**Instructor Guide**

Valves

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Goals

Valves are mechanical devices used extensively in pipeline transmission, distribution, and storage facility systems to interrupt, divert, or regulate the flow of product.

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:

* Identify the types of valves
* Identify valve parts (also referred to as components)
* Manually open and close valves
* Identify maintenance requirements and process
* Verify valve identification
* Perform maintenance and lubrication procedures
* Discuss the importance of preventive maintenance and general measures followed

Preparation and Facilitator Guidance

Ensure the participants have completed:

* ASME – 0301 Manually Opening and Closing Valves, including the pre-test and 10 question course assessment.
* ASME – 0321 Valve Corrective Maintenance, including the pre-test and 20 question course assessment.
* ASME – 0331 Valve‐Visual Inspection and Partial Operation, including the pre-test and 10 question course assessment.
* ASME – 0341 Valve – Preventive Maintenance, including the pre-test and 10 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 the 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.

* §192.145 Valves.
* §192.179 Transmission line valves.
* §192.181 Distribution line valves.
* §192.193 Valve installation in plastic pipe.
* §192.365 Service lines: Location of valves.
* §192.381 Service lines: Excess flow valve performance standards.
* §192.615 Emergency plans.
* §192.625 Odorization of gas.
* §192.745 Valve maintenance: Transmission lines.
* §192.747 Valve maintenance: Distribution systems.
* §195.116 Valves.
* §195.258 Valves: General.
* §195.260 Valves: Location.
* §195.420 Valve maintenance.

Materials

Provide the following to each participant:

* A copy of the Activity Worksheets, Appendix 2 Performance Checklists, and the Valve Job Aid.
* 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 to each participant:

* Valves (labeled for workshop activity)
	+ Ensure there is an example of each valve
	+ Ensure each valve has a unique component identifier (mark 1, 2, 3, etc.)
		- * + Meters for measurement
				+ Materials to lubricate a valve
			* Tools, PPE to open and close a valve
			* Tools, PPE to winterize, troubleshoot, or perform preventive maintenance

***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**  |
| **10 minutes**  | **Introduction**Explain that valves are: * Named according to the inside element that controls the product flow.
* Categorized as 1/4 turn valves, multi-turn valves, non-essential valves, and emergency (critical) valves.
* Operated:
	+ Manually-using a hand wheel or lever.
	+ Automatically-using electronic, pneumatic, and hydraulic actuators to control valve operation.

Explain that each type of valve is designed for a specific function, such as:* Turn product flow on and off
* Vary the amount of product flow, which is known as throttling
* Direct product flow
* Regulate product pressure
* Relieve overpressure

Point out that there are several types of valves, and they are classified as:* **Critical valves**
* The DOT standards require that certain valves must be designated as critical (also called priority) valves-necessary for emergency.
* For example, Emergency Shutdown (ESD) valves are transmission or distribution system valves essential during an emergency to control the flow of gas for safe operation.
* **Non-essential valves**
* Also known as non-emergency, these valves, are used to control individual service (meter sets)/used in construction, for example a tap or bypass valve.
 |
| **60 minutes**  | **Discussion with Examples – Valve Types** Show examples and point out the key characteristics of the following types of valves. Refer to the [Valve Features and Characteristics Job Aid.](#_Job_Aid)

|  |  |
| --- | --- |
| * Gate
 | * Diaphragm
 |
| * Globe
 | * Plug
 |
| * Ball
 | * Swing
 |
| * Butterfly
 | * Safety
 |
| * Check
 | * Lift
 |
| * Pinch
 | * Release
 |

* Point out, that even though the valve types have the same basic components, some valves are able to throttle flow while others can only stop flow.
* Point out that valves can either be:
* Non-directional - Direction of product flow through the valve doesn't matter, for example, ball, butterfly, gate, and plug.
* Uni-directional - Product flow through the valve must flow in a specific direction, for example check and globe.

***Note****: The tools, PPE, and materials used in the demonstrations will be determined by the materials and tools used at the training facility.* |
| **Time**  | **Topics for Discussion, Demonstrations, and Activities**  |
| ??? | **Valve Uses****Discussion with Examples*** Give examples when valves are used, for example:
	+ Check valves: Automatic valves contain no manual controls. They operate automatically to control product flow.
* Valves that aid in system operation and maintenance.
* Tap valves
* Bypass valves
* Main line valves sectionalize/divide cross-country transmission lines or large distribution feeder mains
* Service (curb) valves
* Meter stop (riser) valves
 |
| **60 minutes**  | **Valve Components****Discussion with Examples** * Point out and explain the valve components on each of the types of valves. Refer to the [Valve Features and Characteristics Job Aid](#_Job_Aid).
* ***Body****- also machined to serve as the seating surface on some valves is the outside part of the valve which connects to the pipe.*
* ***Bonnet*** *or flange-retains pressure.*
* ***Lubrication points/fittings****-fitting for injecting lubricant if needed.*
* ***Stem****-connects the handle or actuator to the valve element.*
* ***Seat-****provides the surface for the valve element to seal against.*
* ***Seal****-prevents leaks between the stem and the bonnet.*
* ***Stop collar****–indicates if the valve is open or closed.*
* ***Core*-***also referred to as the valve element, controls product flow.*
 |
| **????** | **Valve Operations****Discussion with Examples** Review how valves are actuated and show their operating methods.* Manually Operated
* Electrically Operated
* Pneumatically Operated
* Hydraulically Operated

Point out and explain the features of the two classifications of manually operated valves.

|  |  |
| --- | --- |
| **Multi-turn valves**  | **¼-turn valves**  |
| * Need to turn handle several times to fully open or close the valve.
* Raising or lowering the valve element off or on to a valve seat controls the gas flow.
* Examples:
* Globe
* Gate
* Wedge
 | * Only need to turn the handle ¼ turn to open or close the valve.
* The valve element turns within the valve seat to control flow.
* A stop (an outside indicator) shows whether the valve is opened or closed.
* Examples:
* Ball
* Butterfly
* Plug
 |

 |
| **Time**  | **Topics for Discussion, Demonstrations, and Activities**  |
| **60 minutes**  | **Discussion with Examples – Operating Features and Characteristics*** Explain the four methods to control flow, and show an example of each.
* Insertion element, for example a globe valve.
* Sliding element, for example a gate valve.
* Rotating element, for example a butterfly valve.
* Flexible material, for example a diaphragm valve.

Instruct participants to complete [**Activity Worksheet #1.**](#_Activity_Worksheet_#1-Types)**Note:** * *Use the materials and products available at the local training facility.*
* *Label the valves (A-Z, for example) for the activities.*
* *Modify the activity instructions to the materials, tools, and PPE available.*
 |
| **30 minutes**  | **Working with Valves-Before Conducting Maintenance****Discussion**Explain why it is important before any valve preventive and/or corrective maintenance begins, technicians must conduct a valve verification, which is to **verify, notify,** and **isolate** a valveto ensure the valve identified for maintenance matches job specifications and to record the valve location in the maintenance records.Verify a valve, using the following tools:* Maps
* Records
* Tags
* Charts

*These tools help confirm detail such as:** *Valve ID number, make, model control function, last inspection.*
* *Valve location with respect to curbs, property lines, etc., which allows valves to be found even in poor conditions such as snow.*

*Show examples of how each can be used to verify the valve.*Notifyappropriate parties before opening and closing a valve, for example: * Government agencies
* Company offices
* Landowners
* Customers

*Present examples and discuss why these groups must be contacted.*Isolate the valve per project requirements/pipe/pressure. For example, pinch off a service line and install a line stopper.* Follow regulations, manufacturer's instructions, and company policy/procedure for isolating the valve to stop the flow of product.
* Be sure to visually inspect area around the valve during your approach to the valve location.
 |
| **Time**  | **Topics for Discussion, Demonstrations, and Activities**  |

|  |  |
| --- | --- |
| **60 minutes**  | **Demonstration*** Demonstrate, following the manufacturer’s instructions for the parts being used, the steps operators take to open and close a valve.

*Note: Point out important features about the valve being used for demonstration and the hands-on workshop* activity. **Opening and Closing a Valve*** Inspect the valve, following the steps outlined in the previous demonstration.
* Verify the pressure upstream and downstream.
* If the valve that is adversely affected is an automatic valve, place it in manual valve control.
* Operate the valve: Open and Close

***Note****: In a live environment it is necessary to close or discontinue service if service would be interrupted by shutdown or decrease in pressure.** Verify the pressure upstream and downstream.
* Use the appropriate lockout/tagout procedures.
* Review the information that must be recorded on the equipment records according to regional work practices..
* Stress the importance to:
	+ Follow regulations, manufacturer's instructions, and company policy/procedure for opening and closing valves.
	+ Review the procedures to report and document during this task regarding:
		- Emergency AOCs
		- Non-emergency AOCs

Instruct the participants to complete [**Activity Worksheet #2**](#_Activity_Worksheet_#2-Opening)**.** |

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| **60 minutes**  | **Preventive Maintenance****Discussion**Explain* Valves require partial maintenance and visual inspection to meet federal regulations and to ensure continued safety of the pipeline.
* Based on regional operating procedures, the preventive maintenance steps operators take on a regular basis to ensure the safety of the people and property, per federal regulations: CFR 195.420, 192.745, 192.747
* Main line valves must be inspected twice per calendar year.
* Inspections may reveal valves that do not work correctly and require maintenance due to:
	+ Inadequate periodic lubrication
* Improper lubricant used
* Improperly adjusted valve
* Solid fillers forming in the lubrication grooves
* Internal debris or contaminants
* Corrosion between bonnet packing gland and stem in the tapered plug
* Damage, deterioration, or general corrosion
* Explain that these problems can often be reduced with the following preventive maintenance actions:
	+ Visual inspection
	+ Product check
	+ Valve verification
	+ Valve lubrication
	+ Valve winterization\*
* To winterize a valve:
* Remove any ice or snow build-up from around the valve and/or in the ground box.
* Remove any debris from the ground box.
* Adjust the valve packing, using approved packing material, so that the packing meets manufacturer's specifications.
* If necessary, lubricate the valve according to manufacturer’s specifications.
* Paint any aboveground valve components according to manufacturer's specifications and company procedures.

\* Note: Preventive maintenance is not the same for all regions (due to weather and geographic differences). Refer to local/regional practices/ guidelines for preventative maintenance practices. |
| **60 minutes**  | **Preventive Maintenance - Inspecting the Valve****Demonstration** Following the manufacturer’s instructions for the parts being used, the steps operators take to conduct a preventive maintenance inspection for the following:\** Product leaks
* Valve components
* Locks
* Lids, covers
* Paint (for above ground valves)
* Roadway box ( for underground valves)

*\*Note: Point out characteristics about the valve being used for demonstration and the hands-on workshop* activity. Emphasize that the guidelines for all preventative maintenance are determined by the manufacturer’s operating instructions. |

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| **Time**  | **Topics for Discussion, Demonstrations, and Activities**  |
| **60 minutes**  | **Maintenance - Lubricate a Valve** **Demonstration** * Demonstrate, following the manufacturer’s instructions for the parts being used, the steps to conduct lubricate a valve during routine preventive maintenance.
* Ensure not to:
	+ Over lubricate
	+ Trap air in the valve
	+ Leave debris in the box

Verifying the starting position of the valve is important because the valve must be returned to the starting position after maintenance is complete. * Inspect valve and verify correct operation.
* Emphasize that the installer must verify the valve’s starting position (on or off) before conducting any maintenance. After completing the maintenance the valve must be set to the same position.

Instruct the participants to complete [**Activity Worksheet #3**](#_Activity_Worksheet_#3-Valve). |
| **15 minutes**  | **Troubleshooting****Discussion**Explain the importance of using the manufacturers' operating instructions for procedures specific to the design and model for the valve to: * Troubleshoot
* Apply maintenance procedures
 |
| **60 minutes**  | **Valve Evaluation** At regular intervals and when a valve is not operating as designed, inspect and perform troubleshooting procedures to evaluate the valve.* Visually inspect area around the valve during your approach to the valve location.
* Record the valve location.
* Test for leakage.
* Check lids and covers.
* Verify valve information: ID number, make, model control function, and last inspection.
* Lubricate valve.
* Check valve key.
* Document inspection.
* Check actuator.
* Maintain correct valve position.
* Discuss “real-world” scenarios to illustrate operators conducting a valve evaluation.

Instruct the participants to complete [**Activity Worksheet #4**](#_Activity_Worksheet_#4-Valve). |

Boot Camp Activities

Working with a partner or partners, complete the following tasks, using the materials and equipment in your lab.

* Valves will be identified as A, B, C, etc.
* Valve components will be marked as 1, 2,3, etc.

Follow the industry guidelines and manufacturer’s instructions as needed for the project/activity assigned.

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| Activity Worksheet #1 - Types of Valves, Components, and Characteristics  |
| Lab | * Complete **Appendix 1** - Performance Checklist Types of Valves,Components, and Characteristics using the valves labeled for the workshop activities.
	+ Identify the valves.
	+ Identify the valve component that is labeled.
	+ Indicate if it is a multi-turn or ¼ turn valve.
	+ Identify the type of valve, for example automatic, critical, tap valves, bypass, etc.
	+ Identify how the value is actuated.
	+ Answer any question presented.
* Take notes in the sections below (as needed).
* Be prepared to participate in workshop discussions.

***Note****: Workshop discussion will focus on proper use, troubleshooting and when/how to use valves following industry guidelines, best practices, and regulations.* |
| References-guidelines-tools used. |  |
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| General discussion questions or notes.  |  |
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**Note:**

* Valves will be labeled as A, B, C, etc.
* Components will be labeled 1,2,3, etc.
* After detailing the information about the valves, workshop discussion will address proper usage, troubleshooting, impact of weather, industry guidelines, best practices, and regulations.

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| Activity Worksheet #2 - Opening and Closing a Valve  |
| Lab | * Complete **Appendix 2** - Performance Checklist Opening and Closing a Valve.
	+ Perform the tasks, using the tools and products provided.
	+ 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 |  |
|  |
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|  |
| Steps - actions  |  |
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| References-guidelines-tools used, including CFR (If applicable)Indicate, if applicable measures to respond, report, and document potential problems and AOCs. |  |
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| Lessons learned |  |
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| General discussion questions or notes.  |  |
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| Activity Worksheet #3 - Valve Maintenance: Lubricate a Valve  |
| Lab | * Complete **Appendix 3** - Performance Checklist Valve Maintenance: Lubricate a Valve
	+ Perform the tasks.
	+ Be sure to identify 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 |  |
|  |
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|  |
| Steps - actions  |  |
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|  |
|  |
| References-guidelines-tools used, including CFR (If applicable)Indicate, if applicable measures to respond, report, and document potential problems and AOCs. |  |
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| Lessons learned |  |
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| General discussion questions or notes.  |  |
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| Activity Worksheet #4 - Valve Evaluation – On the Job Scenario |
| Lab | Working at the guard gate area of a housing development, it has been determined that a valve needs to be evaluated. * Complete **Appendix 4** - Performance Checklist Valve Evaluation.
* Take notes in the sections below (as needed).
* Be prepared to participate in workshop discussions.
 |
| Tools used PPE |  |
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|  |
| Steps - actions  |  |
|  |
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|  |
| References-guidelines-tools used, including CFR (If applicable)Indicate, if applicable measures to respond, report, and document potential problems and AOCs. |  |
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| Lessons learned |  |
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| General discussion questions or notes.  |  |
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# Appendix 1

Appendix 1 – Performance Checklist – Valve Types and Valve Components

Examine the valves and complete the following checklist.

* Note a valve type may be used more than once because of the type of pipe or marked component.
* Keep in mind that preventive maintenance of valves/components follows guidelines per manufacturers’ operating instructions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Valve** | **Type** | **Component** | **Turn** | **Use, i.e.: critical, tap, emergency** | **How valve is actuated** |
| A |  |  |  |  |  |
| B |  |  |  |  |  |
| C |  |  |  |  |  |
| D |  |  |  |  |  |
| E |  |  |  |  |  |
| F |  |  |  |  |  |
| G |  |  |  |  |  |
| H |  |  |  |  |  |
| I |  |  |  |  |  |
| J |  |  |  |  |  |
| K |  |  |  |  |  |
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| **Notes** |
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***Notes****:*

* *The valves used will be determined by the materials and tools used at the training facility.*
* *The instructor will determine how the valves are marked.*
* *The answers will vary depending on the valves the participant inspects.*

Appendix 1 – Performance Checklist – Opening and Closing a Valve (Instructor)

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Valve notification and verification | Answer the following:1. Identify who might need to be notified when valves are opened or closed.
2. What tools can you use to verify a valve?
3. How is a valve isolated?
 | 1. *Groups include:*
* *Governmental agencies*
* *Company offices*
* *Landowners*
* *Customers*
1. *Available data that is pertinent, for example:*
* *Maps*
* *Records*
* *Tags*
* *Charts*
1. *Isolate, per project requirements/pipe/pressure. For example, pinch off a service line and install a line stopper.*
 |
| 2 | Open and close a valve  | List the steps in the chart below to set open and close a valve.

|  |  |
| --- | --- |
| **Steps** | **Notes**  |
|  |  |
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|  |  |

 | *Answers will depend on the supplies and equipment used and the manufacturer’s instructions.*

|  |  |
| --- | --- |
| **Steps** | **Successful Y/N** |
| 1. Inspect the valve.
 |  |
| 1. Verify the pressure upstream and downstream.
 |  |
| 1. Place any automatic valve that may be adversely affected under manual valve control.
 |  |
| 1. Close or discontinue service if service would be interrupted by shutdown or decrease in pressure.
 |  |
| 1. Operate the valve: Open and Close.
 |  |
| 1. Verify the pressure upstream and downstream.
 |  |
| 1. Use appropriate lockout/tag out procedures.
 |  |

 |
| 3 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? | *Specific answers will depend on company guidelines and facilitator. However, the participants must indicate possible problems they might encounter and the immediate steps to notify 911 and all principles involved to ensure the safety of personnel, property, and all persons in the vicinity.**Answers should also include a discussion of the documentation needed and how to record the instance.**The answers to this question can be tracked on flip charts during class discussions.*  |

Appendix 1 – Performance Checklist – Valve Maintenance: Lubricate a Valve (Instructor)

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Lubricate a valve based on routine preventive maintenance. | List the steps in the chart below to lubricate a valve.

|  |  |
| --- | --- |
| **Steps** | **Notes**  |
|  |  |
|  |  |
|  |  |
|  |  |

 | *Details, for example part names and characteristics will depend on the supplies and equipment used and the manufacturer’s instructions.*

|  |  |
| --- | --- |
| **Steps** | **Successful Y/N** |
| 1. *Verify the valve’s starting position (on or off).*
 |  |
| 1. *Ensure not to:*

*o Over lubricate**o Trap air in the valve**o Leave debris in the box.* |  |
| 1. *Inspect valve and verify correct operation.*
 |  |
| 1. *Set valve to the starting position.*
 |  |

 |
| 2 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? | *Specific answers will depend on company guidelines and facilitator.* *Answers should also include a discussion of the documentation needed and how to record the instance.**The answers to this question can be tracked on flip charts during class discussions.*  |

Appendix 1 – Performance Checklist – Valve Evaluation (Instructor)

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Perform valve evaluation maintenance. | List the steps in the chart below to perform valve evaluation.

|  |
| --- |
| **Steps** |
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 | *Answers will depend on the supplies and equipment used and the manufacturer’s instructions.*

|  |  |
| --- | --- |
| **Steps** | **Successful Y/N** |
| 1. *Visually inspect the area around the valve during your approach to the valve location.*
 |  |
| 1. *Record the valve location.*
 |  |
| 1. *Test for leakage.*
 |  |
| 1. *Check lids and covers.*
 |  |
| 1. *Verify valve information: ID number, make, model control function, last inspection.*
 |  |
| 1. *Lubricate the valve.*
 |  |
| 1. *Check the valve key.*
 |  |
| 1. *Document inspection.*
 |  |
| 1. *Check actuator.*
 |  |
| 1. *Maintain correct valve position.*
 |  |

 |
| 2 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? | *Specific answers will depend on company guidelines and facilitator.* *Answers should also include a discussion of the documentation needed and how to record the instance.**The answers to this question can be tracked on flip charts during class discussions.*  |

# Appendix 2

Appendix 2 – Performance Checklist – Valve Types and Valve Components

Examine the valves and complete the following checklist.

* Note a valve type may be used more than once because of the type of pipe or marked component.
* Keep in mind that preventive maintenance of valves/components follows guidelines per manufacturers’ operating instructions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Valve** | **Type** | **Component** | **Turn** | **Use, i.e.: critical, tap, emergency** | **How valve is actuated** |
| A |  |  |  |  |  |
| B |  |  |  |  |  |
| C |  |  |  |  |  |
| D |  |  |  |  |  |
| E |  |  |  |  |  |
| F |  |  |  |  |  |
| G |  |  |  |  |  |
| H |  |  |  |  |  |
| I |  |  |  |  |  |
| J |  |  |  |  |  |
| K |  |  |  |  |  |
| L |  |  |  |  |  |
| M |  |  |  |  |  |
| N |  |  |  |  |  |
| O |  |  |  |  |  |
| P |  |  |  |  |  |
| **Notes** |
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|  |

Appendix 2 – Performance Checklist – Opening and Closing a Valve

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Valve notification and verification | Answer the following:1. Identify who might need to be notified when valves are opened or closed.
2. What tools can you use to verify a valve?
 |  |
| 2 | Open and close a valve  | List the steps in the chart below to set open and close a valve.

|  |  |
| --- | --- |
| **Steps** | **Notes**  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

 |  |
| 3 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? |  |

Appendix 2 – Valve Maintenance: Lubricate a Valve

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Lubricate a valve based on routine preventive maintenance. | List the steps in the chart below to lubricate a valve.

|  |  |
| --- | --- |
| **Steps** | **Notes**  |
|  |  |
|  |  |
|  |  |
|  |  |

 |  |
| 2 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? |  |

Appendix 2 – Performance Checklist – Valve Evaluation

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

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Tasks** | **Actions and Questions** | **Answers** |
| 1 | Perform valve evaluation maintenance | List the steps in the chart below to perform valve evaluation.

|  |  |
| --- | --- |
| **Steps** | **Notes**  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
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|  |  |
|  |  |

 |  |
| 2 | Troubleshooting  | Answer the following question:If there is a problem with an inoperable valve and you discover that the condition was not as specified, what should you do? |  |

# Job Aid

Valve Features and Characteristics Job Aid

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Type of valve** | **Definition**  | **Uni-directional** **Non-directional\*** | **Method to control flow** | **Uses/Applications – General Notes** |
| Gate  | Uses a solid or split wedge or “gate” in an open passage between seats.  | Non-directional | Sliding Element | * Frequently used
* For flow regulation/throttling
* Applications: Liquids, gases

*NOTE: Angle valves, used to change product flow, are, in every significant way, identical to globe valves.*  |
| Globe  | * A disc is on top of a circular opening with a seat.
* Seat rings are seal welded to the body.
 | Uni-directional  | Insertion Element | * Applications: Liquids, gases
 |
| Ball  | Uses a handle attached to a ball inside the valve to control the flow.  | Non-directional |  | * With higher temperature
* Applications: Liquids
 |
| Butterfly  | Uses a plate connected to a rod and handle to control flow. | Non-directional | Rotating Element  | * Fluid trapping is minimal
* Frequently used
* Fully opened or fully closed, throttling
* Applications: Liquids, gases
 |
| Check  | * Restricts flow to one direction and if flow reverses or stops, the valve will close.
* Automatically closes if flow is reversed or stops.
 | Uni-directional |  | * Applications: Liquids, gases
 |
| Diaphragm  | Constructed from steel or plastic. | Uni-directional | Flexible material | * Generally work as shut-off valves.
 |
| Swing  | A type of check valve. |  |  |  |
| Lift | * A type of check valve.
* Designed to be installed on horizontal piping.
 |  |  |  |
| Pinch  | A full bore or fully ported type of control valve which uses a pinching effect to obstruct fluid flow. | Uni-directional |  |  |
| Plug  | * Use a 90-degree on/off action to control the product flow.
* Contains a cylindrical (or tapered) plug that extends through the valve body.
 | Non-directional |  | * Valves work best for on/off service (generally not recommended for throttling).
 |
| Safety  | Safety valves can often be distinguished by the presence of an external lever at the top of the valve body, which is used as an operational check.   |  |  | * A safety valve fully opens as soon as a set pressure is reached.
* Will stay open until the pressure drops below the set point.
* Used to prevent equipment damage by relieving pressure in the event of accidental over-pressurization.
 |
| Relief  | A relief valve opens only as necessary to relieve an over-pressure condition. |  |  | * Relief valves are used to prevent equipment damage by relieving pressure in the event of accidental over-pressurization.
 |

 “Non-directional" means that the product may flow in any direction.

 “Uni-directional" means that the product may ?????.