Certifying the finest in HVACR

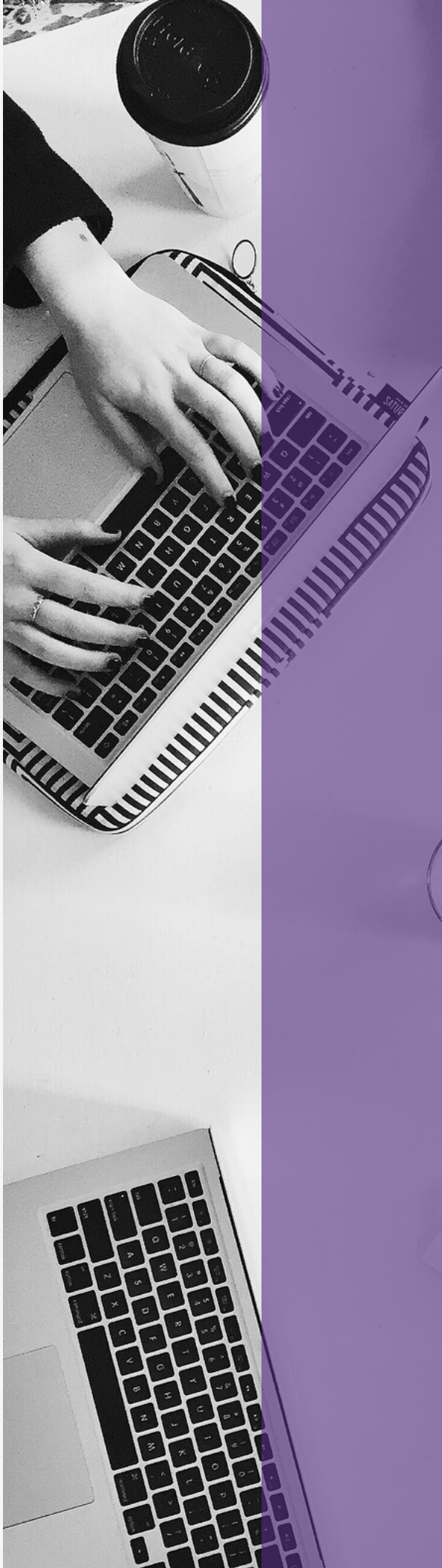
HVAC Support Technician

KATE

Knowledge Areas of Technician Expertise

www.NATEX.org

Table Of Contents



HVAC Support Technician Exam

Exam Information & Qualifications

The HVAC Support Technician exam tests a candidate's general knowledge and HVAC specific knowledge in the areas of safety, tools, heat transfer, comfort, basic science, basic electrical, installation, planned maintenance, system components, and design considerations.

This exam and certificate is for early career technicians in the HVAC industry. The exam was designed for technicians that have 6 months to 1 year of experience in the HVAC industry. This test is not designed for HVAC system designers, sales force, or engineers.

Achieving a passing score on the HVAC Support Technician exam is required to earn the HVAC Support Technician certificate.

Exam Copyrights

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:

- SAFETY - 10%
- TOOLS - 8%
- BASIC CONSTRUCTION TERMS - 4%
- USING BASIC SCIENCE - 5%
- ACHIEVING DESIRED CONDITIONS - 7%
- TAKING TEMPERATURE & HUMIDITY MEASUREMENTS - 7%
- INTRODUCTION TO BASIC ELECTRICITY - 9%
- INSTALLATION - 24%
- SERVICE - 7%
- SYSTEM COMPONENTS - 13%
- APPLIED KNOWLEDGE: DESIGN CONSIDERATIONS - 6%

Exam Specifications:

Passing Score: Pass/Fail

2.5 Hour Time Limit

Closed Book

100 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 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-Hydronics Section – IBO/RAH – Latest Edition
- International Code Council – Latest Editions
  - Mechanical, Plumbing, Energy Conservation, and Residential
- 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

References continue on next page

Industry References (continued)

- 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
- Generally accepted HVACR textbooks
- Generally accepted construction textbooks
- OSHA safety standards
- National Fire Protection Association – Latest Editions
  - Gas, Oil, and Electric

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 **HVAC Support Technician Exam** and should be used as reference material.

Safety

- Personal Safety and Work Practices
  - Safety with hand tools
  - Using ladders and scaffolds
  - Refrigerant in confined spaces
  - Safe driving practices
  - Clothing, safety quipment, and hard hats
  - Safety glasses
  - Hearing protection
  - Safe practices
  - using warning symbols
  - Safe handling of hazardous materials
  - Safety within ocnfied spaces
  - Safe practices in troubleshooting and repair.
- Personal Safety Around Moving Machinery
  - Blowers
  - Pulleys
  - Clothing requirements
- Electrical Safety
  - Overview of electrical safety
  - Grounding-GFI requirements
  - Personal protection
- Safe Brazing and Soldering Practices
  - Overview of safety
  - Oxygen and acetylene safety
  - Using purging gases-Nitrogen, Carbon Dioxide, etc
  - Fire extinguishers
  - Documentation for hazardous materials - SDS
- Safe Handling of Containers
  - Disposal
  - Securing containers for transport
  - Proper storage
  - Proper container filling
- Understanding Hazmat
  - Signage for hazardous materials
  - Securing hazardous materials for transport
  - Documentation for hazardous materials - SDS
  - Worker requirements for HAZMAT training

KATES Knowledge Areas of Technician Expertise

Tools

- Tools & Scales Basic Math Measurement
- Rulers, compass, square, protractor, etc.
  - Measurements - inches, feet, centimeters, millimeters, etc.
  - Basic scale drawings
- 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
  - Reamers

Basic Construction Terms

- Room Specs
  - Construction
  - Materials
- Ceilings
  - Construction
  - Materials
- Walls
  - Construction
  - Materials
- Floors
  - Construction
  - Materials
- Girders & Trusses
  - Construction
  - Materials

KATES Knowledge Areas of Technician Expertise

Using Basic Science

- 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
- Mathematics
  - Arithmetic
  - Algebra
  - Geometry
  - Graphs, Charts, and Tables
- Mechanics
  - Simple machines
  - Conservation of energy
  - Complex machines
  - Basics of fluid mechanices

Achieving Desired Conditions

- Temperature
  - Role of temperature in comfort
- Humidity
  - Role of humidity in comfort
  - Adjusting system performance for humidity control
- Air Quality
  - Ventilation
  - Air cleaning
  - Odor control
- Sound
  - Equipment source
  - Airflow source

KATES Knowledge Areas of Technician Expertise

Taking Temperature and Humidity Measurements

- Physical Measurements - Temperature & Heat
  - Latent heat
  - Sensible heat
  - Temperature
  - Fundamentals of humidity
  - Conduction
  - Convection
  - Radiation
  - BTU - Definition and use
- Thermometers
  - Mechanical thermometers
  - Electronic thermometers
  - Gauge / meter calibration
  - Recording thermometers - digital and analog

Introduction to Basic Electricity

- Digital Electrical Meters
  - Identify meters and instruments
- Electrical Basic Terms
  - Voltage
  - Amps
  - Resistance
  - Power
- AC and DC Circuits
  - Simple DC circuit
  - Basic control and loads
  - Introduction to AC circuits
  - Effects of AC on controls and loads

KATES Knowledge Areas of Technician Expertise

Installation

- Fabricating Copper Tubing
  - Refrigerant line installation
  - Bending copper tubing
  - Copper tubing preparation
  - Brazing
  - Flare fittings
  - Brazing & soldering equipment
- Duct Installation
  - Installing metal duct
  - Installing flexible duct
  - Installing ductboard
  - Installing grilles, registers, diffusers, & damper
  - Reconnecting duct when replacing equipment
  - Installation of plenums and duct
- Installing Accessories
  - Installing thermostats
  - Installing electronic air cleaners
  - Installing humidifiers
- Field Wiring
  - Wiring units & control wiring
- Refrigerant Circuit Tools
  - Manifold gauge set
  - Evacuation tools
  - Charging tools
- Recovery/Recycling Machines
  - Recovery machines and recycling machines
- Installing gas furnaces
  - Mounting furnaces
  - Installation of metal venting systems
  - Installation of pvc / abs venting systems
  - Installation of condensate drains for cond. furn.
  - Installation and/or connection of utilities

KATES Knowledge Areas of Technician Expertise

Service

- Introduction to Systems
  - Heat transfer and the basic cooling cycle principles
  - Split systems
  - Packaged systems
  - Multi-capacity systems
  - The basic heat pump refrigerant circuit
- Planned Maintenance
  - Mechanical planned maintenance
  - Electrical planned maintenance
  - Combustion planned maintenance

System Components

- Duct Systems
  - Duct systems
- Components
  - Outdoor coils
  - Compressors
  - Refrigerants
  - Indoor coils
  - Blowers and fans
  - Air side components
  - Grilles, registers, & diffusers
- Electromechanical Sensing Controls
  - Electromechanical wall thermostats
  - Electromechanical temperature controls
- Electronic Controls
  - Electronic thermostats
- Air Distribution
  - Duct systems
  - Supply blowers
- Induced Draft Non-condensing Furnaces - Components
  - Heat exchangers
  - Burners
  - Induced draft blowers
- Induced Draft Condensing Furnaces - Components
  - Heat exchangers
  - Burners
  - Induced draft blowers

KATES Knowledge Areas of Technician Expertise

Applied Knowledge: Design Considerations

- Design Considerations - Comfort
  - Temperature
  - Humidity
  - Indoor air quality
  - Sound level
- Design Considerations - External Components
  - Diffusers, registers, and grilles
  - Accessories
  - Blueprint reading