

**L1 HVAC**

LEVEL 1

**Curriculum Notes**

- 192.5 Hours (Includes 72.5 hours of *Core Curriculum*, which is a prerequisite for Level 1 completion and must be purchased separately. See p. 11 for ordering information.)
- Revised: 2013, Fourth Edition
- NATE-Recognized Training Provider
- New printed Instructor's Package includes lesson plans and instructor's copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from [www.nccerirc.com](http://www.nccerirc.com).

PAPERBACK	ISBN
Trainee Guide: \$67	978-0-13-340253-7
Instructor's Package: \$67	978-0-13-416627-8
NCCERconnect Access Card: \$67	978-0-13-415708-5
NCCERconnect + Trainee Guide: \$92	978-0-13-427461-4

## MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Package. The following ISBN and pricing information is for ordering individual modules only.

### Introduction to HVAC (7.5 Hours)

Trainee \$20 ISBN 978-0-13-340339-8  
 Instructor \$20 ISBN 978-0-13-340349-7  
 (Module ID 03101-13) Covers the basic principles of heating, ventilating, and air conditioning, career opportunities in HVAC, and how apprenticeship programs are constructed. Basic safety principles, as well as trade licensure and EPA guidelines, are also introduced.

### Trade Mathematics (10 Hours)

Trainee \$20 ISBN 978-0-13-340341-1  
 Instructor \$20 ISBN 978-0-13-340350-3  
 (Module ID 03102-13) Explains how to solve HVAC/R trade-related problems involving the measurement of lines, area, volume, weights, angles, pressure, vacuum, and temperature. Also includes a review of scientific notation, powers, roots, and basic algebra and geometry.

### Basic Electricity (12.5 Hours)

Trainee \$20 ISBN 978-0-13-340342-8  
 Instructor \$20 ISBN 978-0-13-340351-0  
 (Module ID 03106-13) Introduces the concept of power generation and distribution, common electrical components, AC and DC circuits, and electrical safety as it relates to the HVAC field. Introduces reading and interpreting wiring diagrams.

### Introduction to Heating (15 Hours)

Trainee \$20 ISBN 978-0-13-340343-5  
 Instructor \$20 ISBN 978-0-13-340352-7  
 (Module ID 03108-13) Covers the fundamentals of heating systems and the combustion process. Provides the different types and designs of gas furnaces and their components, as well as basic procedures for their installation and service.

### Introduction to Cooling (30 Hours)

Trainee \$20 ISBN 978-0-13-340344-2  
 Instructor \$20 ISBN 978-0-13-340353-4  
 (Module ID 03107-13) Explains the fundamental operating concepts of the refrigeration cycle and identifies both primary and secondary components found in typical HVAC/R systems. Also introduces common refrigerants. Describes the principles of heat transfer and the essential pressure-temperature relationships of refrigerants. Introduces basic control concepts for simple systems.

### Introduction to Air Distribution Systems (15 Hours)

Trainee \$20 ISBN 978-0-13-340345-9  
 Instructor \$20 ISBN 978-0-13-340354-1  
 (Module ID 03109-13) Describes the factors related to air movement and its measurement in common air distribution systems. Presents the required mechanical equipment and materials used to create air distribution systems. Introduces basic system design principles for both hot and cold climates.

### Basic Copper and Plastic Piping Practices (10 Hours)

Trainee \$20 ISBN 978-0-13-340346-6  
 Instructor \$20 ISBN 978-0-13-340355-8  
 (Module ID 03103-13) Explains how to identify types of copper tubing and fittings used in the HVAC/R industry and how they are mechanically joined. Also presents the identification and application of various types of plastic piping, along with their common assembly and installation practices.

### Soldering and Brazing (10 Hours)

Trainee \$20 ISBN 978-0-13-340347-3  
 Instructor \$20 ISBN 978-0-13-340356-5  
 (Module ID 03104-13) Introduces the equipment, techniques, and materials used to safely join copper tubing through both soldering and brazing. Covers the required personal protective equipment, preparation, and work processes in detail. Also provides the procedures for brazing copper to dissimilar materials.

### Basic Carbon Steel Piping Practices (10 Hours)

Trainee \$20 ISBN 978-0-13-340348-0  
 Instructor \$20 ISBN 978-0-13-340358-9  
 (Module ID 03105-13) Explains how to identify various carbon steel piping materials and fittings. Covers the joining and installation of threaded and grooved carbon steel piping systems, including detailed descriptions of threading and grooving techniques.

**NATE CERTIFICATION**

NCCER is an officially recognized training provider for North American Technician Excellence (NATE), an independent, third-party certification body for HVAC/R technicians. NATE-certified technicians can use module completions through NCCER-accredited training providers for the continuing education hours required for recertification through NATE. For details and lists of available NATE-recognized training, visit [www.natex.org](http://www.natex.org). For more information regarding NATE recertification, please contact NCCER Customer Service at 1-888-622-3720.

**L2 HVAC**

LEVEL 2

**Curriculum Notes**

- 170 Hours
- Revised: 2013, Fourth Edition
- NATE-Recognized Training Provider
- New printed Instructor's Package includes lesson plans and instructor's copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from [www.nccerirc.com](http://www.nccerirc.com).

PAPERBACK	ISBN
Trainee Guide: \$97	978-0-13-340427-2
Instructor's Package: \$97	978-0-13-415782-5
NCCERconnect Access Card: \$97	978-0-13-415714-6
NCCERconnect + Trainee Guide: \$122	978-0-13-427453-9

## MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Package. The following ISBN and pricing information is for ordering individual modules only.

### Alternating Current (10 Hours)

Trainee \$20 ISBN 978-0-13-377994-3  
 Instructor \$20 ISBN 978-0-13-378009-3  
 (Module ID 03206-13) Covers transformers, single-phase and three-phase power distribution, capacitors, the theory and operation of induction motors, and the instruments and techniques used in testing AC circuits and components. Also reviews electrical safety.

### Compressors (12.5 Hours)

Trainee \$20 ISBN 978-0-13-377996-7  
 Instructor \$20 ISBN 978-0-13-378070-3  
 (Module ID 03302-13) Explains operating principles of compressors used in comfort air conditioning and refrigeration systems. Includes installation, service, and repair procedures.

### Refrigerants and Oils (12.5 Hours)

Trainee \$20 ISBN 978-0-13-377997-4  
 Instructor \$20 ISBN 978-0-13-378010-9  
 (Module ID 03301-13) Covers characteristics and applications of pure and blended refrigerants, and provides extensive coverage of lubricating oils used in refrigeration systems.

## HVAC Level 2 (continued)

### Leak Detection, Evacuation, Recovery, and Charging (30 Hours)

Trainee \$20 ISBN 978-0-13-377998-1  
 Instructor \$20 ISBN 978-0-13-378011-6  
 (Module ID 03205-13) Covers refrigerant handling and equipment servicing procedures for HVAC systems in an environmentally safe manner.

### Metering Devices (12.5 Hours)

Trainee \$20 ISBN 978-0-13-382754-5  
 Instructor \$20 ISBN 978-0-13-378012-3  
 (Module ID 03303-13) Covers the operating principles, applications, installation, and adjustment of fixed and adjustable expansion devices used in air conditioning equipment.

### Heat Pumps (20 Hours)

Trainee \$20 ISBN 978-0-13-378001-7  
 Instructor \$20 ISBN 978-0-13-378013-0  
 (Module ID 03211-13) Covers the principles of reverse cycle heating. Describes the operation of heat pumps and explains how to analyze heat pump control circuits. Includes heat pump installation and service procedures.

### Basic Maintenance (20 Hours)

Trainee \$20 ISBN 978-0-13-378002-4  
 Instructor \$20 ISBN 978-0-13-378014-7  
 (Module ID 03215-13) Covers information related to maintenance-oriented materials, as well as guidelines for the inspection and periodic maintenance of various systems and accessories. Also covers the application of gaskets and seals, as well as the adjustment of different types of belt drives. Includes information on inspection and maintenance requirements for selected equipment.

### Chimneys, Vents, and Flues (5 Hours)

Trainee \$20 ISBN 978-0-13-378003-1  
 Instructor \$20 ISBN 978-0-13-382270-0  
 (Module ID 03202-13) Covers the principles of venting fossil fuel furnaces and methods for selecting and installing vent systems for gas-fired heating equipment.

### Sheet Metal Duct Systems (10 Hours)

Trainee \$20 ISBN 978-0-13-378004-8  
 Instructor \$20 ISBN 978-0-13-382271-7  
 (Module ID 03213-13) Covers layout, fabrication, installation, and insulation of sheet metal ductwork. Also includes selection and installation of registers, diffusers, dampers, and other duct accessories.

### Fiberglass and Flexible Duct Systems (7.5 Hours)

Trainee \$20 ISBN 978-0-13-378005-5  
 Instructor \$20 ISBN 978-0-13-382272-4  
 (Module ID 03214-13) Covers the layout, fabrication, installation, and joining of fiberglass ductwork and fittings. Describes the proper methods for attaching and supporting flex duct.

### Commercial Airside Systems (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378006-2  
 Instructor \$20 ISBN 978-0-13-382273-1  
 (Module ID 03201-13) Describes the systems, equipment, and operating sequences commercial airside system configurations such as constant volume single-zone and multi-zone, VVT, VAV, and dual-duct VAV.

### Air Quality Equipment (5 Hours)

Trainee \$20 ISBN 978-0-13-378007-9  
 Instructor \$20 ISBN 978-0-13-382274-8  
 (Module ID 03204-13) Covers principles, processes, and devices used to control humidity and air cleanliness, as well as devices used to conserve energy in HVAC systems.

### Introduction to Hydronic Systems (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378008-6  
 Instructor \$20 ISBN 978-0-13-378108-3  
 (Module ID 03203-13) Introduces hot water heating systems, focusing on safe operation of the low-pressure boilers and piping systems in residential applications.

**L3 HVAC**

LEVEL 3

**Curriculum Notes**

- 157.5 Hours
- Revised: 2013, Fourth Edition
- NATE-Recognized Training Provider
- New printed Instructor's Package includes lesson plans and instructor's copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from [www.nccerirc.com](http://www.nccerirc.com).

<b>PAPERBACK</b>	<b>ISBN</b>
Trainee Guide: \$97	<b>978-0-13-375083-6</b>
Instructor's Package: \$97	<b>978-0-13-430598-1</b>
NCCERconnect Access Card: \$97	<b>978-0-13-414605-8</b>
NCCERconnect + Trainee Guide: \$122	<b>978-0-13-427460-7</b>

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Package. The following ISBN and pricing information is for ordering individual modules only.

### Fasteners, Hardware, and Wiring Terminations (10 Hours)

Trainee \$20 ISBN 978-0-13-377999-8  
 Instructor \$20 ISBN 978-0-13-378120-5  
 (Module ID 03313-13) Covers a variety of fasteners, hardware, and wiring terminations used in HVAC systems including the installation of these components.

### Control Circuit and Motor Troubleshooting (30 Hours)

Trainee \$20 ISBN 978-0-13-382407-0  
 Instructor \$20 ISBN 978-0-13-378121-2  
 (Module ID 03314-13) Provides information and skills to troubleshoot control circuits and electric motors found in heating and cooling equipment.

### Troubleshooting Cooling (20 Hours)

Trainee \$20 ISBN 978-0-13-382406-3  
 Instructor \$20 ISBN 978-0-13-378122-9  
 (Module ID 03210-13) Provides guidance related to troubleshooting cooling systems.

### Troubleshooting Heat Pumps (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378119-9  
 Instructor \$20 ISBN 978-0-13-378132-8  
 (Module ID 03311-13) Provides a thorough review of the heat pump operating cycle, and presents troubleshooting procedures for components.

### Troubleshooting Gas Heating (12.5 Hours)

Trainee \$20 ISBN 978-0-13-382405-6  
 Instructor \$20 ISBN 978-0-13-378133-5  
 (Module ID 03209-13) Covers information and skills needed to troubleshoot gas-fired furnaces and boilers.

### Troubleshooting Oil Heating (12.5 Hours)

Trainee \$20 ISBN 978-0-13-382404-9  
 Instructor \$20 ISBN 978-0-13-378135-9  
 (Module ID 03310-13) Describes the construction and operation of oil-fired heating systems and their components. Includes servicing and testing of oil furnaces and procedures for isolating and correcting oil furnace malfunctions.

### Troubleshooting Accessories (7.5 Hours)

Trainee \$20 ISBN 978-0-13-382438-4  
 Instructor \$20 ISBN 978-0-13-378136-6  
 (Module ID 03312-13) Delivers information and skills needed to troubleshoot various air treatment accessories used with heating and cooling equipment.

### Zoning, Ductless, and Variable Refrigerant Flow Systems (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378109-0  
 Instructor \$20 ISBN 978-0-13-378137-3  
 (Module ID 03315-13) Introduces the information and skills needed to troubleshoot and repair zoned, ductless, and variable refrigerant flow systems.

### Commercial Hydronic Systems (10 Hours)

Trainee \$20 ISBN 978-0-13-378111-3  
 Instructor \$20 ISBN 978-0-13-378138-0  
 (Module ID 03305-13) Reviews basic properties of water and describes how water pressure is related to the movement of water through piping systems. Describes various types and components of commercial hot-water heating and chilled-water cooling systems, and examines how those systems function.

### Steam Systems (10 Hours)

Trainee \$20 ISBN 978-0-13-378112-0  
 Instructor \$20 ISBN 978-0-13-378139-7  
 (Module ID 03306-13) Focuses on the use of steam for storing and moving energy in HVAC systems. Reviews the fundamentals of water that relate to steam and describes the basic steam system cycle. Discusses a steam system's operational components—steam boilers and their accessories and controls; steam system loads, including heat exchangers/converters; and terminal devices. Steam system valves and piping are covered in detail, including common types of piping arrangements; the components of a condensate return/feedwater system; steam and condensate pipe sizing; and pressure-reducing valves and thermostatic valves.

### Retail Refrigeration System (15 Hours)

Trainee \$20 ISBN 978-0-13-378116-8  
 Instructor \$20 ISBN 978-0-13-378140-3  
 (Module ID 03304-13) Covers the applications, principles, and troubleshooting of retail refrigeration systems.

## HVAC Level 3 (continued)

### Customer Relations (5 Hours)

Trainee \$20 ISBN 978-0-13-378117-5  
 Instructor \$20 ISBN 978-0-13-378142-7  
 (Module ID 03316-13) Presents the importance of establishing good relations with customers and provides guidance on how to achieve that goal. Focuses on ways for a technician to make a good first impression and describes how to communicate in a positive manner with customers. The elements of a service call and dealing with different types of problem customers are also covered.

#### L4 HVAC

LEVEL 4

#### Curriculum Notes

- 155 Hours
- Revised: 2013, Fourth Edition
- NATE-Recognized Training Provider
- New printed Instructor's Package includes lesson plans and instructor's copy of Trainee Guide with an access code to download TestGen software, module exams, PowerPoints®, and performance profile sheets from [www.nccerirc.com](http://www.nccerirc.com).



#### PAPERBACK

#### ISBN

Trainee Guide: \$97	978-0-13-375719-4
Instructor's Package: \$97	978-0-13-416628-5
NCCERconnect Access Card: \$97	978-0-13-414607-2
NCCERconnect + Trainee Guide: \$122	978-0-13-427455-3

### MODULES

All of the modules listed below are included in the Trainee Guide and the Instructor's Package. The following ISBN and pricing information is for ordering individual modules only.

#### Water Treatment (10 Hours)

Trainee \$20 ISBN 978-0-13-378143-4  
 Instructor \$20 ISBN 978-0-13-378164-9  
 (Module ID 03308-13) Explains water problems encountered in heating and cooling systems and identifies water treatment methods and equipment. Covers basic water testing procedures and chemistry.

#### Indoor Air Quality (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378144-1  
 Instructor \$20 ISBN 978-0-13-378165-6  
 (Module ID 03403-13) Defines the issues associated with indoor air quality and its effect on the health and comfort of building occupants. Provides guidelines for performing an IAQ survey and covers the equipment and methods used to monitor and control indoor air quality.

### Energy Conservation Equipment (7.5 Hours)

Trainee \$20 ISBN 978-0-13-378173-1  
 Instructor \$20 ISBN 978-0-13-378166-3  
 (Module ID 03404-13) Covers heat recovery/reclaim devices, as well as other energy recovery equipment used to reduce energy consumption in HVAC systems.

### Building Management Systems (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378174-8  
 Instructor \$20 ISBN 978-0-13-378168-7  
 (Module ID 03405-13) Explains how computers and microprocessors are used to manage zoned HVAC systems. Provides coverage of various network protocols and systems controllers, and introduces trainees to the various means of connection and system interface.

### System Air Balancing (15 Hours)

Trainee \$20 ISBN 978-0-13-378157-1  
 Instructor \$20 ISBN 978-0-13-378169-4  
 (Module ID 03402-13) Covers air properties and gas laws, as well as the use of psychrometric charts. Describes the tools, instruments, and procedures used to balance an air distribution system.

### System Startup and Shutdown (15 Hours)

Trainee \$20 ISBN 978-0-13-378158-8  
 Instructor \$20 ISBN 978-0-13-378170-0  
 (Module ID 03406-13) Presents the procedures for the startup and shutdown of hot water, steam heating, chilled water, and air handling systems. Also covers the start-up and shutdown of typical cooling towers and packaged HVAC units. The procedures for both short- and long-term shutdowns are included.

### Construction Drawings and Specifications (12.5 Hours)

Trainee \$20 ISBN 978-0-13-378160-1  
 Instructor \$20 ISBN 978-0-13-378171-7  
 (Module ID 03401-13) Teaches how to interpret drawings used in commercial construction, including mechanical drawings, specifications, shop drawings, and as-builts. Explains how to perform takeoff procedures for equipment, fittings, ductwork, and other components.

### Heating and Cooling System Design (22.5 Hours)

Trainee \$20 ISBN 978-0-13-378161-8  
 Instructor \$20 ISBN 978-0-13-378172-4  
 (Module ID 03407-13) Identifies factors that affect heating and cooling loads. Explains the process by which heating and cooling loads are calculated, and how load calculations are used in the selection of heating and cooling equipment. Covers basic types of duct systems and their selection, sizing, and installation requirements.

### Commercial/Industrial Refrigeration Systems (20 Hours)

Trainee \$20 ISBN 978-0-13-378162-5  
 Instructor \$20 ISBN 978-0-13-378176-2  
 (Module ID 03408-13) Expands on the study of product and process refrigeration equipment by describing systems used in cold storage and food processing applications, as well as transportation refrigeration. Various types of defrost systems are covered in detail.

### Alternative and Specialized Heating and Cooling Systems (10 Hours)

Trainee \$20 ISBN 978-0-13-378163-2  
 Instructor \$20 ISBN 978-0-13-378177-9  
 (Module ID 03409-13) Describes alternative devices used to reduce energy consumption, including wood, coal, and pellet-fired systems, waste-oil heaters, geothermal heat pumps, solar heating, in-floor radiant heating, and direct-fired makeup units. Also introduces application-specific computer room environmental and air turnover systems.

### Fundamentals of Crew Leadership (20 Hours)

(Module ID 46101-11; see p. 69)  
 Trainee \$43 ISBN 978-0-13-292245-6  
 Instructor \$43 ISBN 978-0-13-292255-5

## GREEN TOPICS IN HVAC



In the typical American household, heating, cooling and lighting consumes 67% of all the electricity that's generated. With buildings being the leading source of greenhouse emissions, it is no surprise that HVAC systems

have become primary targets in this energy conservation battle. In these four modules, we explore the methods and opportunities for increasing the efficiency of energy use and the quality of air that we breathe. These modules have been individually approved by GBCI for continuing education (CE) under its Credential Maintenance Program. CE hours are included next to the Module titles.

#### SPIRAL BOUND

Trainee Guide: \$65 ISBN 978-0-13-611998-2  
 Instructor's Guide: \$65 ISBN 978-0-13-611999-9

#### MODULES

Air Quality Equipment (5 Hours)	03204-07
Indoor Air Quality (10 Hours)	03403-09
Energy Conservation Equipment (10 Hours)	03404-09
Alternative Heating and Cooling Systems (10 Hours)	03409-09

