



Certifying the  
finest in HVACR

CHP-5  
Service

KATE

Knowledge Areas of  
Technician Expertise

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# Table Of Contents

03

Exam Information

04

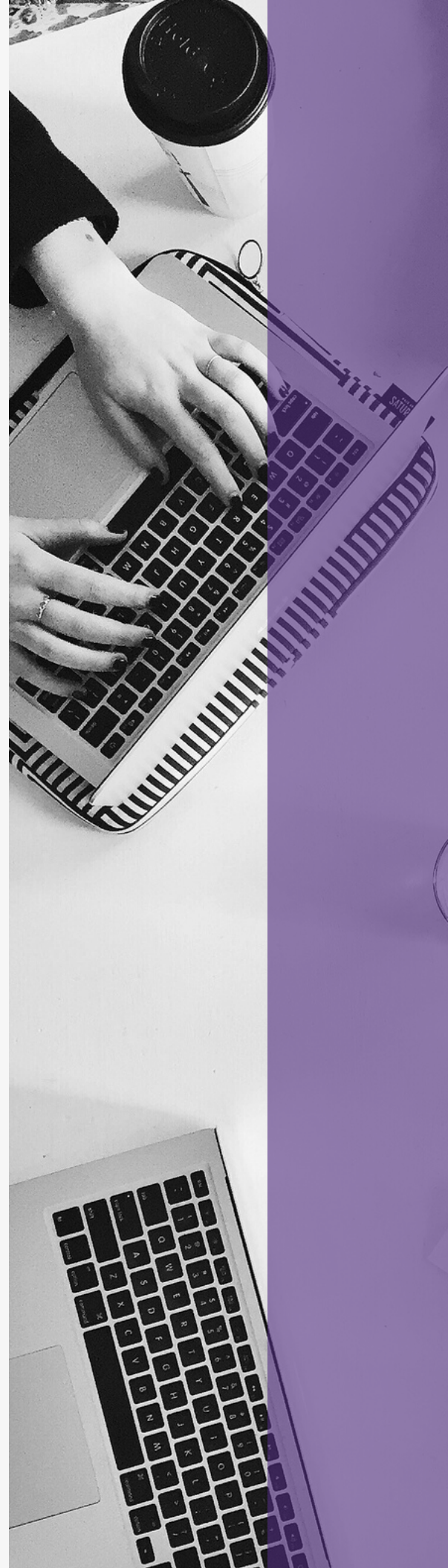
Exam Subject Areas  
& Specifications

05

Industry References

07

KATES



# CHP-5: Service Exam

## Exam Information & Qualifications



The Certified HVAC Professional (CHP-5): Service 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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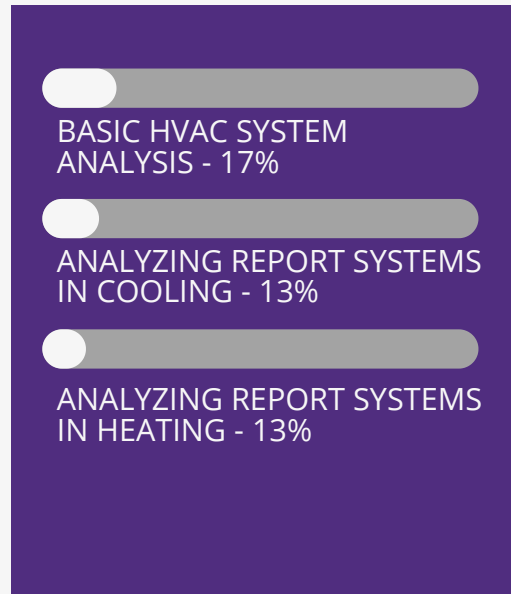
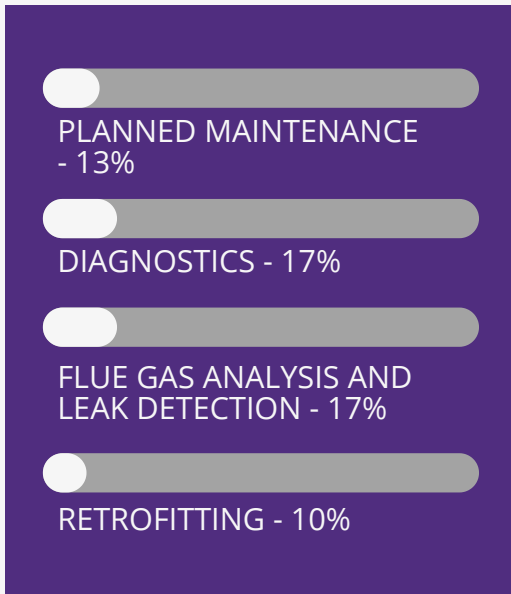
## Passing Score Development Process



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: Service Exam** and should be used as reference material.

### Planned Maintenance

- Mechanical Planned Maintenance
  - Filters
  - Charge
  - Lubrication
  - Outdoor coil care
  - Indoor coil care
  - Roof seals - packaged
  - Diffusers, grilles, and registers
  - Ducts
  - Performance checks - temperature rise
  - Fan blades / blower scroll
  - Gas connections
  - Flue / vent stack inspection
  - Combustion air supply
  - Heat exchanger
  - Burner assembly
- Electrical Planned Maintenance
  - Electric motor checks
  - General wiring checks - tightness of connections, aluminum wire, etc.
  - Compressor checks, voltage, current
  - Sequence of operation checks
  - Crankcase heater check

### Diagnostics

- Preliminary System Diagnostics
  - Outdoor unit checks
  - Attic ventilation
  - Indoor unit checks
  - Wiring checks
  - Refrigerant line checks
  - Thermostat checks
  - Condensate drain checks
  - Accessories



# KATES Knowledge Areas of Technician Expertise

## Diagnostics (continued)

- Analyzing Reported Symptoms
  - No cooling
  - Humidity problems
  - No heating
  - Runs continuously
  - Steam from outdoor unit
  - Short Cycle
  - Low capacity
  - Start problems
  - Noise problems
  - High utility bills
  - Air quality
  - Thermostat, droop
  - Drafty - cold air
- System Air Side Diagnostics
  - Temperature checks - dry bulb, wet bulb, etc.
  - Static pressure checks - noise problems and drafts
  - Ductwork - return checks
  - Airflow checks
  - Ductwork - supply checks
- Refrigerant System Diagnostics
  - Overview
  - Using subcooling
  - Analyzing overall refrigerant circuit performance
  - Analyzing effects of refrigerant circuits on reversing valve operation
  - Using superheat
  - Locating problems based on refrigerant circuit temperatures
- Repair
  - Refrigerant circuit on coils
  - Electrical wiring
  - Ductwork
  - Electrical components
  - Fuel supply
  - Flue stack / venting system
  - Condensate / drain system



# KATES Knowledge Areas of Technician Expertise

## Diagnostics (continued)

- Replacements
  - Outdoor units
  - Transformers
  - Liquid line bi-flow filter-driers
  - Fixed orifice metering devices
  - Capacitors
  - Suction line filter-driers
  - Compressors
  - Outdoor fans
  - Indoor coils
  - TEV's
  - Relays and contactors
  - Indoor blowers
  - Defrost controls
  - Reversing valves
  - Heat exchanger
  - Gas valve
  - Safety circuit switches
  - Draft motor
  - Pilot / ignitor assembly
  - Flame sensing rod
- System Cleanup After Compressor Electrical Failure
  - Compressor
  - Acid test
  - TEV's
  - Reversing valves
  - Check valves
- Component Checks - Refrigeration
  - Compressor TEV's
  - Filter-drier
  - Suction line - oil traps, risers, etc.
  - Liquid line - vertical height, static pressure loss, etc.
  - Condensate drains
  - Indoor and outdoor coils
  - Fixed orifice metering devices / piston
  - Solenoid valves
  - Reversing valves
  - Check valves

# KATES Knowledge Areas of Technician Expertise

## Diagnostics (continued)

- Diagnosing Gas Combustion Problems
  - Flame "roll-out"
  - Flame "lift-off"
  - Discolored flame
  - Intermittent flame
  - Partial burner flame
  - Delayed ignition
  - Carbon build up
  - Flashback
  - Trip on high limit
  - Carbon Monoxide

## Flue Gas Analysis and Leak Detection

- Flue Gas Analysis
  - O<sub>2</sub> Measurements
  - Carbon Dioxide Measurements
- Leak Detection
  - Carbon Monoxide Detector - electrical
  - Carbon Monoxide detector - manual-monoxor

## Retrofitting

- Equipment Component Retrofitting
  - Changing out an outdoor unit
  - Changing out an indoor unit
  - Matching split system components - efficiency and capacity
  - Modifying ductwork for replacement equipment

# KATES

Knowledge Areas of  
Technician Expertise

## Basic HVAC System Analysis

- Noise Problems
  - Interpreting supply / return air volume
  - Blower cavitation
  - Interpreting supply / return air velocity
  - Noise problems
  - Oil canning
  - Vibration
  - Motor / belt noise
- High Utility Bills
  - Interpreting supply / return air temperature
  - Evaluating duct insulation
  - Interpreting supply / return air volume
  - Evaluating duct leakage
  - Thermostat air sensing
  - Envelope infiltration
- Wide Temperature Swings
  - Interpreting supply / return air temperature
  - Evaluating duct insulation
  - Interpreting supply / return air volume
  - Evaluating duct leakage
  - Envelope infiltration
  - Thermostat air sensing
- Single Area is Hot or Cold
  - Interpreting supply / return air temperature
  - Evaluating duct insulation
  - Interpreting supply / return air volume
  - Evaluating duct leakage
  - Envelope infiltration
  - Thermostat air sensing

# KATES Knowledge Areas of Technician Expertise

## Analyzing Report Systems in Cooling

- Poor Cooling
- Interpreting supply / return air temperature
- Interpreting supply / return air volume
- Interpreting supply / return air velocity
- Determining and interpreting the sensible heat ratio
- Using temperature drop across evaporator coil
- Evaluating duct leakage
- Humidity Problems
  - Interpreting wet bulb and dry bulb temperatures
  - Interpreting supply / return air volume
  - Determining and interpreting the sensible heat ratio
  - Evaluating duct leakage
- Drafty
  - Interpreting supply / return air temperature
  - Interpreting supply / return air volume
  - Interpreting supply / return air velocity

## Analyzing Report Systems in Heating

- Poor Heating
  - Interpreting supply / return air temperature
  - Interpreting supply / return air volume
  - Interpreting supply / return air velocity
  - Using temperature drop across evaporator coil
  - Evaluating duct leakage
- Humidity Problems
  - Interpreting wet bulb and dry bulb temperatures
  - Interpreting supply / return air volume
  - Determining the need for additional humidity
  - Evaluating duct leakage
- Drafty
  - Interpreting supply / return air temperature
  - Interpreting supply / return air volume
  - Interpreting supply / return air velocity