness     - *If the thickness is not printed on the plastic pipe, use a caliper to measure.* |
| **15 minutes** | **Plastic Pipes-Cutting Plastic Pipe**  **Demonstration**  Show participants how to cut plastic pipe.   * Cut pipe ends square and remove any sawdust.   + Be sure to go over the tools used and reinforce tool safety. |
| **15 minutes** | **Plastic Pipes—Examples of Joined Pipes**  **Demonstration**  Show participants examples of pipes that have been joined by using:   * Conventional socket heat fusion * Electrofusion * Butt fusion * Mechanical joint |
| **Time** | **Topics for Discussion, Demonstrations, and Activities** |
| **30 minutes** | **Plastic Pipes—Installation**  **Discussion/Demonstration**  If there is a lab set up, or a field lab, walk with the participants and point out:\*   * Pipe stringing, emphasizing how to minimize stress on the pipes. * Pipe installation and how the service line is graded. * Show how pipes are lowered into the trench using padded calipers and/or nylon slings. * Point to the separation between lines and how the separations are protected, for example: insulators, casing, shields, and spacers. * Backfill used and backfill cover requirements for service lines and an underground main.   Show participants:   * How to run a test for pressure (follow guidelines §192.123, company guidelines and best practices using the local tools and materials. * Examples of completed documents detailing the plastic pipe install.   *\*If there is no field lab, review the online content to ensure the participants are fully aware of the factors that must be managed during plastic pipe installation.*  Instruct participants to complete **Activity Worksheet #1.** |
|  | **Tracer Wire**  **Discussion**  Review the features and characteristics of tracer wire: what it is made of why it is used, and how it works (while reinforcing installation requirements and federal regulations).   * Present real-world, on-the-job experiences about using tracer wire: * Highlight and encourage “what if” discussions if a tracer wires is not used. * Explain why a tracer wire could not be located inductively. * Show examples of tracer materials and the tracer wire jacket and explain why these materials are used. * Review placement of tracer wire and characteristics when installing tracer wire using:   + Open trench installation   + Bore installation   + Plow-in/planting installation |
|  | **Tracer Wire**  **Demonstration**  Demonstrate, using the correct tools and PPE, how to:   * Strip insulation from wire ends. * Splice the tracer wire to the service line wire. * Attach the tracer wire. * Make sure the copper wire does not contact the riser and do not leave wires exposed. |

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| **Time** | **Topics for Discussion, Demonstrations, and Activities** |
|  | **Tracer Wire**  **Demonstration**  Demonstrate using the correct tools and PPE how to:   * Secure the tracer wire at an appropriate distance from the plastic pipe; no bare tracer wire is exposed * Test the continuity of the tracer wire, and repair if it is not continuous. * Reinforce company guidelines and practices relevant to the job, natural gas safety, local, state and federal regulations. * Address through the demonstration how to watch for and manage any potential problems and/or AOCs. * Reinforce the importance that maintenance records and repairs must be maintained throughout the life of the pipeline.   Instruct participants to complete **Activity Worksheet #2.** |

Boot Camp Activities

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Answer the following questions and complete the tasks, according to the materials, equipment, and manufacturers’ instructions used.   |  |  | | --- | --- | | Activity Worksheet #1- Installation of Plastic Pipe in a Ditch | | | Lab | * Use the materials provided and refer to **Appendix 1**-Performance Checklist –Installation of Plastic Pipe in a Ditch   + Perform the tasks.   + Identify the materials, tools and instructions used to complete the task(s).   + Answer any question presented. * Take notes in the sections below (as needed). * Be prepared to participate in workshop discussions. | | Tools used  PPE |  | |  | |  | |  | | Steps -actions |  | |  | |  | |  | | References/Guidelines including:   * Industry sources * Online course materials * CFR   Indicate, if applicable, measures that appear to be a potential problem and or an abnormal operating condition (AOC). |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | Lessons learned |  | |  | |  | |  | |  | | General discussion questions or notes |  | |  | |  | |  |  |  |  | | --- | --- | | Activity Worksheet #2- Installation a Tracer Wire | | | Lab | * Use the materials provided and refer to **Appendix 2**-Performance Checklist –Install a Tracer Wire.   + Perform the tasks.   + Identify the materials, tools and instructions used to complete the task(s).   + Answer any question presented. * Take notes in the sections below (as needed). * Be prepared to participate in workshop discussions. | | Tools used  PPE |  | |  | |  | |  | | Steps -actions |  | |  | |  | |  | | References/Guidelines including:   * Industry sources * Online course materials * CFR   Indicate, if applicable, measures that appear to be a potential problem and or an abnormal operating condition (AOC). |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | |  | | Lessons learned |  | |  | |  | |  | |  | |  | |  | |  | | General discussion questions or notes |  | |  | |  | |  | |  |

# Appendix 1

Appendix 1–Performance Checklist– Install Plastic Pipe in a Ditch (Instructor)

Answer the following questions and complete the tasks, according to the materials, equipment, and manufacturers’ instructions used.

Participants will complete the task(s) and answer the question(s). When finished, provide appropriate feedback.

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| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Identify information on the pipe you are given to examine. | What does the information printed on the pipe mean?  If the thickness is not printed on the pipe, what tools do you use to get the measurement? | *Answers should include:*   * *Pipe material* * *ASTM number* * *Outside Diameter (OD)* * *Manufacturer* * *Date of Manufacturer* * *Thickness*   *Answer: Caliper* |
| 2 | Cut a plastic pipe. | What tools do you use to cut a plastic pipe? | |  | | --- | | *Successful Y/N* | |  | |
| 3 | Types of joints. | * Look at examples (A, B, C, and D). * Identify the type of joint * Identify the method used to make the joint.  |  |  | | --- | --- | | Type of joint | Method used | |  |  | |  |  | |  |  | |  |  | | |  |  | | --- | --- | | *Type of joint* | *Method used* | | 1. *Butt* |  | | 1. *Mechanical* |  | | 1. *Socket* |  | | 1. *Saddle* |  | |
| 4 | Lower and protect pipes. | In a lab environment:   1. Lower pipes into a trench. 2. Protect the separation.  |  | | --- | | What tools did you use? | |  | |  | | Any comments/notes about the backfill? | |  | |  | | |  |  | | --- | --- | | **Steps** | **Successful Y/N** | | 1. *Lower with calipers or nylon slings.* |  | | 1. *Identified separation between lines* |  | | 1. *Protected the separation with insulators, casing, shields, and or spacers* |  | | 1. *Ensure all safety guidelines/mfg. instructions have been followed.* |  | |
| 5 | Run a pressure test. | * List the steps you took in the chart below to run a pressure test. * Use the tools, materials, manufacturer’s instructions, and best practice guidelines typically used on the job.  |  |  | | --- | --- | | Steps | Notes | |  |  | |  |  | |  |  | |  |  |   Indicate:   * The tools used. * Any problems and/or AOCs as the process are completed. * Job specifications/company policies, and procedures that are relevant to this task | |  |  | | --- | --- | | **Steps** | **Successful Y/N** | | 1. *Consult job specifications/company policies, and procedures.* |  | |  |  | |  |  | |  |  | |

Appendix 1–Performance Checklist–Install a Tracer Wire (Instructor)

Answer the following questions and complete the tasks, according to the materials, equipment, and manufacturers’ instructions used.

Participants will complete the task(s) and answer the question(s). When finished, provide appropriate feedback.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Strip and attach a tracer wire. | * List the steps you took in the chart below to strip a wire. * Use the tools, materials, manufacturer’s instructions and best practice guidelines typically used on the job.  |  |  | | --- | --- | | Steps | Notes | |  |  | |  |  | |  |  |   Indicate:   * The tools used. * Any problems and/or AOCs as the process are completed. * Job specifications/company policies and procedures that are relevant to this task. | |  |  | | --- | --- | | **Steps** | **Successful Y/N** | | 1. *Strip insulation from wire ends.* |  | | 1. *Splice the tracer wire to the service line wire.* |  | | 1. *Attach the tracer wire.* |  | | *Make sure the copper wire does not contact the riser and do not leave wires exposed.* | | |
| 2 | Secure and test a tracer wire. | In a lab environment:   * Using the correct tools and PPE secure and test a tracer wire. * What tools did you use? | |  | | --- | | Successful Y/N | |  | |

# Appendix 2

Appendix 2–Performance Checklist– Install Plastic Pipe in a Ditch

Answer the following questions and complete the tasks, according to the materials, equipment, and manufacturers’ instructions used.

Complete the task(s) and answer the question(s). The instructor will provide appropriate feedback.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Identify information on the pipe you are given to examine. | What does the information printed on the pipe mean?  If the thickness is not printed on the pipe, what tools do you use to get the measurement? |  |
| 2 | Cut a plastic pipe. | What tools do you use to cut a plastic pipe? |  |
| 3 | Types of joints. | * Look at examples (A, B, C, and D). * Identify the type of joint * Identify the method used to make the joint.  |  |  | | --- | --- | | Type of joint | Method used | |  |  | |  |  | |  |  | |  |  | |  |
| 4 | Lower and protect pipes. | In a lab environment:   1. Lower pipes into a trench. 2. Protect the separation.   What tools did you use?  Any comments/notes about the backfill?   |  | | --- | | What tools did you use? | |  | |  | | Any comments/notes about the backfill? | |  | |  | |  |
| 5 | Run a pressure test. | * List the steps taken in the chart below to run a pressure test. * Use the tools, materials, manufacturer’s instructions, and best practice guidelines typically used on the job.  |  |  | | --- | --- | | Steps | Notes | |  |  | |  |  | |  |  | |  |  |   Indicate:   * The tools used. * Any problems and/or AOCs as the process are completed. * Job specifications/company policies and procedures that are relevant to this task. |  |

Appendix 2–Performance Checklist–Install a Tracer Wire

Answer the following questions and complete the tasks, according to the materials, equipment, and manufacturers’ instructions used.

Complete the task(s) and answer the question(s). The instructor will provide appropriate feedback.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Question** | **Answers** |
| 1 | Strip and attach a tracer wire. | * List the steps you took in the chart below to strip a wire. * Use the tools, materials, manufacturer’s instructions and best practice guidelines typically used on the job.  |  |  | | --- | --- | | Steps | Notes | |  |  | |  |  | |  |  |   Indicate:   * The tools used. * Any problems and/or AOCs as the process are completed. * Job specifications/company policies and procedures that are relevant to this task. |  |
| 2 | Secure and test a tracer wire. | In a lab environment:   * Using the correct tools and PPE secure and test a tracer wire. * What tools did you use? |  |