

# Massachusetts Technical Teacher Testing Program Heating-Ventilation-Air Conditioning- Refrigeration Content Outline

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## Written and Performance Exam General Overview

- The intent of this exam is to assess your ability to teach the skills found in the Massachusetts Technical Education Framework.
- This exam is aligned to the frameworks which can be accessed [here](#).
- Many questions and tasks require a synthesis of knowledge based on experience in the field and may not be found in any book.
- Candidates are encouraged to prepare for their exam by reviewing textbooks and reference material which has been listed as part of this exam outline. These resources can be found using online search tools, online vendors, and websites.
- Contact the Technical Teacher Testing Office if you need further assistance in locating resources listed in the exam outline.
- Use this exam outline and the Massachusetts Technical Education Framework to focus your preparation for the exam.

## Written Exam

- Number of Questions: 100
- Administration Time: 3 hours
- Administration Method: Remote Proctoring Online Session

## Written Exam Content Coverage

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### **10% Fundamentals of Health & Safety and Refrigerant Regulations**

- Health and Safety Regulations and Practices
- Refrigerant Regulations

### **5% HVAC & R Fundamentals and Refrigeration Principles**

### **5% Pipe Joining Techniques**

- Identify and Install Piping, Fittings, and Materials
- Describe Brazing and Soldering Techniques

### **20% Electrical Components and Wiring**

- Apply Principles of Electricity
- Install Electrical Controls and Systems

### **30% Refrigeration Components and Systems**

- Troubleshoot and Install Refrigeration Components

### **5% Installation and Service of Heating and Cooling Equipment**

- Install and Troubleshoot Air Conditioning and Heat Pump Equipment

**10% Installation and Service of Oil Heating and Systems**

- Install and Troubleshoot Oil Heating Equipment

**5% Installation and Service of Natural Liquid Petroleum Gas Equipment**

- Install and Troubleshoot Gas Heating Equipment

**5% Air Distribution and Indoor Air Quality**

- Describe Ventilation Applications and Forced-Air Duct Systems

**5% HVAC & R Related Mathematics**

- Estimation
- Use Formulas
- Convert Between Measurement Systems
- Solve Linear Equations
- Calculate Geometric Figures

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**Written Exam Reference Materials (Reference Current Edition)**

- **Refrigerant Transition and Recovery Certification Manual** by Air Conditioning Contractors of America (ACCA)
- **Modern Refrigeration and Air Conditioning** by Althouse, et al. (Delmar – ISBN #1-56637-300-X)
- **Refrigeration and Air Conditioning Technology** by Whitman and Johnson (Delmar – ISBN #0-8273-5646-3)

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**Materials Needed for the Written Exam**

- A four-function calculator is included in the online testing system. No other calculators are permitted.
- Scrap paper and pencil/pen are permitted.

## Written Exam Sample Items

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Each question on the exam consists of one incomplete sentence or question followed by four choices. Some items reference an image or diagram. A few sample items are included below; the correct answer is designated with an asterisk (\*).

What percentage of a recovery (D.O.T.) cylinder can be safely filled with liquid refrigerant?

- a. 95%
- b. 70%
- \*c. 80%
- d. 90%

An oversized Thermostatic Expansion Valve (TEV) installed on an evaporator coil will create:

- a. a high superheat reading.
- \*b. a low superheat reading.
- c. a starved evaporator coil.
- d. excessive head pressure.

### Performance Exam

- Administration Time: 5 hours
- Administration Method: Onsite at an approved Teacher Testing Location

### Performance Exam Content Coverage

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- 13%**    ***Working with Copper Tubing***
- 15%**    ***Refrigeration Pump-Down***
- 14%**    ***Evaporator Performance***
- 14%**    ***Control Wiring/Thermostat/Transformer Wiring***
- 13%**    ***Multi-Meter Operation***
- 12%**    ***Troubleshooting Commercial Refrigerator/Freezer Unit***
- 13%**    ***Heating (Gas and Oil)***
- 6%**     ***Safety***

## Materials Required for the Performance Exam (Candidate Must Supply)

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The following materials should be brought to the test site.

- Face mask (cotton face covering or respirator which fully cover the nose and mouth)
- Eye protection
- Disposable gloves
- Industry-Approved Work Clothes and Boots/Shoes
- Pen or pencil
- Pressure Temperature Charts
- Calculator

**Special Instructions:** Hand tools and test instruments such as manifold gauges, temperature measuring instruments and electrical instruments will be provided at the test site. Candidates may bring their own hand tools. Soldering and brazing equipment and supplies will be provided by the test site. No books or notes will be allowed. Cell phones are prohibited during the exam administration.

## Onsite Performance Exam Requirements

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- Candidate must practice social distancing and wear the appropriate face covering that covers the nose and mouth while at the exam site.
- Testing sites may have individual requirements based on location and the current guidance from the Center for Disease Control and Prevention (CDC).

## Performance Exam Reference Materials (Reference Current Edition)

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- **American Society of Mechanical Engineers (ASME) Codes and Standards**
- **Safety Orientation** by NCCER (Pearson Prentice Hall) [www.crafttraining.com](http://www.crafttraining.com)
- **OSHA Regulations** [www.osha.gov](http://www.osha.gov)
  - [1910.1200 - Hazard Communication](#)
  - [1910 Subpart I - Personal Protective Equipment](#)