



MASTER CATALOG

Revised June 8, 2018



Online Classes

Heating, Ventilation, Air Conditioning, and Refrigeration

New-to-the-Industry, Apprentice through Senior Technician Programs,
Continuing Education, and Contractor Services

Our Mission is quality education, student success, and exceptional customer service.

POWER YOUR CAREER TO THE NEXT LEVEL



All the quality online educational courses described here are perfect for your busy schedule. Study at your own pace at any time of the day or night, on any Internet connected computer anywhere without having to travel to a classroom.

All courses are recognized for initial certification prep and continuing education by HVAC Excellence and NATE (unless stated otherwise).

[It's easy to get started, just click the highlighted title to enroll online.](#)

We accept Visa, MasterCard, American Express, and PayPal and we offer a Pay-as-You-Go Plan for any enrollments priced at \$1,000 or more.





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NATE Certified HVAC Technician Program

254 or more instructional hours

Refer to the Program Admissions and Enrollment Process after this section.

The NATE Certified HVAC Technician Program (NCT) is a comprehensive online HVAC education program encompassing a well-rounded set of skills used by installers and technicians who are seeking NATE Certification. It covers all the NATE Core areas with a rich selection of foundational courses, and then focuses on Air Conditioning specialty at the Service Level. The content presented in each course homes in on learning objectives that have been identified by HVAC industry groups (HVAC Excellence, AHRI, NATE, RSES, HARDI, PAHRA, and ACCA) as critical knowledge areas for an HVAC technician.

About NATE

North American Technician Excellence (NATE) is the nation's largest and most recognized non-profit certification organization for heating, ventilation, air conditioning and refrigeration technicians. NATE certification tests represent real-world working knowledge of HVACR systems. Developed by a committee of industry experts nationwide, all the NATE tests are rigorous, knowledge-based, multiple-choice tests designed to validate a technician's knowledge. You can read more about NATE at: www.natex.org.

HVACRedu.net's NCT Program is specifically structured to teach foundational skills to individuals who are new-to-the-industry and non-certified installers and technicians who want formal education to upskill their knowledge and prepare for licensing or certification exams.

What's Included

- ✓ The current edition of the Delmar Cengage Refrigeration & Air Conditioning Technology textbook is included in the tuition for this program and is shipped shortly after enrollment.
- ✓ Four HVAC Industry Exam fees are included. Reimbursement is issued when a student submits proof of passing each exam and copy of each paid invoice or receipt.
- ✓ Online Training - The online program is a Career Technical Education (CTE) model. Courses are entirely online with access 24/7/365. Class is always open. Student support is provided by our student services crew and faculty instructors through email, chat, our campus messaging system, and phone.

For the Employer (if the employer purchases the program for the technician)

- ✓ Regular reports on student progress
- ✓ Notification of less than satisfactory performance

For the Student

- ✓ Registration into each course in the program sequence one at a time
- ✓ Certificate of Completion upon successfully passing each course
- ✓ Online Faculty- mentoring and technical topic assistance
- ✓ Business hour communications with faculty and student services via email, chat, and phone

Training and Time Management

The online program model is called an Asynchronous Learning Network (ALN). Studying is done on each tech's own schedule, on his time and at his place; but a commitment to regular study is essential to ensure completion of each course within its 60-day enrollment. Students can move through course material more quickly or take the full 60 days per course, as they choose.

What's Covered in The Program

<p>Step 1: 101 HVAC Fundamentals (18 hours) 050 Applied Math Review (15 hours) OSHA 30 Hour Construction Safety (30 hours) 106 Building Systems Review (3 hours) 109 Basic Hand and Power Tools (6 hours) NATE Ready to Work Exam @ 72 Hours</p>	<p>Step 2: 111 Electrical DC Theory Plus (18 hours) 112 Electrical AC Theory Plus (18 hours) 113 Electrical Common Components (18 hours) 114 Electrical Motors (21 hours) 121 System Properties & Measurement (18 hours) 141 Refrigeration I (18 hours) NATE CORE Exam @ 183 Hours</p>
<p>Step 3: 142 Refrigeration II (18 hours) 241 Intro to Cooling System Troubleshooting (18 hours) 242 R-410A Refrigerant Technology (18 hours) 010 Employability Skills (9 hours) NATE Air Conditioning Specialty Exam @ 246 Hours</p>	<p>Step 4: EPA 608 Certification Prep (8 Hours) EPA 608 Exam @ 254 Hours</p> <p>Total Program Time: 254 Hours</p>

The first group of courses includes OSHA 30 Hour Construction Safety. Successfully completing this course provides you with your OSHA 30 hour safety card (included). After you successfully complete the first group of courses with a grade of 75% or more, you are ready to take your first NATE Ready-to-Work (RTW) Certificate Exam. This exam is optional. The RTW exam is not a proctored exam. Any tech can purchase the exam on their own (it comes with a PDF study guide) and take it at home. The exam fee will be refunded to you in full! All we need is for you to email us proof that you passed the exam and a copy of your paid invoice/receipt. We will mail you a check.

But this program doesn't end there – we continue to train you for higher levels of NATE Certified HVAC Technician credentials. After you successfully complete the second group of courses, you are ready to take the NATE Core Exam at the service level. Again, the NATE Exam fee will be refunded to you in full! Just send us proof of your passing the exam and a copy of your paid invoice/receipt.

Once you have passed the NATE Core Certification Exam, you will be ready for the third group of courses. When they are successfully completed, you will be prepared for the NATE Air Conditioning Specialty Service Level Exam, the focus of this program. Send us your proof of passing the exam with a copy of your paid invoice/receipt, and we'll reimburse you for the exam fee.

And finally, the program concludes with EPA 608 Prep and exam. You'll be reimbursed for the exam fee, just as described above.

When you reach the end of the program you will receive a Certificate of Completion for the NATE Certified HVAC Technician Program. This is the program that pays you for upskilling your credentials. You can be proud of your Certificate and your NATE Certification!

Note: The 101 Fundamentals course for Program Students requires that students must pass each module exam with a score of 75% or higher before they can move on to the next module. Once this strong foundation is established in the 101 course, students can then move through the remainder of their program at their own pace, one course at a time.

Note: For complete individual course descriptions, go to the corresponding course number in this Catalog.

This program qualifies for our pay-as-you-go in-house financing.

HVACR Apprenticeship Related Training Program

624 (or more) instructional hours

Refer to the Program Admissions and Enrollment Process after this section.

This apprenticeship related training program is entirely online—convenient quality education. Courses align with the US Department of Labor Apprenticeship Guidelines and HVACRedu.net is a Registered Apprenticeship Training Provider. This online program is the related training/educational component of registered apprenticeship programs; or many employers find it a valuable way to provide on-the-job training to new employees. [Note: Employment and on-the-job-training are not included.] All courses are written and supported by qualified industry experts. Courses are open entry:open exit, available 24/7/365 so students may begin the program at any time. Students have 8 months from the date of enrollment to access their online program and complete the year's curriculum. We are happy to offer assistance registering your apprenticeship program with our online training in your state, please contact us. Also, please check out the REQUIRED textbooks and the recommended Tool List at the back of this catalog.

Year 1 (162 hours)

Basic Construction Math (12 hrs/ 2 weeks)
Basic Hand and Power Tools (6 hrs/ 1 week)
Intro to Applied Science (24 hrs/ 4 weeks)
Energy Sources (12 hrs/ 2 weeks)
Intro to Code (12 hrs/ 2 weeks)
Customer Service (6 hrs/ 1 week)
Fuel Piping (30 hrs/ 5 weeks)
Venting (30 hrs/5 weeks)
OSHA 30 Hour Construction Safety (30 hrs/ 5 weeks)

Year 3 (156 hours)

Basic AC & Refrigeration (30 hrs/ 5 weeks)
Systems Air Flow & Duct Sizing (30 hrs/ 5 weeks)
Introduction to Hydronics (6 hrs/ 1 week)
Introduction to Service (12 hrs/ 2 weeks)
Basic Controls (36 hrs/ 6 weeks)
Basic Sheet Metal (42 hrs/ 7 weeks)

Year 2 (150 hours)

Intro to Blueprints (24 hrs/ 4 weeks)
Appliance Installation (24 hrs/ 4 weeks)
Heat Loads (24 hrs/ 4 weeks)
Indoor Air Quality (18 hrs/ 3 weeks)
Electrical I (24 hrs/ 4 weeks)
Electrical II (36 hrs/ 6 weeks)

Year 4 (156 hours)

Testing & Air Balance (12 hrs/ 2 weeks)
Control Strategies (6 hrs/ 1 week)
Advanced Air Conditioning & Heat Pump (42 hrs/ 7 weeks)
Advanced Service (24 hrs/ 4 weeks)
Systems Integration (12 hrs/ 2 weeks)
Code Review (48 hrs/ 8 weeks)
Project Management (12 hrs/ 2 weeks)

Program Learning Objectives:

Year 1

The apprentice will demonstrate new knowledge in the subjects of Basic Construction Math, Basic Hand & Power Tools, Introduction to Applied Science, Energy Sources, Intro to Code, Customer Service, Fuel Piping, Venting, and OSHA Construction Safety, by earning an overall average score of 75% or higher in the combined year's curriculum.

Year 2

The apprentice will demonstrate new knowledge in the subjects of Heat Loads, Indoor Air Quality, Electrical, Blueprints, and Appliance Installation; by earning an overall average score of 75% or higher in the combined year's curriculum.

Year 3

The apprentice will demonstrate new knowledge in the subjects of: Basic Sheet Metal, Basic Air Conditioning and Refrigeration, Systems Air and Duct Sizing, Intro to Hydronics, Intro to Service, and Basic Controls; by earning an overall average score of 75% or higher in the combined year's curriculum.

Year 4

The apprentice will demonstrate new knowledge in the subjects of: Advanced Service, Systems Integration, Code Review, Project Management, Testing & Air Balance, and Control Strategies; by earning an overall average score of 75% or higher in the combined year's curriculum.

Apprentices are enrolled for an 8 month period of time to complete the year's program. We provide a live program orientation to help students succeed and a campus navigation video. Apprentices can view only the first topic module, and open the following module by earning a minimum score of 65% on each exam. . . one module at a time . . . however, an overall averaged grade of 75% is required to successfully pass the program and receive a certificate of completion. Try to complete 2 modules each week. That will keep you on track to complete by the recommended schedule. You should refer to the Apprentice Student Handbook for specifics.

This program qualifies for our pay-as-you-go in-house financing when purchased through the store.

PROGRAM ADMISSIONS and ENROLLMENT PROCESS

Welcome! We're here to help you start your career in HVACR.

1. Students should be 18 years or older. Submitting your enrollment for a program validates that you are at least 18. If you are not yet 18, please email info@hvacredu.net before enrolling.
2. It is recommended that students are employed in the HVACR industry; OR that they make arrangements with an HVACR industry professional who can supervise the practical application of competencies, provide hands-on work experience, OR that you have the use of a learning lab throughout the program. If you do not yet have these arrangements, you are encouraged to make some local contacts. If you cannot find a placement, please let us know so we can help you locate a situation in your area.
3. Students need frequent reliable access to a computer with high speed internet and need to allow sufficient time (6 hours or more per week) to devote to learning. We recommend a PC or MAC/iMAC computer for optimal learning:
 - Your PC computer browser should be Chrome with Flash set to allow
 - Your MAC or iMAC computer browser should be Safari with "settings for this website" Adobe Flash is on or enabled, and uncheck "enable content blockers".
 - If you choose to use a tablet (whether it be iOS or Android) you will need to download a browser (such as Puffin Browser) to view the many flash assets included in the courses.
4. Complete this self-assessment: "[Is Online Learning Right for You](#)" that will help you think about what you need to prepare for learning online.
5. Select the Program of your choice and be prepared to pay in full or to make a down payment (if you select the Pay-as-you-go plan) with a credit or debit card. Your employer may want to pay for all or part of your enrollment as your on-the-job-training program. Or your employer may reimburse you for all or part of your enrollment after you successfully complete the program. If your employer pays for your enrollment, HVACRedu.net will provide him with your activity and progress reports (when requested).
6. Complete the Program Enrollment Information:
 - student's first and last name, mailing address, email, and phone; and
 - your employer's company title, contact person's first and last name, email, and phone.
7. Proceed to the payment page and complete (choose pay in full, or pay-as-you-go).
8. Once your purchase is processed, Student Services will email a welcome letter with your User Name and Password along with instructions for logging into the campus. Check your email and save it.
9. As soon as you can, log into the campus and complete your "Program Pre-Assessment" that will provide us with your Computer, English, and Math readiness. Whatever your score, it's fine. There is no pass or fail.
10. Your Program begins with an orientation with one of our faculty. The Orientation information will be provided to you in your email welcome letter. Please complete and submit #9 above before your orientation, as your faculty may want to discuss this with you.
11. You do not need to wait until your Orientation is completed to start your first course. And you do not need to wait for your textbook (if there is one). The time starts ticking on your enrollment period the day we email your welcome letter, so you'll want to get started.
12. Once you begin studying online, you may ask questions or get assistance by emailing your instructor or Student Services. We are here to support your educational success.

livesfaculty@hvacredu.net 888-655-4822 x1010 studentservices@hvacredu.net 888-655-4822 x1117

Technical Core Assessment (TCA)

You get a Competency Based Professional Education Plan

If you are a technician, but you're not sure where to start, or what to study first, start with this online assessment of your current knowledge. Don't waste time taking classes you don't need. The TCA will reveal your strengths and weaknesses in nine CORE areas of HVACR, and indicate your readiness for industry certification exams such as HVAC Excellence, or NATE.

If you're a manager or supervisor, the TCA is a great way to establish a competency based training plan for new hires and existing technicians. It is a series of nine separate assessments focusing on HVACR Core knowledge areas. The questions for each assessment are randomly selected from a pool of qualified questions for that knowledge area. The TCA has a 30 day enrollment.

You must complete the nine Core Assessments to receive a Professional Education Plan (PEP). Remember, you have 30 days to take all nine. You'll receive an email with your results and PEP shortly after you complete the TCA. Your performance on the assessments will determine the structure of your PEP. It is not necessary to complete all nine assessments in one sitting or in any order, but you will want to complete each individual assessment in one sitting. Allow 30 minutes for each assessment. We recommend that you have a calculator, a watch or clock with a second hand, a pencil, and note paper to assist in completing the assessments.

Your Professional Education Plan is competency based training, customized for your needs. If you follow your plan and complete the courses or reviews listed on your PEP, it will bring your knowledge up to the industry standards for CORE knowledge excellence and prepare you for certification exams.

The knowledge areas covered are:

- Safety Assessment (Core) - 1 Question
- HVAC Efficiency Technician 2 (Core) - 12 Questions
- Electrical 1 Assessment (Core) - 20 Questions
- Electrical 2 Assessment (Core) - 20 Questions
- Electrical 3 Assessment (Core)- 20 Questions
- Electrical 4 Assessment (Core) - 20 Questions
- HVAC Physics Assessment (Core) - 20 Questions
- HVAC Air Properties Assessment (Core) - 20 Questions
- Refrigeration Cycle Assessment (Core) – 20 Questions

Advanced Certificate Programs

HVACR Controls / Building Automation Systems Program

87 instructional hours

Written by Ron Auvil

The **HVACR Controls / Building Automation Systems Program** is an advanced program totaling 87 instructional hours, videos included. Students will take one course at a time in a systematic progression through courses that lay a good foundation, then move into commercial HVAC systems and through the specific technologies of controls systems. Students are enrolled as online asynchronous independent study. This access allows students to login at their convenience 24/7/365. The courses were written by Ron Auvil who is the Author of *HVAC Control Systems*, American Technical Publishers. Along with the courses described below, Ron also teaches these topics in a series of recorded video lecture presentations included with each learning module. This program is NATE recognized for 87 hours of continuing education (CEHs) which are applicable to NATE re-certification; and BPI recognized for 43.5 continuing education units (CEUs).

The courses making up the Program are:

1. 153 HVACR Control Systems Fundamentals
2. 154 HVACR Control Systems Types and BAS Basics
3. 155 HVACR BAS Installation and Strategies
4. 156 HVACR BAS System Management and Advanced Technologies
5. 157 HVACR Troubleshooting DDC Systems & Components

Required Textbooks: *HVAC Control Systems (4th edition)*, American Technical Publishers, by Ronnie J. Auvil, ISBN- 978-8269-0779-0 shipped upon program enrollment, **included** with Program Enrollment.

Prerequisites:

This program is designed for HVACR technicians, facilities managers, and commercial maintenance technicians who have already completed an educational program for HVACR and/or have current industry work experience in the field. The program will build on your existing knowledge of HVACR fundamentals and equipment and help you learn HVACR Controls and Building Automation Systems.

Grades: Students who complete a course with a grade of 75% or higher will receive a certificate of completion for that course. Further, at the end of the program, if all courses are passed with a score of 75% or higher, students will receive a Certificate of Completion for the HVACR Controls / Building Automation Systems Program. All courses in the program also carry NATE and BPI continuing education credit for technicians maintaining industry certifications.

Jobs: A quick check revealed that Indeed.com shows 1,044 job listings for Building Automation Controls Technician; Monster.com shows over 1,000, Career Builder shows 504, and GlassDoor.com shows 4,457. This skill set is much in demand right now and will continue to increase!

For course descriptions, find the corresponding course number in this catalog.

This program qualifies for our pay-as-you-go in-house financing.

HVACR Commercial Refrigeration Program

42 instructional hours

Written by Dick Wirz

The Commercial Refrigeration Program is an advanced program, perfect for HVACR technicians and contractors who want to better understand refrigeration systems used in commercial applications like stores, warehouses, restaurants, and product and food services. The first time the course was offered Dick's lectures were recorded. Those recordings are included in the asynchronous delivery so you feel like you're sitting in his classroom. He covers everything you need from refrigeration principles through evaporators, condensers, compressors, metering devices, controls, accessories, motors, and the various refrigerants used so you can service walk-in refrigerators and freezers, and commercial ice makers with confidence. He also describes the most common service issues and troubleshooting procedures. The courses included in this program are described below:

441 HVACR Commercial Refrigeration I (24 hours / 60 days) *Advanced*
Written by Dick Wirz

We will compare things you're already familiar with like space temperatures and common components of basic AC systems to those of commercial refrigeration systems. We will examine evaporators, condensers, compressors, metering devices, controls and accessories, and the refrigerants commonly used in commercial refrigeration. We will review the important terminology. At the end of this course we will cover some system troubleshooting, giving you a chance to put your knowledge to work on the 9 most common system problems. And you will understand when to apply TROT (The Rule Of Thumb) in the absence of a manufacturer's recommendation. **Recommended**

Prerequisites: you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. This course is recognized for 24 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 12 continuing education units (CEUs). Required Text: Commercial Refrigeration for HVACR Technicians – by Dick Wirz. This course is divided into these learning modules:

- Refrigeration Principles
- Evaporators
- Condensers
- Compressors
- Metering Devices
- Controls and Accessories
- Refrigeration System Troubleshooting Part 1
- Refrigeration System Troubleshooting Part 2

442 HVACR Commercial Refrigeration II (18 hours / 60 days) *Advanced*
Written by Dick Wirz

This course is a continuation of 441 HVACR Commercial Refrigeration I. Again, we will compare things you're already familiar with like basic AC systems to those of commercial refrigeration systems. We will examine compressor motor controls, retrofitting, recovery, evacuation, and charging; various supermarket refrigeration systems, walk-in refrigerators and freezers, and commercial ice machines so you can identify the components, their functions, and the refrigerants belonging with each application. After you have a good understanding of the equipment, we'll explore appropriate temperatures for products kept in that equipment. And finally, you will understand when to apply TROT (The Rule Of Thumb) in the absence of a manufacturer's recommendation. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Required Text: Commercial Refrigeration for HVACR Technicians – by Dick Wirz. This course is divided into these learning modules:

- Compressor Motor Controls
- Retrofitting, Recovery, Evacuation, and Charging
- Supermarket Refrigeration
- Walk-in Refrigerators and Freezers
- Ice Machines

- Product Temperatures for Preservation and Health – Refrigeration Business Tips

Required Textbook: *Commercial Refrigeration for Air Conditioning Technicians*, shipped upon program enrollment, included in the program price.

Prerequisites: This advanced program is designed for HVACR technicians and contractors, facilities managers, and commercial maintenance technicians who have already completed an educational program for HVACR and/or have current working knowledge of HVACR fundamentals. It will build on your existing knowledge.

Grades: Students who complete a course with a grade of 75% or higher will receive a certificate of completion for that course. Further, at the end of the program, if both courses are passed with a score of 75% or higher, students will receive a Certificate of Completion for the HVACR Commercial Refrigeration Program. Both courses in the program also carry NATE and BPI continuing education credit for technicians maintaining industry certifications.



HVACR Chiller Mechanic Program 36 instructional hours

Many commercial buildings utilize chilled water systems for comfort cooling. These chillers come in many different configurations. Small and mid-size chillers are used in buildings such as schools and medical office buildings. Large facilities such as colleges, hospitals, and military bases have central chiller plants that supply chilled water to multiple buildings. This program is designed for advanced level technicians and building maintenance personnel who are responsible for operation, maintenance, and troubleshooting of chiller systems in commercial buildings. This program is made up of four courses for a total of 12 learning modules that are recognized for 36 hours of continuing education (CEHs), applicable to NATE re-certification.

202 High Efficiency HVAC System Maintenance – Central Chillers (6 hours/30 days) *Intermediate* *Written by Chris Compton*

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course focuses upon Commercial Central Chiller Systems, with a basic introduction as to the layout of the various components utilized in large and small commercial facilities. Then the modules expand into the specifics of chilled water systems and the required maintenance and record keeping to insure efficient operation of the Chiller Systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs). Module topics covered:

- Central Chiller Maintenance – Daily and Weekly
- Central Chiller Maintenance – Monthly and Annual

402 HVACR Packaged Chillers: 25 - 150 Tons (9 hours / 30 days) *Advanced* *Written by Ron Auvil.*

This course is designed for advanced level technicians and building maintenance personnel who are responsible for operation, maintenance, and troubleshooting of chiller systems in commercial buildings. Packaged chillers such as those used in small and medium tonnage applications will be covered in this course. Emphasis will be given to operating characteristics, main components, maintenance, control, and troubleshooting. This course is recognized for 9 hours on continuing education, (CEHs), applicable to NATE re-certification. Modules cover:

- Introduction; AHU and Chilled Water System Overview
- Packaged Air-Cooled Chillers
- Packaged Chiller Control, Operation, and Maintenance

203 High Efficiency HVAC System Maintenance – Cooling Towers (6 hours/30 days) *Intermediate*

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course focuses upon Commercial Cooling Tower Systems, with a basic introduction as to the layout of the various components utilized in large and small commercial facilities. Then the modules expand into the specifics of cooling towers and the required maintenance to insure efficient operation of the cooling tower systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs).

Module topics covered:

- Cooling Tower Overview – Daily and Monthly Maintenance
- Cooling Tower Overview – Annual and Seasonal Maintenance

403 HVACR Water Cooled Mid & Large Tonnage Chillers 150+ Tons (15 hours/60 days) *Advanced*
written by Ron Auvil.

This course is designed for advanced level technicians and building maintenance personnel who are responsible for operation, maintenance, and troubleshooting of chiller systems in commercial buildings. We will cover larger chiller systems, to include screw and centrifugal chillers, as well as cooling towers. Emphasis will be given to operating characteristics, main components, maintenance, control, and troubleshooting. The vast majority of chiller types are thoroughly covered, as well as components and control sequences. The course will finish up with detailed, in-depth multiple field troubleshooting scenarios. All scenarios are derived from actual service calls. Upon completion of this course the technician will have been exposed to a minimum 75% of the most common service calls on commercial chiller systems. The prerequisites are successful completion of the 402 HVACR Packaged Chillers 25 – 150 Tons Course or equivalent field experience. This course is recognized for 15 hours of continuing education, (CEHs), applicable to NATE re-certification. The modules cover:

- Centrifugal Chillers
- Screw Chillers
- Cooling Towers
- Typical Chiller Plant Layout
- Mid and Large Tonnage Chiller Diagnostics and Troubleshooting.

Program Prerequisites: This advanced program is designed for HVACR technicians and contractors, facilities managers, and commercial maintenance technicians who have already completed an educational program for HVACR and/or have current working knowledge of HVACR fundamentals. It will build on your existing knowledge.

Grades: Students who complete the program with a score of 75% or higher will receive a Certificate of Completion for the HVACR Chiller Mechanic Program. Both courses in the program also carry NATE continuing education credit for technicians maintaining industry certifications.

Professional Development for Technicians Prepare for Exams

How can you be sure you're truly ready to pass your industry exams the first time?

Save time and money by being sure.

You can sign up for:

EPA 608 Review to have full access to everything in the course, move freely through the material and take practice exams, without worrying about grades.

Certification Exam Prep Reviews are practice exams available on demand, you can continually test yourself and improve weak areas as needed. These will help you become familiar with the language and format of exams and relieve test anxiety.

Tek Assist

To help experienced HVACR Technicians prepare for industry certification exams.

Certification Exam Prep Reviews

Each review includes random selection exams that provide immediate feedback. With these exams available on demand, you can continually test yourself and improve weak areas as needed. No certificates of completion are issued for these reviews. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Online learning tools include:

- * Downloadable study handouts
- * User-friendly navigation
- * Linked resource sites for additional study
- * 30-day access
- * Video clips on key points

[Core Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Core Service Certification exam. The review covers in detail the same main topics as the NATE Core Service:

- *HVAC Fundamentals
- *HVAC Air Side Knowledge
- *HVAC Electrical Knowledge

[Air Conditioning Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Air Conditioning Certification exam at the Service level. The review is done in four comprehensive sections covering:

- *HVAC Electrical Knowledge
- *Refrigeration Cycle Knowledge
- *Air Side Knowledge
- *Cooling Service Knowledge

[Air to Air Heat Pump Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Air to Air Heat Pump Service Certification exam at either the Installation or Service level. The review is done in four comprehensive sections covering:

- * HVAC Electrical Knowledge
- * Air Side Knowledge
- * Refrigeration Cycle Knowledge
- * Heat Pump Specific Knowledge

[Gas Heating \(Air\) Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Gas Heating (Air) Service Certification exam at either the Installation or Service level. The review is done in three comprehensive sections covering:

- * HVAC Electrical Knowledge
- * Gas Heat Specific Knowledge
- * Air Side Knowledge

[Hydronics Gas Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Hydronics Gas Service Certification exam at either the Installation or Service level. The review is done in three comprehensive sections covering:

- * HVAC Electrical Knowledge
- *Hydronics Knowledge
- * Gas Heat Specific Knowledge

[Hydronics Oil Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Hydronics Oil Service Certification exam at either the Installation or Service level. The review is done in three comprehensive sections covering:

- * HVAC Electrical Knowledge
- *Hydronics Knowledge
- *Oil Heat Specific Knowledge

[Oil Heating \(Air\) Service Certification Review](#)

This review prepares technicians for the HVAC Excellence or NATE Oil Heating (Air) Service Certification exam at either the Installation or Service level. The review is done in three comprehensive sections covering:

- * HVAC Electrical Knowledge
- * Oil Heat Specific Knowledge
- * Air Side Knowledge



[TekAssist 30 Day Subscription](#) **Exam Prep Study Guides, Slides, and Sample Exam Questions**

To help experienced HVACR Technicians prepare for industry certification exams (especially NATE Core and Specialties), we have partnered with Jeff Taylor of TekAssist to bring you 30 days access to his library of extensive online downloadable study guides, instructional slide presentations, and online sample exam questions (with correct answer indicator) for almost any HVACR topic including:

- Core
- Air Conditioning
- Gas Heat
- Heat Pumps
- Air Distribution
- Commercial

Your enrollment in TekAssist includes access to everything in its entire library. It is a great way to prepare for any industry certification exam on a budget.

Note: This 30 day online access is provided for industry certification exam preparation and knowledge refresh only. There are no instructors or student support services included, no grades, and no continuing education credits. All content is copyrighted to TekAssist.

Courses for Continuing Ed Hours or Units (CEUs)

Foundation, Intermediate, Advanced, Energy Efficient

Courses are open-entry, self-paced, open-exit (unless described otherwise). You have access to each course for 60 days (unless stated otherwise). Spend as much time as needed on a certain subject or move along more quickly. Most courses include instructor support unless described as “without an instructor”. If the course you select does not come with an instructor, you can “add an instructor” for a small additional fee. If you have questions for the instructor, just send an e-mail and you will have an answer within 24 hours.

Our course modules present specific HVACR concepts by incorporating some or all of the following: text reading assignments, web site tours, applied exercises, online quizzes, industry terminology definitions, video clips, animations, images and downloadable/printable handouts. Each module concludes with a 20 question module-specific exam and the course may conclude with a 25 question comprehensive final exam. Students are required to earn a minimum score of 75% overall for successful course completion, and to complete the Online Learning Survey before a Certificate of Completion will be issued.

All courses are aligned with the National Standards for HVACR education and the Home Performance industry as formulated by numerous industry groups such as ANSI/ACCA Quality Standards, AHRI, HVAC Excellence, BPI, PAHRA, PHCC, RSES, and others. Each course is recognized for NATE Continuing Education Hours and BPI Continuing Education Units applicable to NATE and BPI re-certification (see each course description). Courses may also qualify for state and local re-licensure CEH’s, and for state teaching certification renewal CEU’s (check with your local agency for details and contact us if you need assistance).

Intermediate and Advanced course descriptions also describe the Recommended Prerequisites. Please refer to each course description in the Catalog for the specific details. Prerequisites are not required; however, you will find the Advanced course content challenging if you have not mastered the recommended prerequisites.

Individual Modules

If you need a limited number of Continuing Education Hours or Units (CEUs) consider enrollment into individual modules. Modules are the building blocks of all our online courses, very much like chapters in a book, with about three hours of online instruction each. These modules are available individually without an instructor. You have a choice to either study the whole online course or just the individual module(s) you’re most interested in. You can even mix and match modules to create a learning experience that meets your individual needs. All this adds up to using your valuable time and money more effectively.

Each module is made up of the same course content, learning resources, pictures, graphics, simulations, charts, tables, and animations included in that section of the full course. You will have a 30 day enrollment to study the online module and complete the online exam. As soon as you submit the exam you’ll receive immediate feedback with your score. If you score 75% or higher you can print your certificate of completion showing recognized continuing education instructional hours.

If you find that you need an instructor who can answer your questions via email or phone, you can add an instructor to a module for a small fee.

You may use your certificate(s) of completion to verify successful completion of a course by providing it to any of the following: your state’s HVACR licensing board, state’s board of education as credit toward renewal of a teaching certificate, national industry certification organizations (such as NATE and BPI) to be applied to re-certification, your employer to be used for advancement, or if you’re enrolled in a state apprenticeship program-to the state office of apprenticeship as verification of successful completion of the required course of study. You may also use certificates in your professional portfolio as part of maintaining, upskilling, or advancing job qualifications; or when job hunting.

Courses

Levels: Foundation, Intermediate, Advanced, Energy Efficient

010 Employability Skills (9 hours/60 days)

Foundation

Written by Patricia Leiser and Phil Rains

Learn how to provide customers with first class customer service by becoming a valued employee, handling your paperwork and recordkeeping correctly, and communicating with your customers and co-workers in professional ways that develop return customers. Three modules cover:

- Personal Work Habits
- Industry Paperwork and Recordkeeping
- Communications & Work Relationships

015 Customer Service and Sales Skills (15 hours/60days)

Foundation

Written by Steve Coscia, CSP- President of Coscia Communications

This course is a compilation of essential lessons on customer service/sales soft skills created by the preeminent leader in soft skills education, Steve Coscia. It provides the soft skills basics for technicians who want to make a positive first impression and differentiate their service delivery. You will improve your communication skills and know how to deliver more proactive and helpful service. This video series includes real situations along with explanations for how to satisfy customers throughout. Non-credit exam questions are built into the lesson to engage the student and ensure content retention. Each module is also followed by a credited and required exam. This course is recognized for 15 hours of continuing education (CEHs) applicable to NATE re-certification, and recognized for 4.5 continuing education units (CEUs). This course is presented in flash video format with modules covering the following topics:



015-1 Contractor Soft Skills

This informative lesson provides the soft skills basics for technicians who want to make a positive first impression and differentiate their service delivery. All content is based on actual customer encounters. Students will learn the importance of a positive attitude when serving customers.

- Courteous and Polite Behaviors
- The First Impression
- Balancing Empathy & Expertise
- Listening & Handling Stress

015-2 Customer Service Superiority

In this lesson, service professionals will improve their communication skills and convey a more proactive and helpful attitude by serving customers with urgency and empathy. First impressions matter. A service professional's role is more than solving problems and answering questions – it's also about adding value. This lesson features actual customer interactions that students will relate to and learn from.

- How to Add Value When Serving Customers
- The Four Parts of a Service Greeting
- How to Let Customers Hear Your Urgency When Helping Them
- How to Remain Calm When Serving Difficult Clients

015-3 Customer Service Persuasion

This lesson covers the persuasive behaviors that enable service professionals to convert customer inquiries into more business. The communication skills techniques in this lesson focus on relationships and delivering value, especially when customers ask about price. Actual customer inquiries are conveyed and analyzed in real time for the student's benefit.

- Gaining Self-Confidence and Being More Persuasive
- Improve from Transactional to Relational Service Events
- Dominate the Listening – Let Customers Talk
- Give Customers Options – Many Ways to Say "YES"

015-4 Customer Service Teamwork

This informative lesson provides the soft skills basics for technicians who want to improve their effectiveness and value as team members and leaders. All content is based on actual encounters within teamwork situations.

- Improve personal and team effectiveness and efficiency
- Learn conflict resolution skills

- Recognize importance of word usage in communication and understanding
- Recognize the value of empathy in teamwork situations.

015-5 Customer Service Leadership

This informative lesson provides the soft skills basics for technicians who want to make a positive first impression and enhance their customer service professionalism. All content is based on actual customer encounters.

- Effective introduction strategies.
- Expanded conflict resolution skills.
- Recognize the importance of awareness, perception and perspective.
- Recognize the value of objectivity in customer service situations.

015-6 Customer Service Attitude

This lesson focuses on how to establish a positive first impression by having a positive attitude and showing respect to your customer.

- Attitude
- Parking the Vehicle

OSHA 10-Hour Construction Safety

Presented in partnership with ClickSafety, this OSHA 10-Hour Construction online course is a part of an OSHA outreach program that results in a valid DOL/OSHA 10-Hour Card. This online training course teaches recognition, avoidance, abatement, and prevention of safety and health hazards in workplaces. This course also provides information regarding workers' rights, employer responsibilities and how to file a complaint. It was designed to help workers stay up-to-date with their OSHA safety requirements. If you should fail the exam, OSHA requires that you re-purchase the course and re-take the exam from the beginning.

OSHA 30-Hour Construction Safety

Presented in partnership with ClickSafety, this OSHA 30-Hour Construction Safety online course is OSHA-Authorized featuring the required steps for completing OSHA Outreach training. This online training covers everything from Electrical Hazard Safety to Fall Protection. Our OSHA 30-Hour Construction online course is a proven way to receive a valid OSHA 30-Hour Card and achieve the safety level required by your company for work in the construction industry. If you should fail the exam, OSHA requires that you re-purchase the course and re-take the exam from the beginning.

050 HVACR Applied Math (12 hours / 60 days)

Foundation

Written by Chris Compton

A course designed to refresh and exercise common math concepts as applied to the HVACR workplace. This course provides demonstrations and exercises in the four basic math functions; addition, subtraction, multiplication and division. Each of the four functions is practiced using HVACR workplace applications. The course is offered without an instructor, but everything you need is included in the learning modules to refresh your working knowledge of basic math. Each of the four math functions are applied to:

- Whole numbers
- Fractions
- Decimals

Each module provides a tutorial that demonstrates how the specific process is performed and then followed with a selection of exercises to sharpen your skills. The correct answer is given after each of the exercise problems. The module is completed with a 10 randomly selected question exam. You will have 5 attempts at each exam to master math process assessed. Your highest score will be entered in your grade book.

Module 01: Addition of Whole Numbers

Module 02: Subtraction of Whole Numbers

Module 03: Multiplication of Whole Numbers

Module 04: Division of Whole Numbers

Module 05: Addition of Common Fractions

Module 06: Subtraction of Common Fractions

Module 07: Multiplication of Common Fractions

Module 08: Division of Common Fractions

Module 09: Addition of Decimal Fractions

Module 10: Subtraction of Decimal Fractions

Module 11: Multiplication of Decimal Fractions

Module 12: Division of Decimal Fractions

101 HVACR Fundamentals (18 hours/60 days)

Foundation

Written by Chris Compton

An introduction to the HVACR basic fundamentals and terminology, and the applied physics concepts that are utilized in HVACR systems. Subjects include measurements, heat, pressure, gas properties, and air properties. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard180. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Six modules cover:

- Measurements
- Heat Energy
- Pressure
- Gas Works
- Air Works
- Introduction to the Industry

103 HVACR Basic Sheet Metal (18 hours/60 days)

Foundation

Written by Mark Clemons

This course will assist HVAC Technicians and others involved in the HVAC industry with a basic understanding of sheet metal. Sheet metal work is essential to HVAC work. An HVAC tech doing a furnace change out, for instance, will need to fit the new furnace to the plenum which may involve designing or building an adapter. The idea of taking a flat piece of metal and forming it into something useful, functional or decorative can be one of the most fascinating aspects of HVAC work. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard180. This course is recognized for 18 hours of continuing education (CEHs) which are applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). The main topics for the course are:

- Types of Sheet Metal and Their Uses
- Assembling, Connecting, and Fastening Sheet Metal Components
- Sheet Metal Tools and Their Uses
- Sealing, Insulating and Lining Sheet Metal Ductwork
- Specifications, Symbols, and Codes
- Introduction to Sheet Metal Duct Layout and Fabrication
- Methods of Layout and Development

104 HVACR Copper Works (6 hours/60 days)

Foundation

Written by Chris Compton

Copper Works is different from all our other online courses because it was designed to provide specific guidance for students in a Copper Lab. It is rich with images and streaming videos that deliver the course content. There are two exams; one at the end of module 1, and the second at the end of module 3. If you are a technician who wants to improve your copper working skills without going to a classroom, this course is right for you. This course is BPI recognized for 3 continuing education units (CEUs), and NATE recognized for 6 hours of continuing education (CEHs) applicable to re-certification. Copper Works course contains six learning modules covering:

- Copper Tubing/Pipe and Fittings (module exam)
- Cutting, Flaring, Swaging & Bending Tubing
- Torch Safety and Operation (module exam)
- Soft Solder
- Silphos Braze
- Silver Braze

106 HVACR Building Systems Review (3 hours/30 days)

Foundation

Written by Scott Oakley

This is an entry-level course in a single module designed for those who need a basic understanding of residential building construction assemblies, terms and materials, as they pertain to HVACR installation and service work on

a jobsite. The content of this course follows the recommended topics for basic study of HVACR. With this introductory course a student will have a better understanding of many of the basic building construction methods and materials. The content covered is keyed to the specified HVACR industry competency and curriculum guidelines published by several organizations concerned about education provided to HVACR technicians: NATE (North American Technician Excellence), ARI (Air-conditioning and Refrigeration Institute), ACCA (Air Conditioning Contractors of America) and RSES (Refrigeration Service Engineers Society). This course is NATE recognized for 3 hours of continuing education (CEHs) applicable to re-certification.

107 Principles of Building Science (PBS) (28 hours/60 days)

Energy Efficient

Written by Roger DesRosiers and Kent Compton

This is the first online course of its kind, developed and written in partnership with nationally recognized building science experts. It features interactive exercises, pictures, videos, graphics, and text covering everything an individual in the building, remodeling, or trade industry needs to know to make buildings perform more efficiently. The PBS course will also help prepare individuals on the path to NATE, NARI, BPI, RESNET, and other industry credentials related to energy efficient building performance. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ACCA/ASHRAE Standard 180. Students receive a downloadable Principles of Building Science study guide within the course. This course is BPI recognized for 14 hours of continuing education and NATE recognized for 28 hours (CEU's/CEHs) applicable to re-certification. This course allows 60 days enrollment to complete. The Principles of Building Science course contains nine learning modules covering:

- House as a System
- Air Flow Basics
- Heat Flow, Insulation & Windows
- Framing & Air Sealing
- Moisture Management
- Conditioning Strategies
- Ventilation
- Combustion Safety
- Indoor Air Quality Basics

109 Basic Hand and Power Tools (6 hours/60 days)

Foundation

Written by James Eller

An introduction to the basic hand, power and specialty tools used daily by the working HVACR technician. The topics discussed include Installation, Service and Troubleshooting Tools. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ACCA/ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs). Two modules cover:

- Installation Hand Tools - Sheet Metal and Piping
- Electronic and Power Tools

110 HVACR Blueprints (12 hours/60 days)

Foundation

This online course provides an introduction to Blueprints used in construction specific to the heating, ventilation, and air conditioning systems that are likely to be found on the jobsite. HVACR Technicians need to understand how to read blueprints in order to perform their jobs and avoid errors. Subjects covered throughout this course include blueprint terms, symbols, interpretation and application of drawings; how to locate and identify the different components of a blueprint, scales of drawings, different measuring instruments; the meaning of different lines, markings, abbreviations, symbols, and keynotes; using gridlines to locate an area, caring for blueprints, and finally, how to measure for accuracy. This course is NATE recognized for 12 hours of continuing education (CEHs) applicable to NATE re-certification. Four modules are entitled:

- Intro to Blueprints
- Components of the Blueprint and Scale
- Lines of Construction, Abbreviations, Symbols, and Keynotes
- Using Gridlines to Identify Plan Locations and Dimensions

111 HVACR Electrical DC Theory Plus (18 hours/60 days)

Foundation

Written by Chris Compton

An introduction to basic electrical theory such as the electron, Ohms Law, circuit schematic symbols, circuit characteristics and measurements as applied to DC & AC circuits in the HVACR industry. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Also the ESCO Electrical Theory and Application e-book is included in the course. This online course is NATE recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Students also receive access to the ESCO Electrical Theory and Application e-book, a downloadable file, as an additional learning resource. Six modules cover:

- Electrical Safety Fundamentals
- What is Energy
- Atomic Theory
- Basic Circuits
- Parallel Circuits
- Power

112 HVACR Electrical AC Theory Plus (18 hours/60 days)

Intermediate

Written by Chris Compton

A continuation of the Electrical 111 course, concepts presented focus on alternating current production and application to devices utilized in HVACR systems. Topics include magnetism, alternating current, two types of loads, capacitors, and values of load devices and their calculations, and transformers. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Also the ESCO Electrical Theory and Application e-book is included in the course as a downloadable file as an additional resource. **Recommended Prerequisites:** It is recommended that you have a good understanding of HVACR Fundamentals and Completion of 111 HVACR Electrical DC Theory Plus, or equivalent on the job training, prior to enrollment into this intermediate course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Six modules cover:

- Magnetism
- Alternating current
- Loads, Resistive and Inductive
- Capacitors
- Resistance
- Transformers

113 HVACR Electrical Common Components (18 hours/60 days)

Advanced

Written by Chris Compton

A logical continuation of 112 Electrical, this course covers common control components found in HVACR systems. Presentations and examples are given for specific devices and their electrical sequence of operation in normal HVACR applications. The final modules discuss wiring and schematic reading. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Also the ESCO Electrical Theory and Application e-book is included in the course. **Recommended Prerequisites:** You will want to have completed 111 HVACR Electrical DC Theory Plus, and 112 HVACR Electrical AC Theory Plus, or have a working knowledge of the content of those courses prior to enrollment into this advanced course. Please refer to each course description in the Catalog for the specific details. 113 Electrical is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Students also receive access to the ESCO Electrical Theory and Application e-book, a downloadable file, as an additional learning resource. The six modules cover:

- Control Methods, Temperature & Pressure
- Residential Heat / Cool Thermostats @ Low Voltage
- Really Good Relay Stuff
- Contactors Go / Starters Go with Protection
- Power Wiring
- Odds and Ends Around a Schematic

114 HVACR Electrical Motors (21 hours/60 days)

Advanced

Written by Bob Recko and Bruce Aitken (module 7)

This course is dedicated to common single-phase and small three-phase electric motors. Presentations focus on basic motor theory, common types of motors, starting components and protection devices. You will also develop diagnostic skills for motor troubleshooting and replacement. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Students receive access to the ESCO Electrical Theory and Application e-book, a downloadable file, as an additional learning resource. **Recommended Prerequisites:** you will want to have completed 111 HVACR Electrical DC Theory Plus, 112 HVACR Electrical AC Theory Plus, and 113 HVACR Electrical Common Components, or have a working knowledge of the content of those courses prior to enrollment into this advanced course. Please refer to each course description in the Catalog for the specific details. This course is recognized for 21 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 10.5 continuing education units (CEUs). Seven modules cover:

- Basic Electric Motor Theory
- Open and Hermetic Motors
- Capacitor Motors
- Three-phase Motors
- The Application of Electric Motors
- Diagnosing and Replacing Electric Motors
- ECM Motors

121 HVACR Systems Air Properties and Measurement (18 hours/60 days)

Intermediate

Written by Chris Compton

Your introduction to HVAC comfort systems. In this course we discuss heat energy, the conditions of human comfort, the psychrometric chart and plotting various air conditions upon it. Included is the top-rated eBook on the topic entitled, “*Psychrometrics Without Tears*” to help you digest the important concepts of air and how the various properties relate to each other. We complete the course by introducing the terms, concepts, measurements, and calculations of moving air. **Recommended Prerequisites:** It is recommended that you have a good understanding of HVACR Fundamentals and have a working knowledge of those topics prior to enrollment into this intermediate course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Six modules cover:

- Heat Energy and Comfort
- Properties of Air
- Psychrometrics
- Total Heat In Air
- Measuring a Heavy Invisible Moving Volume
- Air Flow Measurement

122 HVACR Systems: Load Calculations (18 hours/60 days)

Advanced

Written by Phil Rains

Residential load calculations is a method to determine the heating and cooling BTU/H loads of structures prior to installing HVACR systems to meet those loads. **You will need the required text:** Air Conditioning Contractors of America (ACCA) Manual J, 8th Abridged Edition (MJ8-AE). This manual provides thorough instructions for estimating heat loss and heat gain for residential structures and helps to simplify complicated procedures that are often used on a variety of home applications. 122 Systems provides instruction for completing load calculations by hand, which is necessary prior to attempting any computerized load program. We focus on following the concepts of MJ8-AE while further simplifying the methodology emphasized in the manual. Students will utilize a “simple” residential structure and follow the steps to calculate both heat loss and heat gain for its location and outdoor design temperatures. This course also covers residential equipment selection focused on the heating and cooling equipment Btu/h loads of a structure. **Recommended Prerequisites:** you will want to have a strong working knowledge of HVACR fundamentals prior to enrollment into this advanced course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). This course is presented in the following six modules:

- Fundamentals of Load Calculations
- Heat Loss of a Structure

- Heat Gain of a Structure
- Example Heat Loss and Heat Gain Calculation
- Fundamentals of Equipment Selection
- Regional Load Calculation Exercises

123 HVACR Air Distribution (18 hours/60 days)

Advanced

Written by Phil Rains

123 Air Distribution begins with an in-depth discussion of the fundamentals of residential air flow, then turns the focus to residential duct design utilizing the Air Conditioning Contractors of America (ACCA) Residential Duct Systems, Manual D (required textbook) and ACCA Manual T (optional textbook). System selection, system performance characteristics, duct materials, blower performance, air-side devices and duct sizing procedures are covered in detail. **Recommended Prerequisites:** you will want to have a strong working knowledge of basic HVACR fundamentals prior to enrollment into this advanced course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE recertification, and BPI recognized for 9 continuing education units (CEUs).

Module topics are:

- Fundamentals of Air Flow
- Air distribution Systems
- Fundamentals of Air Conditioning Contractors of America (ACCA) Residential Duct Systems, Manual D
- Application of Air Conditioning Contractors of America (ACCA) Residential Duct Systems, Manual D Duct Sizing Procedures
- Application of Air Conditioning Contractors of America (ACCA) Air Distribution Basics for Residential and Small Commercial Buildings, Manual T
- Selection and Sizing of Supply Air Outlets and Return Air Inlets using the ACCA Manual T and Air Distribution Equipment Manufacturer Performance Data for an Example Residential Structure

131 HVACR Oil Heat I (18 hours/60 days)

Intermediate

Written by Bob Recko

This course introduces the concept of combustion in basic terms. The focus is on the current direct-vent systems and the traditional high-pressure gun burner. It will prepare technicians to install, maintain, and repair residential and small commercial burner systems up to 400,000 BTUs/hour. We explore all the mechanical, electrical, and accessory devices commonly found in modern fuel oil heating systems. With this knowledge, you will build troubleshooting skills and identify applicable codes as they pertain to the installation and use of these systems. The NORA Oil Heat Manual e-book is provided as a downloadable file. **Recommended Prerequisites:** It is recommended that you have a good understanding of HVACR Fundamentals and have a working knowledge those topics prior to enrollment into this intermediate course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Six modules cover:

- Characteristics of Fuel Oil and Principles of Combustion
- Types and Construction of Oil Burners
- Oil Burner Anatomy (part one)
- Oil Burner Anatomy (part two)
- Fuel Oil Tanks and Piping
- Complete Heating Systems

133 HVACR Gas Heat I (18 hours/60 days)

Intermediate

Written by Bob Recko

This course provides knowledge and skills required to become a highly skilled technician who will install, maintain, and repair residential and small commercial Gas Heat Systems. We explore all the mechanical, electrical, and accessory devices commonly found in the modern Gas Heating Systems. With this knowledge, you will build troubleshooting skills and identify applicable codes as they pertain to the installation and use of these systems. Also extremely important is the focus on safety for the technician, the building, and its occupants. **Recommended Prerequisites:** It is recommended that you have a good understanding of HVACR Fundamentals and have a working knowledge those topics prior to enrollment into this intermediate course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education

(CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Six modules cover:

- Fuel Gas Composition
- Pressure Regulators, Burners, and Heat Exchangers
- Standing Pilot Systems
- Electronic Ignition
- High Efficiency Furnaces
- Troubleshooting Gas Burner Systems

135 HVACR Heat Pumps (21 hours/60 days)

Advanced

Written by Phil Rains

An introduction to reverse-cycle heat pumps used in residential and light commercial applications. The course covers components and operational differences of a heat pump vs. a straight air conditioning system, troubleshooting, and solutions. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180.

Recommended Prerequisites: you will want to have a strong working knowledge of basic HVACR fundamentals prior to enrollment into this advanced course. This course is recognized for 21 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 10.5 continuing education units (CEUs). Modules cover:

- What is a Heat Pump?
- Heat Pump Installation and Quality Criteria
- The Heat Pump Cooling Mode
- The Heat Pump Heating Mode
- The Heat Pump Defrost Mode
- Heat Pump Components
- Heat Pump Troubleshooting

137 HVACR Geothermal Heat Pump Systems (18 hours/60 days)

Advanced

Written by Phil Rains

You will gain an introduction to geothermal heat pumps as one of the most efficient heating and cooling technologies available today. The course focuses on geothermal (water source) heat pumps utilized for residential and light commercial applications. **Recommended Prerequisites:** you will want to have a strong working knowledge of basic HVACR fundamentals and a good understanding of the refrigeration cycle prior to enrollment into this advanced course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Modules cover:

- Introduction to Geothermal Heat Pumps
- Geothermal Heat Pump Mechanics
- Ground-Water (Open-Loop) Systems
- Closed-Loop Systems
- Equipment Selection Criteria and Economics
- Installation Setup, Startup, and Troubleshooting

139 HVACR Electric Heat (15 hours/ 60 days)

Advanced

This online course provides an introduction and advanced training on the topic of Electric Heat and Electric Heating components relative to the HVAC systems that are likely to be found by a Technician in residential and light commercial applications. Subjects covered in this course include electric heat terms and identification of the basic components utilized, types of electric heat systems, as well as advanced theory and servicing of Electric Forced Air Furnaces. **Prerequisites:** It is recommended that you have a good understanding of HVACR Fundamentals and Electrical, or have a strong working knowledge of those topics, prior to enrollment into this advanced course. This course is NATE recognized for 15 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 7.5 continuing education units (CEUs). Modules included in this course are:

- Introduction to HVAC Electric Heat Systems
- Troubleshooting and Servicing Electric Furnaces I
- Troubleshooting and Servicing Electric Furnaces II
- Blower Motors and Troubleshooting Electrical
- Airflow Using Ohm's Law – Intro Quiz Review

141 HVACR Refrigeration I (18 hours/60 days)

Intermediate

Written by Chris Compton

HVACR Refrigeration 141 provides a thorough examination of the refrigeration cycle as it is applied to both air conditioning and refrigeration purposes, and presents a practical and systematic method to diagnose problems in the refrigeration cycle. If you understand the parameters governing the operation of the refrigeration cycle, you will be able to diagnose any piece of equipment. **Prerequisite:** It is recommended that you have a good understanding of HVACR Fundamentals, or have a working knowledge of them, prior to enrollment into this intermediate course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Modules cover:

- Basic Refrigeration Cycle Physics
- Condensation and Condensers
- Expansion and Metering Devices
- Evaporation and Evaporators
- Compression and Compressors
- Measure the Normal Cycle

142 HVACR Refrigeration II (18 hours/60 days)

Advanced

Written by Chris Compton

This course is a continuation and elaboration of HVACR Refrigeration I. Presentations describe the application of common accessories found in a system, piping arrangements, sizing considerations and system operation. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Prerequisites:** you will want to have completed 141 HVACR Refrigeration I, or have a working knowledge of the content of that course prior to enrollment into this advanced course. Please refer to the 141 course description in the Catalog for specific details. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Modules cover:

- Refrigerants
- Common Compressor Accessories
- Common High-Side Accessories
- Common Low-Side Accessories
- Piping System Sizing
- Common System Control Arrangements

153 HVACR Control Systems Fundamentals (18 hours/60 days)

Intermediate

Written by Ron Auvil

This course is designed to introduce HVACR Technicians, and others involved in the HVACR industry, to the Fundamentals of HVACR Control Systems. Videos included! This course will prepare students with a strong understanding of typical HVAC mechanical systems in a commercial building environment. In turn, the student will gain an understanding of the different types of control systems and concepts used in these commercial buildings. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180.

Recommended Prerequisites: you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. This course is NATE recognized for 18 hours of continuing education (CEHs) which are applicable to NATE re-certification. Required Text: HVAC Control Systems' by Ronnie J Auvil 4th Edition. The main topics for the course are identified below:

- HVAC Fundamentals
- Commercial Building Heating Systems
- Commercial Building Cooling Systems
- IAQ and Commercial Air Handling Units
- HVAC System Energy Sources
- Control Principles

154 HVACR Control System Types and BAS Basics (18 hours/60 days)

Intermediate

Written by Ron Auvil

This course is designed to introduce HVACR Technicians, and others involved in the HVACR industry, to Electrical and electronic control systems as used in commercial buildings and HVAC systems. Videos included! Building Automation systems will then be discussed in detail, starting with older systems and proceeding to today's modern web-based systems. The student will understand types and methods of operator interfaces in commercial buildings, as well as the different types of BAS inputs and outputs in detail. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals and completion of 153 Controls Systems Fundamentals prior to enrollment into this course. This course is NATE recognized for 18 hours of continuing education (CEHs) which are applicable to NATE re-certification. Required Text: HVAC Control Systems' by Ronnie J Auvil 4th Edition. The main topics for the course are:

- Control Systems
- Electrical Control Systems
- Electronic Control Systems
- Building Automation Systems and Controllers
- Operator Interfaces
- Building Automation System Inputs and Outputs

155 HVACR BAS Installation and Strategies (15 hours/60 days)

Advanced

Written by Ron Auvil

This course is designed to equip HVACR Technicians, and others involved in the HVACR industry, with the skills and understanding needed to install and program typical modern BAS equipment. Videos included! This will be done in a vendor-independent manner. VAV terminal box, Air Handling Unit, and Central Boiler/Chiller Plant Programming will be used as examples. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. Recommended **Prerequisites:** completion of 153 Controls Systems Fundamentals, and 154 Control Systems Types and BAS Basics prior to enrollment into this advanced course. This course is NATE recognized for 15 hours of continuing education (CEHs) which are applicable to NATE re-certification. Required Text: HVAC Control Systems' by Ronnie J Auvil 4th Edition. The main topics for the course are identified below:

- Building Automation System Installation, Wiring, and Testing
- Computer Networks and Web Based Control
- Direct Digital Control Strategies
- Supervisory Control Strategies
- Building Automation Retrofit of Existing Systems

156 HVACR BAS System Management and Advanced Technologies (15 hours/60 days)

Advanced

Written by Ron Auvil

This course is designed to equip HVACR Technicians, and others involved in the HVACR industry, with the knowledge needed to implement advanced strategies in BAS regarding alarms trends and energy saving features. This course will also equip the technician to perform basic service troubleshooting of BAS and understand the role and structure of interoperable systems including BACNET and LON. The student will then be able to work with commissioning agents to ensure proper BAS operation and implementation. Videos included! Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** completion of 153 Controls Systems Fundamentals, and 154 Control Systems Types and BAS Basics, and 155 BAS Installation and Strategies prior to enrollment into this advanced course. Required Text: HVAC Control Systems' by Ronnie J Auvil 4th Edition. This course is NATE recognized for 15 hours of continuing education (CEHs) which are applicable to NATE re-certification. The main topics for the course are identified below:

- Building System Management
- Energy Audits and Utility Structures
- Building Automation System Troubleshooting
- Building Automation System Interoperability-Advanced Technologies
- Building Commissioning

157 HVACR Troubleshooting DDC Systems & Components (21 hours/ 60 days)

Advanced

Written by Ron Auvil

Tap into the experience of a Pro! Videos included! This class is designed for advanced level technicians who want to learn and enhance their BAS/DDC Troubleshooting skills. Dozens of In-depth multiple field troubleshooting scenarios are covered in detail in a 'ride-along in the service van' format. All scenarios are derived from actual service calls. Upon completion of this course the technician will have covered a minimum 75% of the most common service calls on BAS/DDC. Videos and hands-on access to a control system will be used to enhance the learning experience as well!
Prerequisite: Successful completion of BAS Program 153-156 or Equivalent Field experience. Required Text: HVAC Control Systems' by Ronnie J Auvil 4th Edition. This course is NATE recognized for 21 hours of continuing education (CEHs) which are applicable to NATE re-certification. The modules are identified below:

- Troubleshooting Tools & Safety; Overview of 'Typical' DDC System Today
- Input Troubleshooting with Multiple, Typical Field Scenarios
- Output Troubleshooting with Multiple, Typical Field Scenarios
- Field Controller Level Troubleshooting Part 1
- Field Controller Level Troubleshooting Part 2 with Multiple, Typical Field Scenarios
- Basic Web-Based Control Systems Troubleshooting Part 1
- Web-Based Control Systems Troubleshooting Part 2 with Multiple, Typical, Field Scenarios

158 HVACR Troubleshooting Variable Air Volume (VAV) Systems (21 hours/ 60 days) *Advanced*
Written by Ron Auvil

Variable Air Volume (VAV) Systems are the most common type of large commercial HVAC System in use today. This course is designed for advanced level technicians and building maintenance personnel who are responsible for troubleshooting these Variable Air Volume (VAV) systems. This course will start with an in-depth overview of the history and types of VAV systems. Next up is a list of common needed troubleshooting tools. Control system components and layouts to include pneumatic and DDC are given. VAV air handling units and sequences of operation of all major types are covered in depth. The most common troubleshooting scenarios of VAV air handling units are described as well. The vast majority of VAV terminal Box types are thoroughly covered, as well as components and control sequences. The course will finish up with and in-depth multiple field troubleshooting scenarios which are represented in detail. All scenarios are derived from actual service calls. Upon completion of this course the technician will have been exposed to a minimum 75% of the most common service calls on VAV systems.

Prerequisite: Successful completion of BAS Program 153-157 or Equivalent Field experience. No textbook is needed or used. Will be using field manual pdf's from various vendors. Actual Job Prints will be used as needed. This course is NATE recognized for 21 hours of continuing education (CEHs) which are applicable to NATE re-certification. The seven modules in this course are:

- Troubleshooting and Diagnostic Tools and Safety; Definition and Development of VAV
- VAV AHU and Terminal Box Control Systems and Components
- VAV Air Handling Units and Control Sequences
- VAV Air Handling Unit Troubleshooting (Most Common Scenarios)
- VAV Terminal Box Types and Control Sequences
- VAV Terminal Box Types and Control Sequences – VAV Box Modes of Operation
- VAV Terminal Box Troubleshooting Scenarios (Most Common Scenarios)

159 HVACR IT for HVAC Technicians (21 hours / 60 days) *Advanced*

This course will prepare both HVAC and Controls Technicians to work on today's modern web-based systems in a commercial HVAC Control System. This course will provide technicians with an introduction to Ethernet networking concepts, hardware, configuration, and troubleshooting. This course is aimed at HVAC technicians servicing automated control systems that are based on networked controllers. We will cover the basic operation of an Ethernet-based network, servers, and software tools. We'll follow that with examples of the 19 most common causes of network problems, including their symptoms, diagnosis, and remedies. Professional relationships and collaboration with facility IT staff is emphasized throughout. This course is NATE recognized for 21 hours of continuing education (CEHs) which are applicable to NATE re-certification. The seven modules in this course are:

- Introduction; Networking Personnel and Networking Basics Part 1
- Networking Personnel and Networking Basics Part 2
- HVAC Control System Networks
- Client Computers
- Servers
- Wireless Networking: Hardware Troubleshooting Tools

- Software Troubleshooting Tools; Troubleshooting Scenarios

160 HVACR Pneumatic HVAC Controls (24 hours/ 60 days)

Advanced

Written By - Ron Auvil

Pneumatic HVAC Control Systems were the predominant type of commercial building control system for many years. They are still around today in 20-30% of commercial buildings but the technicians that installed and serviced them have retired! An HVAC Technician needs to have a thorough understanding of these Pneumatic Control Systems to be able to effectively service this marketplace. The instructor of this online course, Ron Auvil, started his career exclusively as a pneumatic controls technician and has served as a pneumatics consultant and trainer for decades. He will pass along to you the tips and tricks that he learned from the 'Master Pneumatics Technicians' that he worked with for many years! This course is designed for advanced level technicians and building maintenance personnel who are responsible for servicing and troubleshooting these Pneumatic Control systems. **Prerequisite:** Successful completion of BAS Program 153-157 or equivalent field experience. **Textbook:** "Pneumatic Controls" by RSES is required; access to the e-book is included and provided in the course. In addition, we will be using field manual pdf's from various vendors. Actual Job Prints will be used as needed. This course is NATE recognized for 24 hours of continuing education (CEHs) which are applicable to NATE re-certification. The eight modules in this course are:

- The Air Compressor Station
- Pneumatic Actuators, Dampers, and Valves
- Pneumatic Loads; Pneumatic Thermostats
- Pneumatic Transmitters
- Pneumatic Receiver Controllers
- Pneumatic Auxiliary Devices
- Pneumatic Prints and Applications
- Troubleshooting Pneumatic Controls

161 HVACR Boilers I (18 hours/60 days)

Intermediate

Written by Ken Donovan

An introduction to the concepts and terminology of heating and power boilers, focusing on commercial and industrial boilers. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education (CEHs) which are applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Modules cover:

- Introduction to the Industry
- Classifying Boilers
- Combustion
- The Heat Exchanger
- Controlling Energy Sources
- Boiler Accidents/Hazards

171 HVACR Boilers Low Pressure License Prep (28 hours/90 days)

Intermediate

Written by Ken Donovan and Keith Conrod

This course introduces the concepts and terminology of heating and power boilers, focusing on commercial and industrial boilers. The course covers the required knowledge for proper and safe low pressure boiler system operations and includes an introduction to hydronic heating systems. Students are enrolled for a 90 day term. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 28 hours of continuing education (CEHs) which are applicable to NATE re-certification, and BPI recognized for 15 continuing education units (CEUs). The content is covered in the 9 modules outlined below:

- Introduction to the industry
- Classifying Boilers
- Combustion
- The Heat Exchanger
- Controlling Energy Sources
- Boiler Accidents / Hazards

- Pumps
- Heat Transfer Units
- System Accessories

186 Economizers ADEC / DCV (24 hours/60 days)

Advanced

HVAC Economizer systems are an often misunderstood, yet essential component of successful energy efficiency and air comfort / quality strategies in commercial building applications. The goal of this course is to provide the working field technician and HVAC student with an understanding of the importance of correctly installed and operating economizers, what they are, how they work, and how the service technician can maintain, troubleshoot, and ensure the correct operation of these systems. **Recommended Prerequisites:** You will want to have a strong working knowledge of basic HVACR fundamentals prior to enrollment into this advanced course. This course is applicable to Title 24 in the State of California, and adheres to the ACCA/ASHRAE Standard 180 Quality Maintenance protocols. This Economizers ADEC / DCV course is NATE recognized for 24 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). The learning modules included in this course are:

- Introduction to Economizers
- Applied Economizers
- Air Properties and Psychrometrics
- Applied Psychrometrics
- Economizer DDC Operations - Honeywell
- Economizer Operations – Trane
- Belimo – ZIP Economizer
- Demand Control Ventilation (DCV)

191 HVACR Hydronics I (18 hours/60 days)

Intermediate

Written by Keith Conrod

This course is designed to introduce students to the concepts and terminology of hydronic heating. The main focus will be on residential / small commercial installations. 191 begins a series of courses that address hot water heating systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Module topics covered:

- What is Hydronic Heating?
- Materials and Tools
- Boilers
- Pumps
- Heat Transfer Units
- System Accessories

201 High Efficiency HVAC (12 hours/60 days)

Intermediate

Written by Chris Compton

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course begins with a basic introduction of the layout of the various components of an HVAC system utilized in large and small commercial facilities. Then the modules expand into the specifics of chilled water, refrigeration, and heat rejection systems. The course continues with a focus on central chiller, fan coils, and chilled beam systems. And the course finishes up with a focus on Demand Controlled Outside Air (DCOA), packaged and variable refrigerant flow systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. This course is recognized for 12 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 6 continuing education units (CEUs). Module topics covered:

- Introduction and Airside
- Chilled Water, Refrigeration and Heat Rejection
- Central Chiller, Fan Coil and Chilled Beam Systems
- DCOA, Packaged and Variable Refrigerant Flow Systems

202 High Efficiency HVAC System Maintenance – Central Chillers (6 hours/30 days) *Intermediate*

Written by Chris Compton

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course focuses upon Commercial Central Chiller Systems, with a basic introduction as to the layout of the various components utilized in large and small commercial facilities. Then the modules expand into the specifics of chilled water systems and the required maintenance and record keeping to insure efficient operation of the Chiller Systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs). Module topics covered:

- Central Chiller Maintenance – Daily and Weekly
- Central Chiller Maintenance – Monthly and Annual

203 High Efficiency HVAC System Maintenance – Cooling Towers (6 hours/30 days) *Intermediate*

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course focuses upon Commercial Cooling Tower Systems, with a basic introduction as to the layout of the various components utilized in large and small commercial facilities. Then the modules expand into the specifics of cooling towers and the required maintenance to insure efficient operation of the cooling tower systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs).

Module topics covered:

- Cooling Tower Overview – Daily and Monthly Maintenance
- Cooling Tower Overview – Annual and Seasonal Maintenance

204 High Efficiency HVAC System Maintenance – Air Handlers and Roof Top Units (6 hours/30 days)

Intermediate

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course focuses upon Commercial Air Handlers and Roof Top Units, with a basic introduction as to the layout of the various components utilized in large and small commercial facilities. Then the modules expand into the specifics of each type of system and the required maintenance to insure efficient operation of Air Handlers and RTUs. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs).

Module topics covered:

- Air Handler Maintenance
- Maintenance of Roof Top Units

205 HVACR High Efficiency Ventilation (9 hours / 30 days)

Intermediate

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. This course focuses upon Ventilation Systems in Commercial Buildings. An overview of the science and background of indoor air quality is first, then the course modules expand into the specifics of the components utilized in the operation of modern commercial building ventilation systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/

ACCA/ ASHRAE Standard 180. This course is recognized for 9 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 4.5 continuing education units (CEUs). Module topics covered:

- Indoor Air Quality Overview
- Ventilation Systems I
- Ventilation Systems II

216 Commercial Building Lighting Systems (12 hours/60 days)

Foundation

Written by Chris Compton

Facilities maintenance technicians and building managers are expected to maintain the lighting systems in their buildings. This course guides students through a better understanding of how light works and the importance of proper environmental lighting for both safety and comfort of the building occupants. Introduction to commercial lighting equipment and how to distinguish between a maintenance task and when to call a licensed electrician is covered. Students will better understand various lighting control strategies and opportunities to recommend more efficient lighting technologies. There is no textbook required. This course is recognized for 12 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 6 continuing education units (CEUs). Modules cover the following topics:

- Introduction to Commercial Lighting
- Commercial Lighting Equipment
- Commercial Lighting Maintenance and Upgrades – Part 1
- Commercial Lighting Maintenance and Upgrades – Part 2

217 HVACR On Site Generation Systems (9 hours / 30 days)

Intermediate

Written by Chris Compton

The intent of this course is to give facilities maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. This course focuses upon On Site Electrical Generation Systems utilized in Commercial Buildings. An overview of the fundamentals and background of Back-Up Generation Systems is first, then the course modules expand into the specifics of the components, operation and maintenance requirements of modern commercial building on site generation systems.

Recommended Prerequisites: you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 9 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 4.5 continuing education units (CEUs). A textbook is not required for this course. Module topics cover:

- Generation Fundamentals
- Generation Systems
- Maintenance of Back-up Generators

221 HVACR Indoor Air Quality Basics (18 hours/60 days)

Foundation

Written by John Kreiger and Chris Dorsi

You already know it is your job to provide services related to the comfort of air temperatures inside your clients' buildings. However, temperature management is not the only thing you need to know. This course will help you better understand the various elements of air quality, introduce the science of air quality, and give you some tips on how to identify and address the potential dangers of poor indoor air quality. The course does not address issues of allergies or chemically sensitive clients outside the basics of indoor air quality. You will learn indoor air properties, air flow, ventilation, moisture, and air filtration systems. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Modules address the following topics:

- IAQ Basics
- Properties of Air
- Air Flow Basics
- Ventilation
- Moisture Management
- Air Filtration

[239 HVACR Everything About Belts](#) (3 hours/30 days)

Foundation

This is an entry-level course in a single module designed for those who need a basic understanding of drive belts and how they are utilized in residential and commercial HVACR systems. Types of drive belts, their selection, installation and maintenance are discussed in detail. The content of this course follows the recommended topics for basic study of HVACR. This course is BPI recognized for 1.5 continuing education units (CEUs), and NATE recognized for 3 hours of continuing education (CEHs) applicable to re-certification.

[241 HVACR Intro to Cooling System Troubleshooting](#) (18 hours/60 days)

Advanced

Written by Phil Rains

This course is provided to instruct the entry level HVAC technician in the common service procedures performed on conventional residential/light commercial cooling systems. These include electrical circuits, mechanical compression refrigeration cycle, necessary components in a cooling system, and more. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** This course requires a good understanding of the refrigeration cycle. You will want to have completed 141 HVACR Refrigeration I, or have a working knowledge of the content of that course prior to enrollment into this advanced course. Please refer to the 141 course description in the Catalog for the specific details. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs).

Module topics are:

- Cooling System Service Overview
- Cooling Service Tools/Equipment, Safety, and Quality
- Cooling System Components
- Cooling System Air Flow
- Cooling System Electrical Troubleshooting Basics
- Cooling System Mechanical Troubleshooting Basics

[242 HVACR R-410A Refrigerant Technology](#) (18 hours/60 days)

Advanced

Written by Phil Rains

This R-410A Qualification course is designed to familiarize the technician with the differences between R-22 and R-410A. Background, regulations, impact on the industry, and application requirements are presented. The course provides the technician with practical knowledge for safe performance of service techniques on systems containing R-410A. When you have successfully completed this course, you will receive a certificate of completion that complies with many equipment manufacturers' policies requiring safety and service "certification" prior to purchasing equipment containing R-410A refrigerant. You will also receive a uniform patch and a wallet card for your use. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** you will want to have a strong working knowledge of basic HVACR fundamentals prior to enrollment into this advanced course. This course is recognized for 18 hours of continuing education (CEHs) which are applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). This course has been approved by International Comfort Products, LLC. Six Modules cover:

- R - 410A Refrigerant Background
- R - 410A Refrigerant Regulatory Requirements
- R - 410A Refrigerant Basics
- R - 410A Refrigerant Safety, Handling, and Service Equipment
- R - 410A System Components, Retrofitting, and Charging
- R - 410A System Operation and Troubleshooting

[243 HVACR Advanced Troubleshooting](#) (21 hours/60 days)

Advanced

Written by Chris Hickman, James Eller, and Phil Rains

This comprehensive course will help technicians move through a procedure to follow safety guidelines, identify the source of problems in HVACR systems, use diagnostic tools, and to address the problem properly. Often technicians start their investigation with only the customer's call, "It died yesterday!" Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** you will want to have a strong working knowledge of basic HVACR fundamentals prior to enrollment into this advanced course. This course is

recognized for 21 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 10.5 continuing education units (CEUs). The course is divided into 7 modules covering the topics listed below:

- Electrical Troubleshooting
- Troubleshooting Controls
- Troubleshooting Instrumentation
- Troubleshooting Air Side
- Troubleshooting Refrigeration
- Troubleshooting Combustion
- Troubleshooting Hydronics

244 RSES Hydrocarbon Refrigerants Training (3 instructional hours / 30 days)

Intermediate

The US Clean Air Act and the Environmental Protection Agency is phasing out ozone depleting refrigerants like R-22. As a result, technicians will be handling other refrigerants like Hydrocarbons. This course introduces you to hydrocarbons as refrigerants, covers the associated regulations and standards, and gets you familiar with their properties and how to handle them safely. In addition there is a summary of the refrigerant cycle as it relates to hydrocarbon refrigerants, system components, and the proper safe servicing procedures of hydrocarbon refrigerant systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Course content was provided by RSES. This course is NATE recognized for 3 hours of continuing education (CEHs) and BPI recognized for 1.5 CEU's applicable to re-certification. This course allows 30 days enrollment to complete. Course topics include:

- Introduction to the use of Hydrocarbons as Refrigerants
- HC Regulations and Standards
- Refrigerant Properties and Safety
- The Refrigerant Cycle
- System Components
- Servicing Procedures

261 Commercial Boiler Fundamentals (6 hours / 30 days)

Intermediate

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle maintenance and service issues when required. The course focuses upon Commercial Boiler Systems, with an introduction as to the various components and systems utilized in large and small commercial facilities. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs). Module topics covered:

- Large Boiler Overview
- Small Boilers

262 HVACR Industrial Steam Boiler Fundamentals (9 hours / 30 days)

Intermediate

This course is aimed at providing maintenance staff an understanding of industrial boilers that generate steam and the related equipment, accessories, and controls for them. Some systems run on low pressure, others on high pressure; some use recirculated water, others use incoming water. Also, it is important to understand water treatment and chemical issues in steam systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 9 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 4.5 continuing education units (CEUs). Module topics covered:

- Steam Boiler Overview
- Steam Boiler Terms, Codes, and Accessories
- Water Treatment for Steam Systems

263 HVACR High Efficiency Commercial Boilers (6 hours / 30 days)

Intermediate

This course is aimed at providing maintenance staff an understanding of the specific issues and advantages of high efficiency condensing boilers utilized in commercial hydronic and steam heating systems. Options such as economizers for large boiler systems and high efficiency venting for all systems are introduced. Related equipment, accessories, and controls are also discussed. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE recertification, and BPI recognized for 3 continuing education units (CEUs). Module topics cover:

- Small Condensing Boilers
- High Efficiency Options for Larger Boilers

264 HVACR Industrial Steam Boiler Maintenance (9 hours / 30 days)

Intermediate

Boilers work best when properly maintained. This course presents the necessary and recommended daily, weekly, monthly, semi-annual, annual, and contractor maintenance tasks; and shows best practices for documenting and record-keeping that the maintenance was performed on schedule. When performed properly and on schedule, the tasks contribute to keeping an industrial steam boiler system operating efficiently. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 9 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 4.5 continuing education units (CEUs). Module topics covered:

- Daily Maintenance and Record Keeping
- Industrial Steam Boiler Maintenance – Weekly and Monthly
- Industrial Steam Boiler Maintenance – Semi-Annual, Annual, and Contractors

265 HVACR Small Commercial Boiler Maintenance (3 hours / 30 days)

Intermediate

This course is contained in a single learning module. Small Commercial Boiler systems require scheduled maintenance and this course will offer students the basic steps for how to inspect boilers daily, monthly, and periodically. Guidance is provided for situations requiring extensive maintenance; when to notify third party service providers. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 3 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 1.5 continuing education units (CEUs).

266 HVACR Large Commercial Boiler Maintenance (6 hours / 30 days)

Intermediate

This course provides instruction on how to inspect, perform simple maintenance checks, and keep accurate records on daily, weekly, monthly, and annual schedule. These tasks contribute to the Large Commercial Boiler System's efficient operation. The course also helps students identify when to call in third party service providers.

Recommended Prerequisites: you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 6 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 3 continuing education units (CEUs). Module topics covered:

- Record Keeping and Daily-Weekly Maintenance
- Monthly-Annual Record Keeping and Maintenance

291 HVACR Commercial Water Heating (12 hours / 60 days)

Intermediate

The intent of this course is to give maintenance staff a feel for the equipment present in their buildings. With this understanding, you will be better able to perform and handle service issues when required. The course begins with a basic introduction to standard and high efficiency water heater systems utilized in large and small commercial facilities. Then the modules expand into the specifics of maintaining proper operation and maintenance of both types of systems. **Recommended Prerequisites:** you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this course. Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. This course is recognized for 12 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 6 continuing education units (CEUs). Module topics covered:

- Water Heating Fundamentals

- High Efficiency Water Heating
- Water Heating Maintenance
- High Efficiency Water Heating Maintenance

301 Performing the Comprehensive Building Assessment (40 hours/60 days) *Energy Efficient Intermediate*
 Designed to introduce students to the comprehensive building assessment process, this intermediate course is geared toward conducting visual building inspections, performing diagnostic testing, and determining residential building improvement opportunities in the field; then documenting a home's performance, prioritizing improvements, and preparing a work scope that will guide the homeowner's decision making process for making the improvements.

Students will start out learning the systems, tools and techniques commonly encountered during visual observations, including evaluation of envelope components, mechanical systems and base loads such as appliances and lighting. They will then step into diagnostic testing, learning first how to work safely. Students will learn how to set up and use the blower door for building pressurization/depressurization testing, and how to incorporate the resulting data into decision making. Students will learn combustion safety testing (including worst case depressurization, draft and spillage testing), and how to test various appliances for CO including: furnaces, boilers, water heaters and other combustion appliances. Students will also learn basic duct diagnostic testing. Finally, students will be taught how to use assessment information and diagnostic results to develop a work scope which can then be presented to a customer. Approximately 10 hours of animations are included in the instruction. This course will refer to the BPI Building Analyst as well as to various industry codes and standards. It helps prepare individuals for BPI Building Analyst Certification and NATE HVAC Efficiency Analyst Certification (Senior Level). Instruction aligns with ANSI/ACCA Quality Installation and ANSI/ ACCA/ ASHRAE Standard 180. **Recommended Prerequisites:** you will want to have completed 107 Principles of Building Science, Principles of Energy Efficient Buildings, or a similar course; or have a solid working knowledge of building science concepts, house-as-a-system concepts, and basic HVAC fundamentals prior to enrollment into this intermediate course. Please refer to each course description in the Catalog for the specific details. This course is NATE recognized for 40 hours of continuing education (CEHs) and BPI recognized for 20 CEU's applicable to re-certification. An additional 10 BPI CEUs are available to successful Intercaz Simulation completers directly through Intercaz. This course allows 60 days enrollment to complete.

Performing the Comprehensive Building Assessment course contains learning modules covering:

- Observation Techniques and Data Collection
- Exterior & Interior Assessment and Building System Analysis
- Blower Door and Zonal Pressure Diagnostics, Ventilation Rates
- Combustion Safety Testing and Analysis
- Duct Diagnostics
- Work Scope Development and Customer Relations
- Intercaz Simulation Experience – a comprehensive combustion appliance safety training simulation

402 HVACR Packaged Chillers: 25 - 150 Tons (9 hours / 30 days)

Advanced

Written by Ron Auvil.

This course is designed for advanced level technicians and building maintenance personnel who are responsible for operation, maintenance, and troubleshooting of chiller systems in commercial buildings.

Packaged chillers such as those used in small and medium tonnage applications will be covered in this course.

Emphasis will be given to operating characteristics, main components, maintenance, control, and troubleshooting.

This course is recognized for 9 hours on continuing education, (CEHs), applicable to NATE re-certification. Modules cover:

- Introduction; AHU and Chilled Water System Overview
- Packaged Air-Cooled Chillers
- Packaged Chiller Control, Operation, and Maintenance

403 HVACR Water Cooled Mid & Large Tonnage Chillers 150+ Tons (15 hours/60 days)

Advanced

written by Ron Auvil.

This course is designed for advanced level technicians and building maintenance personnel who are responsible for operation, maintenance, and troubleshooting of chiller systems in commercial buildings. We will cover larger chiller

systems, to include screw and centrifugal chillers, as well as cooling towers. Emphasis will be given to operating characteristics, main components, maintenance, control, and troubleshooting. The vast majority of chiller types are thoroughly covered, as well as components and control sequences. The course will finish up with detailed, in-depth multiple field troubleshooting scenarios. All scenarios are derived from actual service calls. Upon completion of this course the technician will have been exposed to a minimum 75% of the most common service calls on commercial chiller systems. The prerequisites are successful completion of the 402 HVACR Packaged Chillers 25 – 150 Tons Course or equivalent field experience. This course is recognized for 15 hours of continuing education, (CEHs), applicable to NATE re-certification. The modules cover:

- Centrifugal Chillers
- Screw Chillers
- Cooling Towers
- Typical Chiller Plant Layout
- Mid and Large Tonnage Chiller Diagnostics and Troubleshooting.

441 HVACR Commercial Refrigeration I

(24 hours / 60 days)

Advanced

Written by Dick Wirz

We will compare things you're already familiar with like space temperatures and common components of basic AC systems to those of commercial refrigeration systems. We will examine evaporators, condensers, compressors, metering devices, controls and accessories, and the refrigerants commonly used in commercial refrigeration. We will review the important terminology. At the end of this course we will cover some system troubleshooting, giving you a chance to put your knowledge to work on the 9 most common system problems. And you will understand when to apply TROT (The Rule Of Thumb) in the absence of a manufacturer's recommendation. **Recommended**

Prerequisites: You will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this advanced course. This course is recognized for 24 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 12 continuing education units (CEUs). Required Text: Commercial Refrigeration for HVACR Technicians – by Dick Wirz. This course is divided into these learning modules:

- Refrigeration Principles
- Evaporators
- Condensers
- Compressors
- Metering Devices
- Controls and Accessories
- Refrigeration System Troubleshooting Part 1
- Refrigeration System Troubleshooting Part 2

442 HVACR Commercial Refrigeration II

(18 hours / 60 days)

Advanced

Written by Dick Wirz

This course is a continuation of 441 HVACR Commercial Refrigeration I. Again, we will compare things you're already familiar with like basic AC systems to those of commercial refrigeration systems. We will examine compressor motor controls, retrofitting, recovery, evacuation, and charging; various supermarket refrigeration systems, walk-in refrigerators and freezers, and commercial ice machines so you can identify the components, their functions, and the refrigerants belonging with each application. After you have a good understanding of the equipment, we'll explore appropriate temperatures for products kept in that equipment. And finally, you will understand when to apply TROT (The Rule Of Thumb) in the absence of a manufacturer's recommendation. **Recommended Prerequisites:**

Successful completion of 441 or the equivalent; and you will need a strong working knowledge of HVACR Fundamentals prior to enrollment into this advanced course. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE re-certification, and BPI recognized for 9 continuing education units (CEUs). Required Text: Commercial Refrigeration for HVACR Technicians – by Dick Wirz. This course is divided into these learning modules:

- Compressor Motor Controls
- Retrofitting, Recovery, Evacuation, and Charging
- Supermarket Refrigeration
- Walk-in Refrigerators and Freezers
- Ice Machines
- Product Temperatures for Preservation and Health – Refrigeration Business Tips

For the Contractor

Employee Training Programs

Contractors, if you're looking for the best strategy to train your technicians, we can help with all these options:

1. Read about our [Technical Core Assessment](#). Screen a new employee or use it to find out what your technicians really know. The results provide each technician with a Professional Education Plan to fill out his or her specific weak knowledge areas. They don't waste any time learning what they already know. It saves time and money. Also, if you are paying for the student's enrollment fees, we send student progress reports to you so you can check on your technicians' progress.
2. Explore a Registered [Apprenticeship Program](#). Our 4-year online HVACR Apprentice Related Training Program is the only Accredited HVACR Apprenticeship Program anywhere! It's also the only one online. Talk about convenient! Your apprentices can study online, making them more available for work.
3. Choose any course or program from our catalog for your technicians' professional development.
4. Choose smaller 3 hour individual modules from our CEU Catalog for Continuing Education options online.
5. Consider signing up for an [Annual Subscription](#), giving you and your technicians access to our full catalog of courses—as many as you want/one at a time—for a full year. Read about it in this catalog.
6. We can help you qualify to participate in utility company rebate programs: Xcel Energy, Great River Energy, Southern California Edison, or San Diego Gas and Electric.
7. In-house Pay-as-You-Go payment plans available.
8. If you have a job opening, we have recruiting and job posting assistance.
9. If you have specific training needs that are not covered in this catalog, we work with companies across the country and around the world to deliver customized programs to meet your specific needs, we can build it.

Business Courses for the Contractor

[306 Operations Management](#) (18 hours/60 days)

Advanced

Written by Larrie Mendoza, Phil Rains, and Bill Parlapiano

As a contractor or operations manager, there are many challenging elements to overseeing your HVACR work flow. It's up to you to establish and follow-through on business practices that make your company profitable. This course will help by addressing the best practices in the primary areas of your company's operations that impact your profit margin. You will learn basic business practices and procedures to help manage your work flow, maximize resources and minimize delays and loss of time. This course is recognized for 18 hours of continuing education (CEHs) applicable to NATE, and 9 CEU's applicable to BPI re-certification. Module topics are:

- Personnel Management and Communications Skills
- Design Criteria
- Installation
- Materials Management
- Resource Scheduling - Cost Management Awareness
- Industry Paperwork and Recordkeeping

[310 Product and Service Pricing for a Profit](#) (15 hours/60 days)

Foundation

Written by Tom Grandy

This is the first in a series of Online Courses for Contracting Businesses, developed in collaboration with nationally acclaimed Grandy and Associates. This 15 hour course covers everything you need to calculate a realistic hourly rate for your installation and service jobs; budgeting and cash flow; equipment replacement costs; field labor costs; material sales; customer response cards; discussion of flat rate pricing; overhead; company matching taxes; fixed and variable overhead; net profit; overhead absorption; break-even rate; markup vs. profit; calculation of hourly rate; overhead cost per hour and an evaluation of the "what if" process. This course is specifically designed to help you consider all the costs of running a profitable business and setting your pricing at levels that keep your business going and growing. Module topics are:

- Budgeting and Cash Flow
- Equipment and Replacement Costs
- Field Labor Costs
- Material Sales – Overhead Costs
- Net Profit

Written by Tom Grandy

This is the second in a series of Online Courses for Contracting Businesses, developed in collaboration with nationally acclaimed Grandy and Associates. This 15 hour course describes in detail what all successful companies have learned; “what it takes to survive and prosper”. The five modules cover the 15 important topics that every business must know to make it in the Contracting Industry. Each topic provides a fresh insight into how to run a very profitable business in today’s marketplace. We saved the best for last, which is the section on tax tips --**this section alone will provide enough tax savings to pay for this program**. At the end of each section there is a list of additional resources to expand your knowledge of that subject. Module topics are:

- Realistic Labor Rates; Budgeting; Business Plan
- Marketing Plan; Marketing Tools; Collections Policy
- Networking; Planning for Growth; Maintenance Agreement Program
- Company Newsletter; Flat Rate Pricing; Customer Response Cards
- Customer Service Training; Bank Line of Credit; Tax Minimization Plan



Annual Subscription Program

Now small shops can afford the same high quality education as the industry leaders ONLINE for a very reasonable price. You can access our entire Subscription Catalog, over 734 hours of online Assessments, Courses, Continuing Education Units, and Reviews for an entire year (one course at a time, of course). Learn and earn the credentials that prove your technicians are the best. Click here for the [Annual Subscription Catalog](#) to see everything that is included in this program.

Our Annual Subscription includes everything you need for a full 12 months at one reasonable price allowing you to select whatever fits your needs.

1. Pre-Assessment—validate what your technicians already know through an online comprehensive Technical Core Assessment (TCA), and don’t waste time having them take classes they don’t need.
2. Based on the results of the TCA, we develop a Professional Education Plan (PEP) that provides a roadmap for each technician’s learning program; email it to the technician, and enroll him in his first course.
3. All our online courses are asynchronous - available 24 hours every day, no waiting for a course to begin, no travel.
4. We assess student learning at the end of each learning module and at the end of each course topic.
5. So that you know your investment is well spent, we provide the employer with student tracking and notifications every 14 days. Progress reports upon request.
6. Mile Markers—students earn a Certificate of Completion for each course successfully completed at 75% or above.
7. Professional Education Plans (PEP) track technician progress, showing how much progress has been accomplished, and what remains.
8. When the PEP is successfully completed, the technician is fully prepared to take industry certification exams.
9. Technicians may refresh/review just before sitting for exams—online reviews increase their chance for success.
10. Technicians can add more industry certifications or knowledge of special areas of HVACR by choosing additional online courses from our Subscription Catalog.
11. Courses include audio and video elements, simulations, handouts, and more.
12. Courses are self-paced, without an instructor, so you can move as quickly as you like.
13. You have the option to add an instructor to any course for a small fee.
14. New courses are continually being developed to meet the educational needs of our ever-expanding industry.

How much do you pay?

One price for a full 12 months of online learning to handle all your technician training needs:

The more technicians who join in the Annual Subscription Program, the better the price. You pay \$2,495 for a full year, for the 1st technician. Then, if you have more who want to join in, it is only \$225 for each additional technician, as many as you need.

The Rules

This program provides a great price for the best online technician education, and there are a few rules.

1. The start date of the one-year (365 days) annual subscription begins on the date payment for the first subscriber is received. The first enrollment becomes the "Prime Subscriber". The contractor or lead technician may want to fill this role.
2. Additional technicians may be added at any time during the subscription period at the same rate you paid for the initial group.
3. If an employee is no longer working for the company the employer may replace that technician with a new hire at no additional expense.
4. All technicians in your group expire on the same day as the "Prime Subscriber's" 365-day term, even those who may have been added at a later date.
5. Each technician may enroll in only one course at a time.
6. Technicians who are not yet NATE or HVAC Excellence Certified, start with the TCA, and they must complete all the courses listed on the Professional Education Plan (PEP) before enrollment into other course(s).
7. Advanced technicians, who already hold NATE or HVAC Excellence Certifications, do not need to begin with the TCA and are free to select any course to earn CEU's or to refresh or expand current knowledge.
8. Enrolled Contractors / Owners / Supervisors are free to select any course.
9. The instructions for logging into the first course will be emailed to each individual in the welcome letter.
10. Certificates of Completion are issued to those who earn a score of 75% or higher in a course.
11. There is no cap to the number of courses each technician may complete during the annual subscription; complete as many courses as they wish, working at their own pace.
12. To keep the price low, the Annual Subscription enrollments are not guided by online instructors, however you may add an instructor to any course for a small fee, see "Add an Instructor" in our store.
13. A list of add-on courses (not included in the Annual Subscription program) is at the end of the Subscription catalog. If you want to enroll in any of these, just email studentservices@hvacredu.net to request a 15% discount code. Purchase from our online store and enter the code for your 15% discount.

Payment Plan

Set up an in-house pay-as-you-go payment plan to spread out the price over several months when purchased through the store.

If you have any questions, or if we can be of assistance:

Email: info@hvacredu.net

Phone: (888) 655-4822

www.hvacredu.net

National Environmental Balancing Bureau

Written by Bob Gleeson

NEBB-1 NEBB Report Preparation and Writing (3hours/30 days)

This course provides comprehensive instruction concerning the requirements and formats needed to write a NEBB Certified Testing, Adjusting and Balancing (TAB) Report. NEBB Procedural Standards and the usage of NEBB Certified TAB Report forms and formats are discussed in detail. Examples of Certified Report forms are provided along with step by step instructions to teach the student the correct methods involved in the generation of a NEBB Certified Report. Successful completion of this course helps to prepare the student for NEBB Certification. Please note that the student will be provided with two (2) opportunities to take the Final Exam during their enrollment period.

NEBB-2 NEBB Report Review and Error Finding (3hours/30 days)

It is the job of the TAB Certified Professional to control the quality of the TAB work and TAB reports. This course provides comprehensive instruction in the methods and procedures recommended by NEBB to insure an accurate and error free Testing, Adjusting and Balancing (TAB) Report. NEBB Procedural Standards and the usage of NEBB Certified TAB Report forms and formats are discussed in detail. Examples of Certified Report forms are provided along with step by step instructions to teach the student the correct methods involved in the review and error checking of a NEBB Certified Report. Successful completion of this course helps to prepare the student for NEBB Certification. Please note that the student will be provided with two (2) opportunities to take the Final Exam during their enrollment period.

Wholesale Employee Training - Technical Core Assessment (WET - TCA)

Geared specifically for Wholesale Distribution Employers and their Employees

If you're not sure where to start, or what you should study first, start with this online assessment of your current knowledge. The WET - TCA is a tool designed to determine your existing level of knowledge in Wholesale Distribution, Heating, Ventilation, Air Conditioning, Refrigeration, and Electrical. The WET - TCA is actually 6 separate assessments given in a sequence starting with Entry Level - HVACR Distribution Employee. The questions are randomly selected from a pool of qualified questions. It is not necessary to complete all of the assessments in one sitting. However, you must complete all six, (or the ones selected by your Employer), to receive a Professional Education Plan. You have 30 days to complete your assessments from the date that you are enrolled. Allow 30 minutes for each assessment. We recommend that you have a calculator, watch or clock with a second hand and pencil with note paper to assist in completing the assessments. When completed, we can assess your results and design a Professional education plan of courses to bring the Wholesale Distribution Employee's level of knowledge up to the industry standards for excellence. You'll receive an email with your results and your Professional education plan shortly after you complete the assessment. The assessments are:

- WET Entry Level - HVAC Distribution - 30 Questions
- WET - Basic Safety - 1 Question
- WET - Technical Fundamentals - 30 Questions
- WET - HVAC Conditioning - 30 Questions
- WET - HVAC Conditioning II - 30 Questions
- WET - HVAC Electrical - 30 Questions

[HVACR Wholesale Employee Training \(WET\) Program](#)

The HVACR Wholesale Employee Training Program is a comprehensive online education program designed to provide the knowledge and skills needed by people working in the HVACR Wholesale Distribution Industry. The goal of this program is to increase the Wholesale Employee's basic understanding of the industry and HVACR systems in general, so they can sell, serve, and communicate with their contractor / technician customers more effectively.

The WET Program comprises six extensive online course levels. The content presented in each level focuses on learning objectives that have been identified by HVACR industry groups (HVAC Excellence, AHRI, NATE, RSES, HARDI, PAHRA, ACCA) as key knowledge areas. Several course modules are supplemented with tutorials from TEEX.

This program is offered completely online. Students can add an instructor to any course level for a small fee. Send an email to info@hvacredu.net requesting the details. The courses are self-paced within a 90-day enrollment for each level (unless otherwise noted). Students are registered into one course level at a time. Upon successful completion of a level (a score of 75% or higher), students receive a certificate of completion and are registered into the next level. After successful completion of all six course levels, students receive a Certificate of Completion for the HVACR Wholesale Employee Training Program.

The Program Outline:

WET - 1 Entry Level – HVAC Distribution Employee (28 hours-90 days):

- 101-6 Introduction to the Industry
- SCSL-101 Introduction to Distribution
- 010-3 Communications and Work Relationships
- SCSL-204 Principles of Distribution Sales
- SCSL-205 Quality Processes in Distribution
- 010-2 Personal Work Habits
- 306-1 Personnel Management and Communications Skills
- SCSL-301 Manufacturer – Distributor Relationships

WET - 2 OSHA 30 Hour Construction Safety (30 hours-60 days):

WET - 3 Technical Fundamentals (30 hours-90 days):

- 101-1 Measurements are Important
- 101-2 Heat
- 101-3 Pressure
- 101-4 Gas Works
- 101-5 Air Works
- 107-2 Principles of Building Science – Air Flow Basics
- 306-2 HVACR Design Criteria
- 306-3 HVACR Installation

WET - 4 HVAC Conditioning Introduction (23 hours-90 days):

- 121-1 Heat Energy and Comfort
- 121-2 Properties of Air
- 141-1 Basic Refrigeration Cycle Physics
- 135-1 What is a Heat Pump?
- 133-5 High Efficiency Furnaces
- 131-6 Complete Heating Systems

WET – 5 HVAC Conditioning II (24 hours-90 days):

- 122-1 Fundamentals of Load Calculations
- 123-2 Air Distribution Systems
- 142-1 Refrigerants
- 242-3 Refrigerant Basics, R410A
- 135-6 Heat Pump Components

- 142-2 Common Compressor Accessories
- 142-3 Common High Side Accessories
- 142-4 Common Low Side Accessories

WET – 6 HVAC Electrical Introduction (27 hours-90 days):

- 111-2 What is Energy?
- 112-4 Capacitors
- 112-6 Transformers
- 113-1 Control Methods, Temperature, Pressure
- 113-2 Residential Heat – Cool Thermostats, Low Voltage
- 113-3 Really Good Relay Stuff
- 113-4 Contactors Go
- 114-1 Basic Electric Motor Theory – Shaded Pole Motors
- 114-5 The Application of Electric Motors

If you are a Distribution Company wishing to discuss this program or a customized version in detail, please contact us at: info@hvacredu.net or call 888-655-4822. This is our recommended sequence of course levels; however the program can be modified to fit the specific needs of your HVACR Distribution Company. The recommended procedure is to enroll your wholesale employees into one course at a time beginning with WET-1. However, if an employee is already accomplished in his/her job but needs additional training we recommend our TCA (Technical Core Assessment) to identify the appropriate course level to begin with. If the results of the TCA indicate the employee is beyond the level of the WET program, we will provide a PEP (Professional Education Plan) guiding the employee through a very specific higher-level learning track.

Student Services & Support

Online Faculty

When HVACR industry professionals reach the pinnacle of their careers, they come teach with HVACRedu.net! We've been graced with an exceptional group of professionals, here to share their vast knowledge with you. Not only have they written the course content, but they teach it as well. You can learn online, watch their videos, and read their textbooks as you immerse yourself in the experience and knowledge of the best in the industry. If you have questions while enrolled in a course, just email, chat, or phone your instructor who will get back to you within 24 hours during regular business hours (maybe longer on weekends). Instructors hold many industry credentials including the Certified Master HVACR Educator (CMHE), and have completed an online training program for faculty. Together, they have vast years of work experience, and are dedicated to working hard to keep your learning on track.

Student Services Crew

Our Student Services Crew ensures a smooth enrollment process, and they personally answer your questions along the way. They monitor student activity and progress in each course and reach out to any students who appear to be struggling, before they get too far behind. They help students progress through their courses and programs and help whenever special circumstances come up that interrupt or delay a student's learning. They have become known as the "nice ladies" of HVACRedu.net. One of their areas of specialty is to stay in touch with employers who have enrolled one or more of their technicians in a training program. They provide the employer with activity and progress reports along the way. They also celebrate students when they complete their studies. This group of professionals are the reason HVACRedu.net stands out above the competition and the reason so many of our students successfully complete their learning.

Tech Support

Sometimes the electronic world can be glitchy, especially if you're new to using your computer for learning online. If something wacky happens, you can bet our team of technology specialists can quickly find the solution for you.

Student Handbooks are available for each situation. . . from individual course enrollments all the way through comprehensive career educational programs. If you would like a handbook before you enroll, but you couldn't find it, just let us know and we'll email it to you.

Pricing and Financing Options

We assure you that the educational information packed into each learning module and full course is well worth the price, in fact it's a bargain! **From the Master Catalog, click on the title of any item to go to our online Store where you can view the description and the price for that item. If you're ready to enroll, you can "add to your cart" and then go to your cart to complete the payment.** We offer you several purchasing options:

- **Pay in full** with your credit or debit card online.



- **In-house Pay-As-You-Go payment plans** are available to students enrolling in any program priced at \$1,000 or more. You will pay a down payment followed by equal monthly payments when purchased through the store.
- If you work in the HVACR industry or are a contractor, you (and your workmates) can sign up together for an [Annual Subscription](#). This option is great if you're planning to focus on professional development. Your 12 month subscription begins when you sign up. Because you're already working and to save you money, we don't include an online instructor with your subscription. But if you ever want one, you can pay a small fee per course to access our online subject matter experts and receive their professional guidance throughout a course.
- Some technicians receive professional development funding through their employers. It is worth asking about. **We can email an invoice** to you and your boss, the two of you can figure out how much each of you will pay, and mail us a check or pay with credit card(s). Note: if your boss pays the enrollment fee, he is entitled to receive your progress reports and grades.
- Some **utility companies offer a scholarship program** for HVAC Technician Training as part of their efforts to make buildings more energy efficient, or as part of their customer rebate program. Check with your local utility company to see if they have available training funds.
- **Military funding** may be available to you if you are active military or a veteran. The best way for you to access this funding is to enroll in one of our online programs through one of our partner community colleges or workforce training centers. You may be able to apply for federal financial aid or use your military education benefits when you enroll through the college of your choice. Click here to find a college near you: <https://www.ed2go.com/>. Each school will have a Financial Aid specialist work with you.
- If you are a **woman** who wants to begin your career in HVACR, please check with Women in HVACR. They offer scholarships once a year; and HVACRedu.net offers one scholarship per year through their organization. <https://www.womeninhvacr.org/webapp/p/244/whvacr-scholarships>
- Your **family and friends** may offer to support your career path by helping fund all or part of your education. Let them know this kind of gift is what you want for your birthday, anniversary, or Christmas. We can prepare an invoice and letter that describes the program of your choice and the price.

Payment questions? Contact:
orders@hvacredu.net or 888-655-4822 x1111

Text Books for Courses	
Course / Program	Text
101 Fundamentals, 103 Sheet Metal 104 Copper Works 109 Basic Hand and Power Tools 111, 112, 113, 114 Electrical 121, 122 Systems 133, 134 Gas Heating 135, 137 Heat Pumps 141, 142 Refrigeration 201, 202, 203, 204, 205 High Efficiency 221 IAQ 241, 243 Troubleshooting 242 R-410A Refrigerant 306 Operations Management (Recommended) NATE Certified HVAC Technician Program (Required and included with program)	Delmar Cengage: <u>Refrigeration and Air Conditioning Technology</u> , 8 th Edition. by Bill Whitman, Bill Johnson, John Tomczyk, Eugene Silberstein ISBN: 13:978-1305578296 or Goodheart-Willcox: <u>Modern Refrigeration and Air Conditioning</u> 19 th Edition (2014) by Andrew D. Althouse, Carl H. Turnquist, Alfred F. Bracciano and Daniel C. Bracciano . ISBN-13: 978-1619601994 ISBN-10: 1619601990 or AHRI: <u>Fundamentals of HVACR</u> 1 st Edition, 2009, Stanfield & Skaves Prentice Hall ISBN: 13:978-0-13-222367-6 & 10:0-13-222367-8
111, 112, 113, & 114 Electrical (Required and included in the course)	ESCO Electrical Theory and Application e-book is included in the courses.
121 Air Properties & Measurements (Required and included in the course)	<i>Psychrometrics Without Tears</i> e-book is included in the course.
122 Systems (Required)	<i>ACCA Manual J (AE) Residential Load Calculations</i> 8 th Edition, 2003 ISBN 10:1892765-357
123 Air Distribution (Required)	<i>ACCA Manual D Residential Duct Systems</i> ISBN: 10:1892765500
131 Oil Heat (Required and included in the course)	The <i>NORA Oil Heat Manual</i> is provided in the course as a downloadable file.
153, 154, 155, & 156 HVACR Controls / Building Automation Systems Program (Required and included with program, but not included with individual courses)	<i>HVAC Control Systems (4th edition)</i> , American Technical Publishers, by Ronnie J. Auvil, ISBN- 978-8269-0779-0
160 Pneumatic Controls (Required and included in the course)	<i>Pneumatic Controls</i> by RSES, e-book access is provided in the course.
161 & 171 Boilers (Required)	<i>Low Pressure Boilers</i> , 4 th Edition, 2012, Frederick M. Steingress, Daryl R. Walker ISBN: 978-0826943651
186 HVACR Economizers ADEC/DCV (Required and included in the course)	<i>Psychrometrics Without Tears, e-book by ESCO</i> is included in the course.
191 Hydronics (Recommended)	<i>Modern Hydronic Heating: For Residential and Light Commercial Buildings, Delmar</i> , 3 rd Edition ISBN 13-9780766816374
Apprentice Program Year 1, 2, 3, and 4 (Apprentices will need to purchase books in year 1 and use the same books throughout the four year program.) (Required)	Delmar Cengage: <u>Refrigeration and Air Conditioning Technology</u> , 8 th Edition. by Bill Whitman, Bill Johnson, John Tomczyk, Eugene Silberstein ISBN: 13:978-1305578296 -International Fuel Gas Codes 2018 ISBN-13: 978-1609837419 ISBN-10: 160983741X -International Mechanical Codes 2018 ISBN 13: 978-1609837433; ISBN: 10: 1609837436
441 & 442 Commercial Refrigeration (Required and included with program, but not included with individual courses.)	Cengage: <u>Commercial Refrigeration for Air Conditioning Technicians</u> , 3 rd Edition. ISBN 978-1305506435
107 Principles of Building Science 244 Hydrocarbon Refrigerants	No Textbook Required-a reference manual is included with the course
010, 015, 110, 139, 216, 217 261, 262, 263, 264, 265, 266, 291, 301	No Textbook Required

You will find information about whether your course requires or recommends a textbook in the course description or the online Campus Store. Some courses require a textbook and some do not. Some courses include the textbook as a downloadable PDF or eBook reading assignments. You may acquire textbooks through any third party of your choice. If you already have the required textbook(s), you do not need to purchase more. If you have any questions about textbooks, please send an email to: info@hvacredu.net.

You may purchase your textbook(s) anywhere you choose. We suggest a reputable online bookseller.

SUGGESTED HAND TOOLS LIST FOR STUDENTS

10/28/16

10% Discount Through Johnstone Supply

Socket wrench sets (SAE)
 1/4" – 3/ 8" – 1/ 2" drive

Wrenches (SAE)
 Combination wrench set
 Flare nut wrench set
 Adjustable wrenches
 Pipe wrenches
 Hex key wrenches
 Service valve wrenches

Hammers
 Ball peen
 Soft face mallet

Pliers
 Slip joint
 Tongue and groove
 Diagonal cutting
 Linesman pliers
 Long nose pliers
 Locking pliers
 Pinch-off pliers
 Wire-end crimpers

Screwdriver set
 Slotted
 Phillips
 Torx

Nut drivers

Tin snips
 Straight cut
 Left -hand curve cut
 Right -hand curve cut

Drill bits
 Cold chisels
 Punches
 Files
 Hacksaw
 Tube cutter
 Reamer
 Fin straightener
 Schrader valve core tool
 Soldering iron / gun
 Multimeter
 Electric drill
 Tape measure
 Flashlight
 Thermometer
 Drop light
 Safety glasses
 Gloves
 Gauge manifold set

Building Analyst and Home Performance Technician Tool List, shown below, is available to students in the Building Analyst Program, or in the 107 Building Analyst course, or the 301 Performing the Comprehensive Building Assessment course.



SUGGESTED TOOLS LIST FOR ENERGY AUDITORS

11/5/10

Discount available through TruTech Tools

Tool List

Blower Door
Digital Manometer
Digital Thermometer
Duct Pressurization/Tightness Tester & Grill mask
Pressure Pan
Probe (for zonals)
Smoke Bottle / Pens
Non-Contact Voltage Detector
Circuit Tester
Volt/Amp Meter
Refrigeration Gauges
Thermocouples
Exhaust Fan Flow Meter
Vacuum Cleaner
Fire Extinguisher
First Aid Kit
Step Ladder/Small Extension Ladder
Pressure & Temperature Chart
Super heat/ Sub cooling calculators
Hoses with connectors

Heating System Testing

Carbon Monoxide Detector
Gas Leak Detector
Combustion Analyzer /printer/case
Draft Gauge
Lighter (w/Long Handle)
Mirrors (Clear-Flame)
Soap Bubbles
Bleed Jug and Hose
Copper Tubing for Analyzers
Jumper Wires
Lag Bolts or Plugs
High Temp Silicone

Hand Tools

Tape Measures
Flashlights
Multiple Screwdrivers
Large Pry bar
Small Pry bar
Hammer
Cordless Drill and Various Bits
Drill Bit for Sidewall Inspection

Drill Bit for Heating System Inspection
Pen and Paper
Digital Pocket Thermometer
High Temp Silicone
Duct Tape
Tin snips (Right, Left, Center)
Crimper Snips
Extension Cord
Trouble Lights
Coveralls, Gloves, Masks, Respirators (PPE)
Wrenches – Open Ended
Rags/Hand Cleaner
Nut Drivers – 1/4", 5/16" 3/8"
Crescent Wrench
Self-Tapping Screws
Small Paneling Nails
Trash Bags

Maintenance

Extra Batteries
Recharging Equipment
Cleaning Equipment
Calibration Equipment

Code Books

NFPA 54 (NFPA - 1-800-344-3555)
NFPA 211
NFPA 31
Mechanical Code
Electrical Code
Weatherization Installation Standards
Southeast WX Field Guide
Reference Materials

Additional Items

Laptop computer / software
Static Pressure test kit
IR Thermometer
Moisture Meter
Sling Psychrometer
Low Flow Bolometer
Infrared Camera
Inspection Scope or Borescope / Camera
Digital Camera
Distance Meter
Graph Paper for building sketches

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