

# ATPF-2125: GAS HEAT

## Cuyahoga Community College

**Viewing: ATPF-2125 : Gas Heat**

**Board of Trustees:**

2015-12-03

**Academic Term:**

Spring 2019

**Subject Code**

ATPF - Applied Ind Tech - Pipefitters

**Course Number:**

2125

**Title:**

Gas Heat

**Catalog Description:**

Course covers gas furnaces, operation and controls, including safety features of gas heat. Troubleshooting and customer service is also demonstrated and discussed.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

### Requisites

**Prerequisite and Corequisite**

Departmental approval: admission to Pipefitter's apprenticeship program.

### Outcomes

**Course Outcome(s):**

Discuss the different types of gas furnaces, identify the fuel sources used and describe the methods of distribution.

**Objective(s):**

1. List the different types of gas furnaces and describe the function of each.
2. Identify the different fuel sources used in the gas furnace.
3. Differentiate between natural, manufactured and liquefied petroleum gases.
4. Explain the method of heat distribution and discuss the importance of continuous air flow using supply and return air.

---

**Course Outcome(s):**

Discuss the operational aspects of gas furnaces including the controls, the sequence of operation and various valves and regulators used.

**Objective(s):**

1. Identify the different types of gas pilots and discuss the operation of the sensors and ignition modules including flame rod sensors and pre-surge modules.
2. Identify the different electronic modules and regulators used in gas furnaces.
3. Explain the function of dual in line pair switches used for furnace versatility.
4. Differentiate between stack relays and cad cell controls used to monitor flue temperature and positive burner identification.
5. Discuss the dual function of the gas valve and explain the operation of the furnace solenoid.
6. Classify the different type of gas regulators and discuss the operation of each.

---

**Course Outcome(s):**

Discuss the safety features and components of gas furnaces and explain the function of each.

**Objective(s):**

1. Identify the safety features and components of gas furnaces.
  2. Discuss the operation of the thermocouple with respect to pilot devices.
  3. Explain the operation of flame proving devices and discuss the safety components of each.
  4. Describe the operation of a furnace blower and discuss the safety features incorporated to prevent excessive heating of the heat exchanger.
  5. Discuss the operation of limit switches with respect to fan operation and furnace heat overload.
  6. Discuss the importance of proper venting procedures in gas furnaces and explain how flue gases are dispensed into the atmosphere.
- 

**Course Outcome(s):**

Demonstrate the ability to service malfunctioning gas furnaces, diagnose problems and repair and maintain related parts and equipment.

**Objective(s):**

1. Diagnose problems related to heat furnaces with respect to power and fuel sources, venting conditions and primary controls.
  2. Follow proper safety procedures with respect to lock-out tag-out and worker protection.
  3. Select proper tools and equipment required for diagnosed problems.
  4. Repair and replace defective equipment.
  5. Practice proper housekeeping procedures and respect for customers property.
- 

**Methods of Evaluation:**

Class participation, quizzes, tests and final exam;

**Course Content Outline:**

1. Furnaces, fuel sources and distribution
  - a. Types of gas furnaces
    - i. Forced air
    - ii. Gravity
    - iii. High efficiency
  - b. Fuel sources
    - i. Natural gas
    - ii. Manufactured gas
    - iii. Liquid petroleum
    - iv. Differences
  - c. Heat distribution
    - i. Gravity
    - ii. Forced air
    - iii. Return air
    - iv. Continuous air flow
2. Operational aspects
  - a. Modules and regulators
    - i. Continuous retry
    - ii. Complete shut off
    - iii. Lock out
    - iv. Electronic
  - b. Pair switch
    - i. In line
    - ii. Function
    - iii. Versatility
  - c. Stack relay
    - i. Safety features
    - ii. Functions
    - iii. Gas controls
  - d. Furnace solenoid
    - i. Gas valve
    - ii. Flow
    - iii. Electric
    - iv. Safety features

- e. Gas regulator
    - i. Classification
      - 1. Standing pilot
      - 2. Direct burner
      - 3. Automatic
      - 4. Intermittent
    - ii. Control and safety
      - 1. Ignition
      - 2. Installation
  - f. Gas pilots
    - i. Standing
    - ii. Electronic igniter
    - iii. Direct/indirect
    - iv. Flame rod sensor
    - v. Pre-surge module
3. Gas furnace: safety features and components
- a. Safety feature
    - i. Electrical
    - ii. Bi-metal
    - iii. Liquid filled bulb
    - iv. Venting
  - b. Thermocouple
    - i. voltage signal
    - ii. valve
    - iii. pilot device
  - c. Flame proving device
    - i. safety
      - 1. gas overload
      - 2. equipment damage
      - 3. Personal injury
    - ii. Flame rod
    - iii. Sensor/igniter
  - d. Furnace blower
    - i. Safety features
      - 1. Fan guard
      - 2. Pre-purge
      - 3. Flue gas
    - ii. Electrical
    - iii. Timer device
    - iv. Air circulator
  - e. Limit switches
    - i. Fan operation
      - 1. Damage prevention
      - 2. Gas control
    - ii. Heat sensor element
    - iii. Automatic
    - iv. Manual reset
  - f. Venting
    - i. Safety
      - 1. Carbon dioxide build up
      - 2. Explosion
    - ii. Pre-purge
    - iii. Post purge
    - iv. Interference/obstructions
    - v. Maintenance
4. Service
- a. Diagnosis
    - a. Power source
      - i. Electrical
      - ii. Environmental

- b. Fuel source
  - i. Gas leaks
  - ii. Valve malfunction
  - iii. Manufacturer defect
- c. Venting
  - i. Blockage
  - ii. Fan failure
- d. Primary controls
  - i. Integrated module
  - ii. Valves
  - iii. Pilot mechanisms
  - iv. Operational switches
  - v. Ignition
- e. Safety procedures
  - i. Tools and equipment
  - ii. Defective equipment
- f. Housekeeping

## Resources

United Association Training Department. *HVAC/R Training*. Current edition. International Pipe Trades Training Committee, Inc., Washington, D.C., 2006.

---

Thomas W. Frankland. *Pipe Trades*. current edition. Glencoe/McGraw-Hill, New York, New York, 1969.

---

Althouse, Turnquist and Bracciano. *Modern Refrigeration and Air Conditioning*. 4th edition. Goodheart-Willcox Co., South Holland, Illinois, 1979.

---

## Resources Other

<http://www.free-ed.net/sweethaven/MechTech/Refrigeration/coursemain.asp?lesNum=4&modNum=1>

<http://physics.about.com/od/glossary/g/heat.htm>

<http://www.refrigerationbasics.com/1024x768/definitions1.htm>

Top of page

Key: 587