

ATSM-2410: RESIDENTIAL HEATING

Cuyahoga Community College

Viewing: ATSM-2410 : Residential Heating

Board of Trustees:

March 2020

Academic Term:

Fall 2020

Subject Code

ATSM - Applied Ind Tech- Sheetmetal

Course Number:

2410

Title:

Residential Heating

Catalog Description:

Identifies the different types of heating systems, discusses the combustion process including fuel-air mixtures and atomization of fuel oil. Also covers electrical circuitry, air circulation, controls and safety limits.

Credit Hour(s):

3

Lecture Hour(s):

3

Requisites

Prerequisite and Corequisite

Departmental approval: admission to Sheet Metal Worker's apprenticeship program.

Outcomes

Course Outcome(s):

Compare the different heating systems and discuss the operation of each.

Objective(s):

1. Describe the operation of gas furnaces and explain the various ignition systems and heat content.
2. Define the British Thermal Unit, discuss how it is used to determine the size requirement of a furnace and calculate the heat loss of a structure.
3. Identify specialized components of an oil furnace and describe their functions.
4. Explain the function of heating coils and heat sequencers.

Course Outcome(s):

Explain the combustion process including the requirements of air-fuel mixtures.

Objective(s):

1. List the types of burners, igniters and heat exchangers used in gas furnaces.
 2. Calculate temperature rises across heat exchangers and cubic feet per minute requirements.
 3. Explain the function of heating coils and heat sequencers.
 4. Measure fuel pressures to establish correct combinations of gas and air.
 5. Discuss the bi-products of combustion and poor combustion.
 6. Explain atomization processes used with oil furnaces and identify various spray patterns.
 7. Identify the properties of air and explain the proper air flame combinations needed for combustion.
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Course Outcome(s):

Identify the electrical requirements for all furnace types and discuss its supply and distribution for operation and control.

Objective(s):

1. List the types of burners, igniters and heat exchangers used in gas furnaces.
 2. Differentiate between voltage requirements for gas, oil and electrical furnaces.
 3. Determine the respective wire sizes needed for different amperage draws based on voltage requirements
 4. Describe the voltage induction process with respect to transformers.
 5. Explain the operation of thermostats and the distribution of electrical power through control devices.
 6. List the different types of thermostats and heat anticipators.
 7. Calculate temperature rises across heat exchangers and cubic feet per minute requirements.
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Course Outcome(s):

Describe the function of safety limits, the different types and required control wiring.

Objective(s):

1. List the types of burners, igniters and heat exchangers used in gas furnaces.
 2. Explain the operation of safety limits that use bimetal and pressure switches.
 3. List the various types of limits and flame sensors.
 4. Diagram the wiring schematics that are needed for safety limit controls.
 5. Install the necessary safety control wiring and make the connections per the wiring diagram.
 6. Calculate temperature rises across heat exchangers and cubic feet per minute requirements.
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Course Outcome(s):

Describe the different types of venting systems and discuss air circulation requirements.

Objective(s):

1. List the types of burners, igniters and heat exchangers used in gas furnaces.
 2. List the venting systems.
 3. Differentiate between masonry and high efficiency venting operations.
 4. Describe how different materials are used and explain why they are different.
 5. Compare different drafting conditions and explain the differences between atmospheric, induced draft, forced draft systems.
 6. Explain the process of air distribution using fans, manual dampers and zoning systems.
 7. Calculate temperature rises across heat exchangers and cubic feet per minute requirements.
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Methods of Evaluation:

1. Quizzes
2. Tests
3. Class participation

Course Content Outline:

1. Heating systems
 - a. Gas
 - i. Natural
 - ii. Liquefied petroleum
 - iii. Manufactured
 - iv. Propane
 - b. Oil
 - i. Specialized components
 - ii. Types of oil
 - iii. Atomizers
 - c. Electrical
 - i. Power supply
 - ii. Control wiring
 - d. Furnace operation

- i. Ignition systems
 - ii. Heat content
 - e. British Thermal Unit
 - i. Calculation
 - ii. Requirements
 - f. Heating coils and sequencers
- 2. Combustion processes
 - a. Fuel air mixtures
 - i. Calculation
 - ii. Adjustments
 - b. Products
 - c. Atomization
 - i. Spray patterns
 - ii. Oil droplets and liquid volume
 - d. Properties of air
 - i. Air flame combination
 - ii. Combustion requirements
 - iii. Oxygen content
 - e. Burners, igniters, and heat exchangers
- 3. Electrical
 - a. 110 volt versus 220 volt supply
 - b. Wire sizes
 - i. Amperage drain
 - ii. Voltage
 - c. Transformers
 - i. Voltage induction
 - ii. Control wiring
 - d. Thermostats
 - i. Types
 - 1. Mercury bulb
 - 2. Digital
 - 3. Programmable
 - ii. Operation
 - e. Heat anticipators
- 4. Safety limits
 - a. Operation
 - i. Bi-metal
 - ii. Pressure switches
 - b. Types
 - i. Wiring diagrams
 - ii. Installation
 - iii. Shop exercises
- 5. Venting
 - a. Systems and drafts
 - i. Atmospheric
 - ii. Forced
 - iii. Induced
 - b. Masonry and high efficiency
 - i. Materials
 - ii. One and two pipe systems
 - c. Drafting conditions
 - d. Air distribution
 - i. Fans
 - ii. Dampers
 - iii. Zones
 - e. Temperature rises
 - i. Calculations
 - ii. Heat exchangers
 - iii. Requirements

Resources

Johnson. *Refrigeration and A/C Technology*. 8th. Clifton Park, NY Delmar, 2008.

Althouse, Andrew. *Modern Refrigeration and A/C*. 20th. Goodhart-Wilcox Tinley Park, IL, 2016.

Smith, Russell. *Electricity for Refrigeration and A/C*. 8th ed. Clifton Park, NY, 2018.

Resources Other

1. Category: (http://catalog.tri-c.eduurl/?sa=t&rct=j&q=residential%20heating&source=web&cd=4&cad=rja&ved=0CFQQFjAD&url=http%3A%2F%2Fen.wikipedia.org%2Fwiki%2FCategory%3AResidential_heating&ei=xOiPUNz-Cofp0QGzpzYHICA&usg=AFQjCNF22MqcUfMciav0gBb1tuaVVxF73A)*Residential heating* - Wikipedia, the free encyclopedia
2. en.wikipedia.org/wiki/Category:Residential_heating
3. [www. \(http://www.residentialheating-ac.com/\)residentialheating-ac.com/](http://www.residentialheating-ac.com/)
4. www.showmelocal.com/profile.aspx?bid=6154844 (<http://www.showmelocal.com/profile.aspx?bid=6154844>)
5. www.otc.edu/hra/7427.php (<http://www.otc.edu/hra/7427.php>)
6. www.resheatandair.com/

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