



Certifying the  
finest in HVACR

# CHP-5

## Comfort and Air Flow

# KATE

Knowledge Areas of  
Technician Expertise

[www.NATEX.org](http://www.NATEX.org)



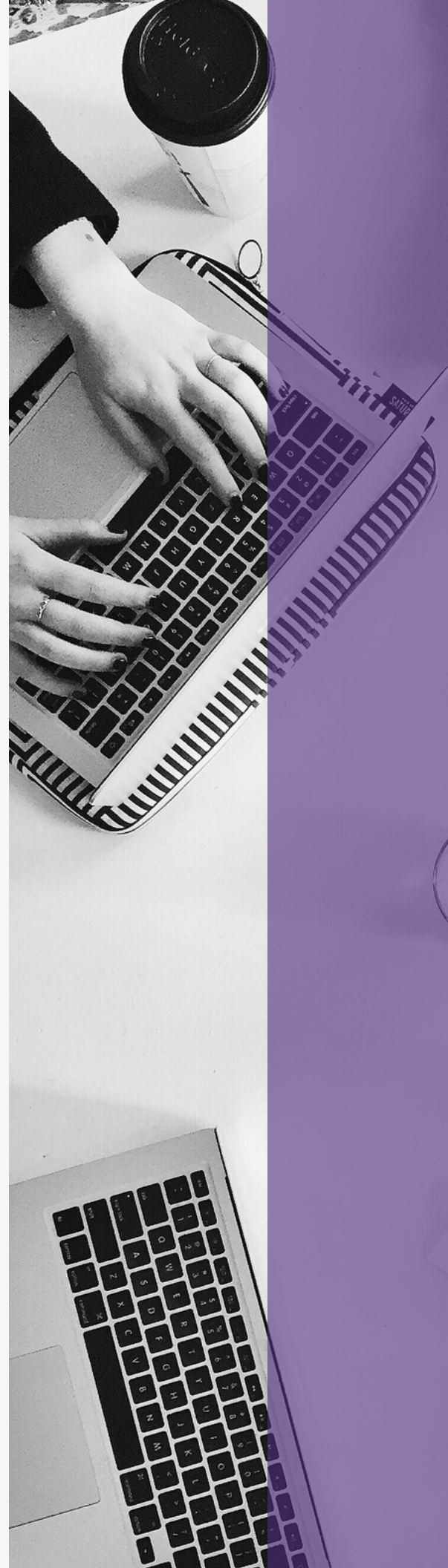
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# CHP-5: Comfort and Airflow Exam

## Exam Information & Qualifications



The Certified HVAC Professional (CHP-5): Comfort and Airflow 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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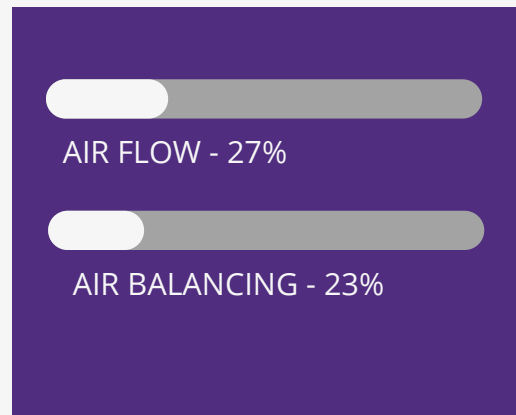
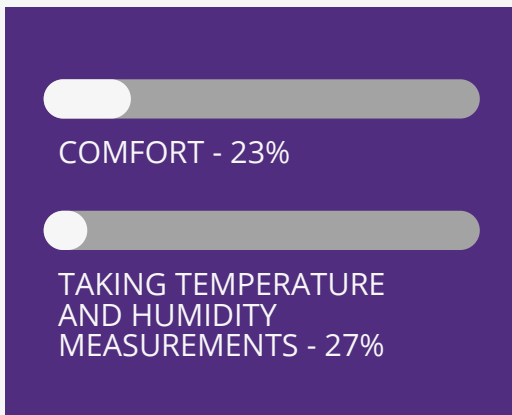
## Passing Score Development Process



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: Comfort and Airflow Exam** and should be used as reference material.

### Comfort

- Temperature
  - Role of temperature in comfort
  - Regional temperature considerations and comfort
- Humidity
  - Role of humidity in comfort
  - Adjusting system performance for humidity control
- Indoor Air Quality
  - Ventilation -comfort
  - Air cleaning for comfort Ventilation - comfort
  - Odor control
  - Number of air changes per hour
  - Contaminants
- Sound
  - Equipment source
  - Airflow source
  - Equipment location considerations
  - Isolation, mounting pad, duct, and structure
- Installing Humidifiers
  - Installing humidifiers
  - Wiring humidifiers
  - Controlling humidifiers

# KATES

Knowledge Areas of  
Technician Expertise

## Taking Temperature and Humidity Measurements

- Physical Measurements - Temperature and Heat
  - Latent heat
  - Sensible heat
  - Convection
  - Conduction
  - Radiation
  - BTU - Definition and use
  - Temperature
  - Fundamentals of humidity
- Thermometers
  - Liquid column thermometers
  - Mechanical thermometers
  - Recording thermometers - digital and analog
  - Electronic thermometers
  - Infrared thermometers
  - Gauge / meter calibration
  - Dry bulb and wet bulb Delta T
- Humidity Measurements and Calculations
  - Sling psychrometer
  - Wet and dry bulb thermometers
  - Electronic humidity measurement
  - Using psychrometric chart
  - Gauge / meter calibration
  - Humidity probes attachments for use with meters
  - Enthalpy



# KATES

## Knowledge Areas of Technician Expertise

### Airflow

- Airflow Velocity Measurements
  - Pitot tube and manometer in measuring static pressure
  - Velometer - electronic and mechanical
  - Velocity measurement procedures
  - Introduction to airflow in Residential HVAC
  - Discharge velocity equipment
  - Gauge calibration
  - Anemometer
  - Velocity
- Airflow Pressure Measurements
  - Overview of static pressure measurements
  - Inclined manometer
  - Diaphragm type differential pressure gauge
  - Electronic manometer / pressure measurement
  - Absolute vs. Gauge Pressure
  - Air pressure measurement terminology
  - Total pressure
  - U-tube manometer
  - Gauge / meter calibration
  - Static pressure
  - Velocity pressure
- Air Volume Measurements
  - Airflow hood
  - Formulae for determining CFM of air
  - Locations for air volume measurements
  - Formulae for weight of air
  - Airflow volume - CFM / SCFM (Static CFM)

# KATES

Knowledge Areas of  
Technician Expertise

## Air Balancing

- Gathering Design Information
  - Interpreting system design
  - Interpreting specifications
  - Interpreting equipment information
  - Interpreting control data
  - Modifying system design
- Preparation of System Air Tests
  - Locating registers, grilles, equipment, controls, and dampers in building walkthrough
  - Setting thermostat for tests
  - Checking for proper fan operation and rotation
  - Setting dampers for tests
  - Checking for proper static pressure and temperature
- Procedures for Conducting Air Tests
  - Measurements of each supply outlet - total readings
  - Measurements of each return inlet - total readings
- Making Adjustments
  - Adjust airflow to achieve required total airflow
  - Re-measure total airflow to verify that it is within +/- 10%
  - Re-measure total supply and return grille airflow
  - Adjust dampers to obtain design airflow
- Final Test
  - Comparing manufacturer's equipment information with test results
  - Record sheave, pulley, and belt sizes data
  - Test and record full load motor amperes Test and record voltage
  - Test and record motor and fan RPM
  - Test and record supply and return static pressures
  - Test and record supply and return air temperatures - heat and cool
- Completion of Appropriate Forms
  - HVAC system report
  - System diagrams
  - Duct traverse or data pulley forms
  - Instrument list - including calibration dates
- Duct Systems
  - Duct system design
  - Duct configurations - extended plenum, reducing extended plenum, perimeter radial, perimeter loop, overhead radial
  - Return configurations - ducted, central, etc.
  - Return grille locations - low sidewall, high sidewall, etc.
  - Supply locations - floor, sidewall, ceiling, etc.

# KATES

Knowledge Areas of  
Technician Expertise

## Air Balancing (continued)

- Blowers and Fans
  - Introduction to indoor blowers
  - Introduction to outdoor fans
  - Indoor blowers - types and selection
  - Outdoor fans - types and selection
  - Blower and fan performance
- Air Side Components
  - Dampers
  - Ventilations fittings
  - EAC's
  - Electrostatic filters - non-electric
  - Media type filters
  - Fixed outdoor air damper
  - Insulating material
  - Flexible duct materials
  - Ductboard
  - Metal Duct Components
- Grilles, Registers, Diffusers
  - Types and uses
  - Selecting diffusers, grilles, and registers