

AIR CONDITIONING & REFRIGERATION with PRINCIPLES OF HEATING APPLICATIONS

When your HVAC system runs safely and efficiently, energy and maintenance costs are reduced. Learn how to maintain the peak efficiencies of your systems which will minimize the downtime spent on maintenance and maximize your energy efficiency.

This course covers the basics of servicing and troubleshooting air conditioning and refrigeration equipment, while expanding your knowledge of heating and ventilation systems.

Learn how to troubleshoot air conditioning system electrical and mechanical problems, and how to legally recover, recycle, and reclaim refrigerants. The program examines forced air furnaces and rooftop packaged systems, air movement and balance, fans, filters, pilot burner systems and flame safeguard devices.

NTT is a proctor for the HVAC Certification Exams—ESCO 608, 410A and Test of Excellence. If you are scheduled to take the test, you receive a free copy of the EPA Certification Exam Preparatory Manual.

CLASS FORMAT:

Lab + classroom

The participant is able to “learn-by-doing” in the course; this knowledge can be transferred to the workplace.

CLASS LENGTH:

Air Conditioning and Refrigeration – 3 Days

Principles of Heating Applications – 2 Days

STANDARD CLASS SIZE:

NTT recommends a class of 12 participants to obtain the best results.

NTT PROVIDES:

- 5-days (40 contact hours) of on-site instruction
- Student textbooks and lab manuals
- Classroom consumables
- Completion certificates
- Shipping instructor fees and travel expenses
- Applicable sales taxes

CLIENT PROVIDES:

- Classroom, with easy access, of 950 square feet or greater
- Projection screen, white board and/or flip chart(s)
- Four separate (dedicated) 20 amp circuits for the training equipment
- A dock facility or a forklift to unload the training equipment
- A pallet jack to move the crates around after they have been unloaded may also be needed
- The equipment should be placed in the training room for the NTT instructor to test and set up prior to the start of training

SHIPPING:

- 4 crates at 2,760 lbs
- 2 crates at 38" x 52" x 81" (1,000 lbs. each)
- 1 crate at 64" x 44" x 38" (600 lbs.)
- 1 crate at 35" x 35" x 27" (160 lbs.)



AIR CONDITIONING & REFRIGERATION with PRINCIPLES OF HEATING APPLICATIONS

COURSE AGENDA

THERMODYNAMICS

- Matter
- Principles of heat transfer
 - Temperature
 - Specific heat
 - Sensible heat
 - Latent (hidden) heat
 - Saturation temperature and superheat
- Heat transfer fundamentals
- Pressure and vacuum
- Pressure/temperature/volume relationships
- Gas laws
- Psychrometrics

VAPOR-COMPRESSION REFRIGERATION CYCLE

- Heat-transfer process
- Follow the heat
 - Air-cooled system
 - Water-cooled system
- Typical operating conditions
 - Comfort cooling systems
 - Refrigeration systems

REFRIGERANTS & OILS

- Refrigerant composition
 - Single-compound refrigerants
 - Blended refrigerants
- Refrigerant classifications
- Refrigerant safety
- Refrigerant cylinders
- Refrigerant oils
- Environmental Refrigerant Regulations
 - Clean Air Act Of 1990, Section 608
 - Recover, recycle, reclaim
 - Recovery and leak-repair requirements

REFRIGERATION EQUIPMENT COMPONENTS

- Evaporators
- Compressors
 - Reciprocating
 - Scroll
 - Screw
 - Centrifugal
 - Lubrication
- Condensers
 - Air-cooled condensers
 - Water-cooled
 - Evaporative condensers
- Metering devices
- Refrigeration-system accessories

AC/R SYSTEMS

- Air-conditioning systems
- Heat pumps
- Commercial refrigeration
- Baselineing
- Service equipment and practices
 - Manifold gauge set
 - Refrigerant recovery
 - Pump down
 - Vacuum and dehydration
 - Micron gauges
 - Electronic scale
 - Leak detection
 - System charging
- System start-up
 - Preoperational checks
 - Operational checks
- Preventive maintenance
 - Cleaning coils
- Mechanical troubleshooting
 - Observation
 - Mechanical faults

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COURSE AGENDA

HANDS-ON EXERCISES

- Component familiarization
- Attaching manifold gauges
- Measuring superheat and subcooling
- Recovering refrigerant
- Evacuation (pull a vacuum)
- Use of micron gauge
- System recharge
- Troubleshooting refrigerant levels
- Condenser faults
- Baselineing a system

**Optional Electrical Topics Listed
below are included in textbook:**

ELECTRICAL FUNDAMENTALS

- Electrical theory
- Electrical circuits

ELECTRICAL COMPONENTS

- Wiring
- Circuit protective devices
- Component protective devices
- Control devices
- Transformers
- Electric motors and motor-starting devices

TROUBLESHOOTING AC ELECTRICAL SYSTEMS

- Safety
 - Personal protective equipment
 - Lockout/tagout practices
- Meter categories
- Meter types and features
- Test procedures
- Electrical drawings
- Electrical symbols
- Electrical troubleshooting

GAS FIRED HEATING SYSTEMS: DESIGN AND OPERATION

- Gas fuels and combustion theory
- Gas regulators, valves, burners
- Heat exchangers
- Pilot safety controls: thermocouples, standing pilot, direct spark
- Glow-coil ignition, hot surface ignition
- Safety devices and controls

GAS FIRED HEATING SYSTEMS: MAINTENANCE AND TROUBLESHOOTING

- Scheduled and typical maintenance
- Early detection and diagnosis of problems
- Troubleshooting techniques
- Combustion efficiency
- Troubleshooting ignition problems
- Preventive maintenance procedures

ELECTRICAL FUNDAMENTALS

- Electrical theory
- Electrical circuits

ELECTRICAL COMPONENTS

- Wiring
- Protective devices
- Control devices
- Transformers
- Motor-starting devices

CONTROLS AND CONTROL SYSTEMS

- Thermostats
- Anticipators

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COURSE AGENDA

**Optional Electrical Topics Listed
below are included in textbook:**

TROUBLESHOOTING HVAC ELECTRICAL SYSTEMS

- Safety
- Meter categories
- Meter types and features
- Test procedures
- Electrical drawings
- Electrical symbols
- Electrical troubleshooting

PSYCHROMETRICS (STUDY OF AIR)

- Comfort, humidity, humidification, dehumidification
- Wet-bulb and dry-bulb temperature, relative humidity
- Psychrometric chart and air movement
- Fans, centrifugal and axial
- Filter design, selection and maintenance

MAINTENANCE AND TROUBLESHOOTING OF FURNACES AND ROOFTOP UNITS

- Fault occurrence

HANDS-ON EXERCISES

- Reading electrical schematic drawings
- Furnace wiring exercises
- Troubleshooting burner systems
- Troubleshooting wiring problems
- Manifold gas pressure
- Combustion analysis
- Motor terminal identification
- Capacitor testing and replacement
- Measuring ampere draw, voltage, resistance