

Mercer County Community College

Division of Business and Technology

UTI 104

Introduction to Appliance Service

COURSE DESCRIPTION:

Provide participants with knowledge and skills to perform piping on residential appliances, utility gas regulators/meters, and gas leak investigation, in accordance with industry standards & D.O.T. Pipeline Operator Qualification.

Text: References & Textbooks:

Handout & Reference Guides

Prerequisites: UTI 102 Fundamentals of Gas Combustion

Credits: 7 Lecture Hours: 6 Studio/Lab Hours 3

Food and drink are strictly prohibited in classrooms as per health and safety laws. Students may not bring in chemicals or cleaning fluids without the appropriate MSD sheets.
--

Course Coordinator: Dominick DeFino

Revised: 10/23/02

Course Objectives:

- Select the proper piping materials and fittings for various appliance installations according to NFPA-54 industry standards and General Criteria for Installation of Gas Appliances and Gas Piping.
- Install piping, fittings and appliance connectors on appliances according to SIM, NFPA-54 industry standards and General Criteria for Installation of Gas Appliances and Gas Piping. The connection must be leak free. Test appliance, associated piping and connectors for gas leaks using proven leak detection methods according to the SIM.
- Determine that the branch connection is able to deliver the proper capacity of gas to the appliance according to manufacturer's requirements and/or the NFPA-54 and General Criteria for Installation of Gas Appliances and Gas Piping.
- Identify the GSIMS job codes specific to piping.
- Given a residential gas-piping sketch, size the needed piping according to the tables found in NFPA-54. The piping system design will supply sufficient gas to fuel the connected appliances.
- Using the SIM/NFPA-54, identify and select the proper piping material and fittings required for a given job.
- Given a spring gauge/manometer, identify the supply pressure
- Given measurements, locate the curb shut off.
- Assess the condition of service head.
- Given two wrenches, use the "two pipe wrench hold back" technique when appropriate.
- Given two separate piping outlets in a residential application and all the required tools and materials, measure, cut and thread the required pipe to length according to industry standards resulting in a proper installation.
- Identify insulated (dielectric) type gas fittings and test their integrity using a multimeter according to industry standards.
- With the assistance of a second qualified fitter and proper tools, make the needed repairs safely on a UP system when required to work on live gas.
- Given a new meter/regulator installation, test for leaks using the Static Meter test and/or the Leak Detection Solution test according to the SIM.
- Given a job assignment, select and use the appropriate PPE according to the Job Hazard assessment and SIM safety standards.
- Select and safely use the proper hand and power tools for a given task according to industry standards. Given a completed task, update the GSIMS work order with the appropriate job code(s).
- Given proper tools and safety equipment, work with pipe/fittings and materials to complete a job assignment according to SIM and industry standards. The completed job will be gas tight.
- Given a GSIMS work order to install a gas meter set that requires the installation of a pressure regulator and a gas meter, install the regulator and its vent line according to SIM and industry standards.
- Install and remove an expansion plug using the tool in order to shut off the flow of gas in a Utilization Pressure (UP) service.
- Given an obsolete Mercury regulator installation, remove the mercury regulator according to the SIM.
- Identify types of meters.

Course Content Objectives - "Introduction to Appliance Service" UTI 104

- Given the SIM and the Gas flow chart, size a residential gas meter up to 425 cubic feet per hour.

- Handle and store gas meters according to established practices.
- Use the PSE&G General Criteria for Installation of Gas Appliances and Gas Piping to identify prohibited locations for a gas meter installation.
- Change or reset a gas meter after a fire within the structure according to the SIM.
- Given a GSIMS high bill/non-register work order, investigate and change out the defective meter.
- Given a GSIMS age change work order, change out a gas meter and properly record new data in GSIMS.
- Given a GSIMS corrosion work order, test, evaluate and provide corrective action according to industry and PSE&G Distribution and SIM standards.
- Given residential regulator components, identify the three essential elements of a regulator
- Explain the function and safety element of the internal relief valve and external vent.
- Identify when an excessive flow valve has been installed on the service according to SIM. Explain how the valve resets after the device has been activated so that full gas flow is restored.
- Given a regulator installation, troubleshoot and repair a malfunction, change an orifice, and adjust gas pressure according to the SIM.
- Given a regulator installation, inspect and clean the regulator vent according to the SIM. Given a GSIMS work order install a regulator (with minimal damage to the structure), install the vent using the appropriate PPE and tools according to the SIM.
- Given a GSIMS work order relating to a I&C Meter/Regulator Installation, select the applicable job code and update GSIMS.
- Under the direction of an experienced Working Inspector (WI)/fitter, change/clean orifices and springs on an I&C regulator.
- Given an I&C meter and regulator installation, determine the correct position of the diaphragm and the venting outlet according to gas distribution standards.
- Given an I&C meter and regulator installation, measure and communicate the proper gas pressures using a manometer and or spring gauge.
- Given an I&C meter and regulator sketch/installation, identify the different types of set designs and its components. Determine if an I&C meter/regulator set is properly located and protected from external hazards.
- Allowable loss in pressure from meter to appliance according to the General Criteria for Installation of Gas Appliances and Gas Piping 2.4.2
 - Maximum gas consumption required
 - Length of piping and number of fittings
 - Specific gravity of the gas
 - Supply pressure
- Respond to the site of an emergency and approach the affected area in a safe manner according to Company standards
- Given an emergency scenario, list and explain the appropriate investigation and safety procedure to be taken in order to protect life, property and making the scene safe.
- Given a GSIMS gas leak investigation order, appropriate tools, test and safety equipment, describe and select one of the approved methods of leak detection according to the SIM.
- Given an emergency situation where it is needed, know when to disconnect residential electric and telephone service according to the SIM and identify potential sources of ignition.
- Make repairs due to a leak on piping, fittings and appliance connectors according to Company standards.

- Operate an approved combustible indicator according to manufacturer and Company standards.
- When faced with a possible alien gas, use and determine when to obtain a sample using the "bottle method" test according to the SIM.
- Determine when to and safely use the "IMPACTO" tool, **shovel***, curb box scoop, curb box key and **manhole cover puller*** without causing injury or damage to underground facilities.
- Determine when and how to safely evacuate a residential or commercial building according to the SIM.
- Identify above and below ground gas, electric and other gas utilities infrastructure facilities such as: regulator vent post, regulator vaults, test boxes and valve boxes.
- Given a gas leak emergency GSIMS order, safely locate the source of the leak and take the appropriate action(s) according to the SIM.
- Given an emergency order, have the ability to record and communicate critical data to gas and electric distribution departments, district dispatch, local management, associates, and proper documentation in GSIMS.
- When responding to an emergency order where local emergency agencies are present, interact with officials on the scene with professionalism and in accordance with Company policy.
- When responding to a gas leak investigation and unable to gain access to premise, take the appropriate actions according to the SIM.
- Given an emergency type order, conduct a carbon monoxide investigation according to the SIM standard.

Evaluation Procedure:

Grading Criteria for Participants

The participants will be individual evaluated on the course content utilizing the following criteria:

- | | |
|----------------------|-----------------------|
| • Attendance | - Mandatory |
| • Average of Quizzes | = 30 % of Total Grade |
| • Final Examination | = 70 % of Total Grade |

Course/Instructor Evaluation

The course and instructor evaluation will consist of the following:

- End of Course Reaction Survey which will ask the participant opinion of the course based on within the objectives and outline
- Overall performance of as indicated by participants completion of quizzes, practical & laboratory exercises and final exam
- Instructor observations by PSE&G – Technical Training team to ensure consistence of instructional quality

Topical Outline:

I – IV Introduction to Piping

Introduction and Overview
Introductions

- Present Course Topics
 - Safety
 - Present Course and Enabling Objectives
- Tools and Tool Use
 - Tools Identification, Purpose, Maintenance
 - Hold Back Technique
- Piping and Fittings
 - Safety
 - Types of Piping and Fittings
 - Tubing
 - Working with Tubing – Hands-on Practice
 - Swing Joints
- Measuring Pipe
 - Measurement Methods
 - Fitting Allowance/Makeup
 - Hands-on Practice
- Installing and Connecting Pipe
 - Safety
 - Appliance Connection Considerations
 - Criteria for Proper Installation
 - Service Information Manual (SIM) and National Fuel Gas Code Book (NFPA-54) Guidelines
 - Gas Leak Detection
 - Cutting and Threading Pipe
 - Hands-on Practice
- Sizing Pipe for Capacity
- Connecting Customer Appliances
 - Piping Components for Appliance Connections
 - Use of Manometer
 - Connecting Appliance Hands-on Practice
- Parts Ordering and Job Codes
 - Gas Service Information Management Systems (GSIMS) Job Codes
- Service Information Manual (SIM)
- Performance Evaluation (pg. 75)
 - Conduct Performance Evaluation
 - Revisit and Summarize
- Wrap-Up and Evaluation (pg. 76)
 - Clean up
 - Review objectives
- Course Evaluations

Continued

Course Content Outline - “Introduction to Appliance Service ”

UTI 104

V – X Residential Piping, Meters, & Regulators, and Industrial & Commercial meters & Regulators

- Introduction and Overview
 - Introductions
 - Present Course Topics
 - Review of Safety Hazards and PPE
 - Present Course and Enabling Objectives
- Pipe Sizing
 - Pipe Sizing Factors
 - Student Research Exercise
- Pipe Installation Skills (pg. 15)
 - Pressure Testing Gas Service
 - Insulator (Dielectric) Fittings
 - Testing for Leaks
 - Xpander Plugs Hands On Activity
 - Gassing Out House Piping
- Locating the Curb Shut Off (pg. 19)
 - Using a Service Card
 - Following a Dispatcher's Instructions
- Working on Live Gas
 - Live (Uncontrolled) Gas Question to Students
 - Safety
- Shutting Off Gas Service Because of Fire, Explosion or Collapse
 - Safety
- Direct Operated Regulators
 - Components and Operation of Direct Operated Regulators (Fisher CBT)
 - Overpressure and Internal Relief (Fisher Computer Based Training)
 - MAOP (Maximum Allowable Operating Pressure), EOP (Estimated Operating Pressure and Capacity)
 - Vents
 - Excess Flow Valves
- Gas Meters
 - History
 - Types of Meters
 - Meter Construction
 - High Capacity Commercial Meters
 - Meter Register
- Meter Capacity
 - Meter Capacity
 - Meter Capacity Exercise
- Care and Handling of Meters
 - Storage
 - Use

Continued

- Installing Meters
 - When to Change a Meter
 - Review objectives
- Removing Meters
- Salvaging Material
- Hands On Practice
- Appliance Regulators
 - Operation
 - Changes in Inlet Pressure
 - Venting
 - Service Problems
- Regulator Installation
 - Installing Regulators
- Building a Typical Residential Meter and Regulator
 - Meter Set Residential Installation
 - Electrical Insulation
 - Setting Pressure Regulators
- Assessing the Condition of a Service Head
 - Safety
- Cathodic Protection
 - Basic Corrosion Mechanism
 - Purpose of Cathodic Protection
 - History
 - Importance of Cathodic Protection
 - Insulating Fittings
- Build a Typical Residential Meter and Regulator Set
 - Safety
 - Hands On Practice
- Build a Typical Residential Meter and Regulator Set
 - Safety
 - Hands On Practice
 - Troubleshooting
 - Mercury Regulators
- Industrial and Commercial Regulators
 - Pilot-Operated Regulators
 - Overpressure Conditions and Pressure Relief
 - Overpressure Protection
 - Monitor Systems
 - Replacing Regulator Springs
 - Changing Springs
 - Making Adjustments
- Group Industrial Meter and Regulator Set Demonstration Activity
 - Restoration of Service After Upgrading from Utilization Pressure to 15, 60 or 120 Pounds Per Square Inch (PSI) Design Pressure Not at the Time of the Regulator Installation
- Updating Gas Service Information Management System (GSIMS) for Meters and Regulators
- Wrap-Up and Evaluation
 - Clean up
 - Review objectives
 - Course Evaluations

XI – XVI **Gas Leak Investigation**

- Introduction and Overview
- Introductions

- Present Course Topics
- Safety
- Present Course and Enabling Objectives
- Leak Reporting
 - Receipt of Leak Call Process
 - Basic Precautions for Handling
- Methods of Leak Detection
 - Combustible Gas Indicator
 - Soap Suds
 - U-Gauge
 - Gas Meter Test/Static Meter
- Leak Investigations
 - General Procedure
 - Residential/Customer not at Home
 - Repairing Leaks and Testing
 - Industrial, Inside and Outside
 - Assisting Street Department
- Reporting and Recording Leak Data
 - Defining Emergency Calls
 - Recording in GSIMS
- Calls Outside Regular Hours
- Alien Gases
 - Types
 - Gas Sample Jar
- Locating Gas Leaks
 - Pressure Drop Test
 - Bottle Test
- Repairing Leaks
- Carbon Monoxide Investigations
 - Use of SIM procedures
 - Responsibilities and Actions
 - Flue Gas Test
 - Facts About Carbon Monoxide
- Hands-on Practice Exercises
 - Gas Leak Field
- Performance Evaluation
 - Conduct Performance Evaluation
 - Test Review
- Wrap-Up and Evaluation
 - Clean up
 - Review objectives
- Course Evaluations