

# **HVAC** Service Technicians Training Center

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## **Introduction to Heating System (HS-1)**

Through lecture and hands-on exercises, this course teaches the basics of oil and gas combustion processes including: air, water, and steam as heating mediums; equipment identification; heating system start-up; systems efficiency, component failure; humidification; air filtration; basic piping arrangements for hydronics systems. An overview of basic heating controls is introduced.

### **DAY 1**

**SUBJECT:** Basic Heating and Systems  
**GOAL:** Show students heating systems  
Hot water, steam, 1 & 2 pipe systems, radiant heat, hot air, electric, gas, oil.  
Theory of heat.

**OBJECTIVES:** For student to understand different types of heating systems and be able to identify them

- Hot air
- Hot water
- 1 pipe steam
- 2 pipe steam
- Electric
- Gas
- Oil
- Rooftop gas/electric cooling

**SUBJECT CONTENTS:**

- Heating And Cooling Essentials
- Whitman Johnson
- Videotapes (Carrier) ( Beckett)
- Dan Holohan (How Come)

**METHODS/  
TECHNIQUES:**

- Heating and Cooling Essentials
- Whitman Johnson
- Videotapes
- Handouts

**EVALUATION:** Review questions from Whitman Johnson and Heating & Cooling Essentials

### **DAY 2**

**SUBJECT:** Basic Heating and Systems  
**GOAL:** Identify systems and their components  
**OBJECTIVES:** For student to understand and identify systems and components for each system

- Back Flow Prevents
- Expansion Tank
- Auto Feeders
- Fan Limits
- Zone Valves
- Relays
- Pumps
- Controls

**SUBJECT CONTENTS:**

- Heating And Cooling Essentials
- Whitman Johnson
- Videotapes

**METHODS/**

TECHNIQUES: Heating and Cooling Essentials  
Whitman Johnson  
Handouts  
Videotapes  
Systems Room

EVALUATION: Review questions from Whitman Johnson and Heating & Cooling Essentials

**DAY 3**

SUBJECT: Basic Heating and Systems  
GOAL: Show students different hot water systems, steam systems, controls.  
OBJECTIVES: For student to understand different systems and their controls  
Manual water fill systems  
Pressure recipe valves & piping  
Pressure reducing valves & piping  
Manual type vents  
Auto type vents  
Controls

SUBJECT CONTENTS:  
Heating And Cooling Essentials  
Handouts of above items  
Whitman Johnson

METHODS/  
TECHNIQUES: Class Room  
Systems Room

EVALUATION: Review questions from Whitman Johnson and Heating & Cooling Essentials

**DAY 4**

SUBJECT: Basic Heating and Systems  
GOAL: Understand Heating Systems and Their Components  
OBJECTIVES: For student to understand different systems and their components  
Glass Tube  
Low water cut outs  
Steam vents  
Steam traps  
Water vents  
Controls  
Heat exchangers rooftop

SUBJECT CONTENTS:  
Heating And Cooling Essentials  
Handouts  
Whitman Johnson  
Videotapes

METHODS/  
TECHNIQUES: Class Room  
Systems Room

EVALUATION: Review questions from Whitman Johnson and Heating & Cooling Essentials

**DAY 5**

SUBJECT: Basic Heating and Systems  
GOAL: Understand Heating Systems and Their Components.  
OBJECTIVES: For student to understand different systems and their components  
Water feed system  
Baseboard BTU's per ft.  
Square ft. of steam  
BTU's per one gallon of oil #2  
Cast iron radiation

Heat exchangers replacement

**SUBJECT CONTENTS:**

Heating And Cooling Essentials  
Handouts  
Whitman Johnson  
Videotapes

**METHODS/  
TECHNIQUES:**

Class Room  
Systems Room

**EVALUATION:**

Review questions from Whitman Johnson and Heating & Cooling Essentials

**DAY 6**

**SUBJECT:**

Basic Heating and Systems

**GOAL:**

To Understand Heating and Controls

**OBJECTIVES:**

For student to understand different systems and identify  
Steam heat  
Oil heating  
Gas heating  
Electric heating

**SUBJECT CONTENTS:**

Heating And Cooling Essentials  
Handouts  
Whitman Johnson

**METHODS/  
TECHNIQUES:**

Class Room  
Systems Room

**EVALUATION:**

Review questions from Whitman Johnson and  
Heating & Cooling Essentials and Dan Holohan Book

**DAY 7**

**SUBJECT:**

Basic Heating and Systems

**GOAL:**

Understand Heating and Controls.

**OBJECTIVES:**

For student to understand different systems and identify  
All work up to date and review for midterm exam  
Hot air gas heating  
Hot air oil heating  
Hot air electric heating  
Hot water heating, gas & oil  
Venting of air for water boilers and venting of steam system  
Pipe steam  
Two pipe steam  
Controls and safety systems

**SUBJECT CONTENTS:**

Heating And Cooling Essentials  
Whitman Johnson  
Videotapes  
Dan Holohan Book

**METHODS/  
TECHNIQUES:**

Recap all above items  
Review exams  
Give out project to midterm exam

(At your home or someone you know – draw pictures of a heating system and identify what type of system it is. What is missing if anything; and submit details of system operation.

**EVALUATION:**

Grading based upon understanding what is there and what is missing

**DAY 8**

SUBJECT: Basic Heating and Systems  
GOAL: Understanding Heating and Controls  
OBJECTIVES: For student to understand Heating and Controls  
SUBJECT CONTENTS: Review of midterm exam  
METHODS/  
TECHNIQUES: Graded exams  
Handed out project exams and go over all items  
EVALUATION: Project was to see if student understands the heating systems and their controls

**DAY 9**

SUBJECT: Basic Heating and Systems  
GOAL: For student to work on systems in systems room (PDF)  
OBJECTIVES: For student to perform replacement of  
Air vent  
Motorized valves  
Pressure relief valve  
Back flow preventors  
Heat exchangers temp rise  
SUBJECT CONTENTS: Heating and Cooling Essentials  
Whitman and Johnson  
Videotapes  
Dan Holohan Book  
METHODS/  
TECHNIQUES: Classroom and System Room  
Two students at a time identify control above and remove and replace system  
with complete understanding of units operation  
RESOURCE: System room boilers and hot air furnace  
EVALUATION: PDF

**DAY 10**

SUBJECT: Basic Heating and Systems  
GOAL: For student to identify heating system and controls in systems room  
OBJECTIVES: For student to draw pictures of heating systems and controls in systems room  
SUBJECT CONTENTS: System room  
Hot water oil boiler and controls  
Hot water gas boiler and controls  
Electric heat and heat pump unit  
Oil furnace heating system  
Rooftop gas and electric cooling  
METHODS/  
TECHNIQUES: Classroom and System Room  
RESOURCE: Heating units in systems room  
EVALUATION: Understanding heating systems in systems room

**DAY 11**

SUBJECT: Basic Heating and Systems  
GOAL: For student to start up and test units in systems room (hands-on) PDF  
OBJECTIVES: For student to:  
Start up hot air furnace and test operation (oil)  
Start up hot water heating system and test operations (oil)  
Start up water heating system and test operation (gas)

Start up heat pump heating system and test (heat pump electric)

METHODS/  
TECHNIQUES:

Classroom  
(PDF) System Room

RESOURCE:  
EVALUATION:

Heating units in systems room  
Based on student understanding of systems and controls

**DAY 12**

SUBJECT:  
GOAL:  
OBJECTIVES:

Basic Heating and Systems  
For student to replace oil pumps, gas valves, thermocouples and nozzles.  
Student PDF: remove and replace  
Oil pump  
Nozzles  
Gas valve  
Thermocouple  
Stack damper

METHODS/  
TECHNIQUES:  
DAYRESOURCE:

Classroom and System Room  
Heating unit in system room  
Videotapes  
Handouts

**DAY 13**

SUBJECT:  
GOAL:  
OBJECTIVES:  
METHODS/  
TECHNIQUES:  
RESOURCE:

Basic Heating and Systems  
For student to complete final exam  
Find out if student understood all classes regarding heating systems and controls  
Exam 50 questions  
Heating and Cooling Essential  
Whitman Johnson  
Handouts  
Videotapes  
PDF's