



Certifying the
finest in HVACR

CHP-5

HVAC Fundamentals

KATE

Knowledge Areas of
Technician Expertise

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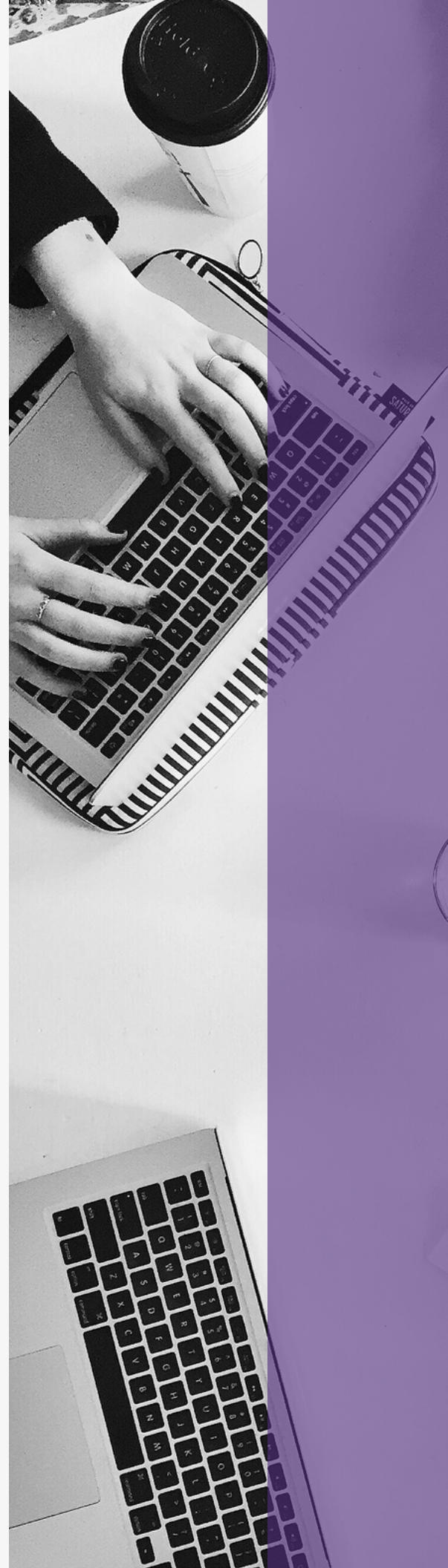
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CHP-5: HVAC Fundamentals Exam

Exam Information & Qualifications



The Certified HVAC Professional (CHP-5): HVAC Fundamentals exam tests a candidate's knowledge of the installation, service, maintenance, and repair of HVAC systems. This is a test and certification for technicians in the HVAC industry. The test is designed for top level technicians. This test for certification is not intended for the HVAC system designer, sales force, or the engineering community.

To become NATE-certified, you must pass all five of the Certified HVAC Professional exams (HVAC Fundamentals, Electrical and Controls, Comfort and Air Flow, Installation, and Service). This test will measure what 80% of candidates have an 80% likelihood of encountering at least once during the year on a national basis.

Exam Copyrights

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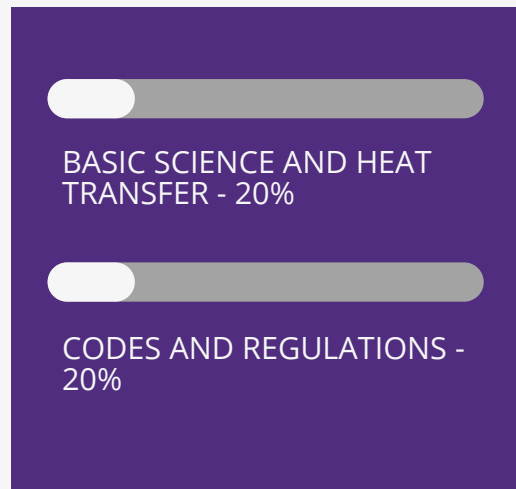
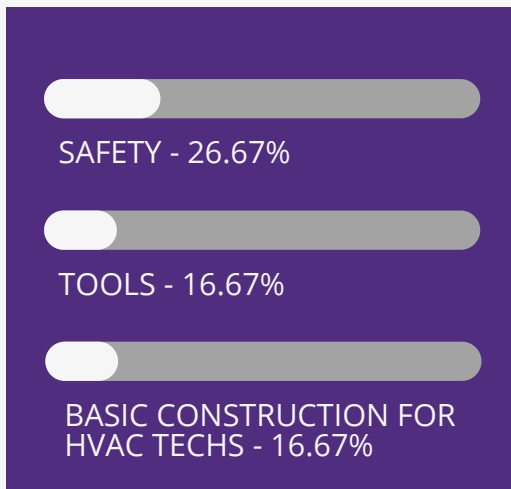
Passing Score Development Process



The passing scores for the NATE tests were established using a systematic procedure (a Passing Score Study). This procedure employed the judgment of experienced HVAC professionals and educators representing various HVAC specialties and geographical areas. The passing scores were set using criteria defining competent performance. The passing score for different test forms may vary slightly due to the comparative difficulty of the test questions.

Exam Subject Areas

Percentages of questions that will be in each section of the exam:



Exam Specifications:



Passing Score: Pass/Fail



1 Hour Time Limit



Closed Book



30 Questions

Industry References

The reference materials list below will be helpful in preparing for this exam. These materials may not contain all of the information necessary to be competent in this specialty or to pass the exam.



- American National Standards Institute (ANSI) / Air Conditioning Contractors of America (ACCA) Manuals – Latest Edition.
 - Manuals “D” “J” “QI” – Quality Installation, and “S”
- ACCA Manuals “T” and “RS” – Latest Editions
- ACCA Residential Duct Diagnostics and Repair – Latest Edition
- AHRI-Hydraulics Section – IBO/RAH – Latest Edition
- International Energy Conservation Code - Latest Edition with Addendum
- International Mechanical Code - Latest Edition with Addendum
- International Plumbing Code - Latest Edition with Addendum
- Uniform Mechanical Code - Latest Edition with Addendum
- Specification of Energy-Efficient Installation and Maintenance Practices for Residential HVAC Systems developed by Consortium for Energy Efficiency (CEE) - Latest Edition with Addendum

References continue on next page

Industry References (continued)

- ASHRAE Standard-62.2 - Latest Edition with Addendum
- ANSI//ASHRAE Standard- 152-2004 – Latest Edition with Addendum
- ENGERY STAR™ Home Sealing Standards – Latest Edition with Addendum
- Duct Calculators – Sheet Metal, Ductboard, and Flexible Duct
- American National Standards Institute (ANSI)/Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Manuals
 - HVAC Duct Construction Standards - Metal and Flexible
- Sheet Metal and Air Conditioning Contractors' National Association, Inc. (SMACNA) Manuals
 - Fibrous Glass Duct Construction Standards, Residential Comfort System Installation Standards Manual, and HVAC Air Duct Leakage Test Manual
- Air Diffusion Council Flexible Duct Performance & Installation Standards
- North American Insulation Manufacturers Association (NAIMA) Manuals
 - Fibrous Glass Duct Construction Standards and A Guide to Insulated Air Duct Systems
- International Fuel Gas Code – Latest Edition with Addendum
- National Fuel Gas Code – Latest Edition with Addendum



KATES

Knowledge Areas of Technician Expertise

All NATE exams are based on Knowledge Areas of Technician Expertise (KATES), statistically proven job task analysis from experts in the HVACR industry. This KATES outline covers all information tested in the **CHP-5: HVAC Fundamentals Exam** and should be used as reference material.

Safety

- Complying with Government Regulations
 - Transportation regulations for hazardous materials
 - Health and safety regs for hazardous materials
 - Environmental regs for hazardous materials
- Personal Safety and Work Practices
 - Regs concerning confined spaces, hard hats, etc.
 - Safety with hand tools
 - Using ladders and scaffolds
 - Refrigerant in confined spaces
 - Safe driving practices
 - Clothing, safety equipment, and hard hats
 - Safety glasses
 - Hearing protection
 - Safe practices in repair
 - Using warning symbols
 - Safe handling of hazardous materials
 - Safety within confined spaces
 - Safe practices in troubleshooting and repair
- Personal Safety Around Moving Machinery
 - Blowers
 - Pulleys
 - Clothing requirements
 - Condenser fans
- Electrical Safety
 - Overview of electrical safety
 - Grounding-GFI requirements outdoor extension cords
 - Personal protection
- Safe Brazing and Soldering Practices
 - Overview of safety
 - Oxygen and acetylene safety
 - Using purging gases-Nitrogen, Carbon Dioxide, etc
 - Fire extinguishers

KATES

Knowledge Areas of Technician Expertise

Safety (continued)

- Safe Handling of Containers
 - Disposal
 - Securing containers for transport
 - Signage and documentation for containers
 - Proper storage
 - Proper container filling
- Understanding Hazmat
 - Signage for hazardous materials
 - Securing hazardous materials for transport
 - Worker requirements for HAZMAT training
 - Documentation for hazardous materials - SDS

Tools

- Tools & Scales - Basic Math Measurement
 - Rulers, compass, square, protractor, etc.
 - Improvised measuring techniques Basic scale drawings
 - Measurements - inches, feet, centimeters, millimeters, etc.
 - Understanding tolerances
- Fabrication Tools
 - Screwdrivers and nut drivers
 - Wrenches, pliers, and allen wrenches
 - Socket sets
 - Levels and squares
 - Tool maintenance and care
 - Saws and files
 - Drills, countersink, reamers, and bits
 - Punches, taps, and dies
 - Hammers
 - Metal tools - metal snips, sheers, benders, breaks, hand formers,
 - calipers, rulers, stapler, etc.
- Tubing Tools
 - Benders - spring, lever, etc.
 - Flaring tools
 - Tube cutters
 - Swaging tools
 - Reamer

KATES

Knowledge Areas of Technician Expertise

Tools (continued)

- Fasteners
 - Screws
 - Nuts and washers
 - Rivets
 - Bolts
 - Lockpins
- Lubricants
 - Mineral oil-based refrigerants and properties
 - Polyolesters (POE)
 - Lubricant / system compatibility
 - Evaluating lubricants after removal from system
 - Alkylbenzenes (AB)
 - Disposal of lubricants

Basic Construction for HVAC Technicians

- Plans/Specifications, Roofing, Ceiling, Walls, Floors, Girders/Trusses, Chimneys
 - Construction
 - Layout
 - Materials
 - Terms

Basic Science and Heat Transfer

- Chemistry Basics
 - Properties of matter
 - How chemicals react with each other
 - Role of chemistry at the jobsite
 - Oxidation and combustion
 - Weight and density of materials
- Pressure Measurements
 - Overview of pressure systems
 - Pressure laws and pressure measurement terminology
 - Temperature vs. Pressure
 - Gas laws

KATES

Knowledge Areas of Technician Expertise

Basic Science and Heat Transfer (continued)

- Arithmetic
 - Whole numbers - add, subtract, multiply and divide
 - Fractions - add, subtract, multiply and divide
 - Decimals - add, subtract, multiply and divide
 - Percentages, ratios, and proportions
 - Rounding off of values
 - Interpolation Calculators
 - Combined calculations
 - Mixed numbers
 - Conversion of number forms
 - Using sequences and series to predict results
- Algebra
 - Basic linear single variable equations
 - Using basic algebra in problem solving
 - Transposing formulas
- Geometry
 - Geometric figures used in HVAC - points, lines, rectangles,
 - parallelograms, rhombuses, squares, trapezoids, etc.
 - Units of measurement
 - Parallels and perpendiculars
 - Concepts of three-dimensional figures
 - Drawing three-dimensional objects.
 - Computations with three dimensional shapes
 - Estimating areas, perimeters, and volumes of irregular figures
- Graphs, Charts & Tables
 - Introduction to basic graphs, plots, and tabular data
 - Graphs and tables used in instruction sheets
 - Blueprint reading
- Mechanics
 - Simple machines - levers, gears, etc.
 - Conservation of energy
 - Complex machines - how mechanisms work
 - Basics of fluid mechanics
- Gas Laws
 - Gas laws

KATES

Knowledge Areas of Technician Expertise

Basic Science and Heat Transfer (continued)

- Heat Transfer and the Basic Cooling Cycle
 - Fundamentals of heat transfer
 - Heat transfer and cooling
 - Basic refrigeration circuit - 10 components
 - Dynamic analysis of temperatures and pressure in the refrigerant circuit
 - Subcooling
 - Superheat
 - Psychrometrics

Codes and Regulations

- Air Quality Regulations
 - Fresh air supplies
- Electrical Code
 - Overview of electrical code
 - Circuit breaker and fuse requirements
 - Class I wire sizing
 - General wiring practices
 - Conduit sizing
 - Definitions
 - Class II wire sizing
- State and Local Regulations
 - State requirements for technicians
- Fire Protection Regulations and Codes
 - Return air sensors
 - Fire dampers
 - Overview of fire prevention
- Mechanical Code
 - Minimum Clearance
 - Electrical Disconnects
 - Fire Dampers
 - Refrigerant Line Routing
 - Condensate Drains
- Industry Standards
 - Introduction to equipment standards
 - ARI standards for ratings
 - Introduction to industry system standards