

# Massachusetts Technical Teacher Testing Program Electricity Content Outline

---

## 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

- 
- 5% Health & Safety**
- Health and safety regulations
  - Right-to-Know
  - Consequences for non-compliance
  - Safety Data Sheet
  - Safety Practices (Lockout/Tagout)
- 2% Reading Technical Drawings and Blueprints**
- Basic layout
  - Print terms, abbreviations, line types, symbols, and notes
  - Drawing dimensions
- 3% Tools, Electrical Test Equipment and Techniques in Fastening Objects**
- Use and types of anchors
  - Measurements of current, voltage and resistance

- 15% Concepts of Electrical Theory**
- Distinguish between conductors and insulators
  - Relationship between voltage, current and resistance
  - Unit of measurements
  - Ohm's law formula
- 25% MA Electrical Code (MEC) and Code of MA Regulations MGL and (CMR)**
- Navigate the MEC Book
  - Identify and summarize the MGL's and CMR's
  - Conductor requirements
  - Raceway requirements
  - Ground-fault circuit interrupters
  - Branch circuit loads and requirements
- 12% Raceways, Boxes and Fittings**
- Types and sizes of raceways, fittings and supports
  - Methods of bending raceway
  - Cutting, reaming, and threading raceways
  - Installing raceways and fittings on various surfaces
  - Selection and installation of boxes
- 10% Fundamentals of Conductors and Cables**
- Electrical conductors for specific applications
  - Sizing conductors for a load
  - Securing and supporting cables
- 15% Power and Distribution of Electricity**
- Electrical service requirements for dwellings
  - Operation of a circuit breaker and fuse
  - Overcurrent devices
  - Compute transformer sizes
  - Identify power transformer connections
- 4% Fundamentals of Motors and Motor Controls**
- Operating principles of motors and motor control
- 2% Fundamentals of Grounding and Bonding**
- Sizing equipment grounding conductors
- 2% Elementary Use of Luminaires and Luminaire Controls**
- Occupancy sensors, photoelectric sensors, and dimmers
  - Classification of lighting fixtures
  - Rating of single-pole, double-pole, three-way, four-way and dimmer switches
  - Installation and layout of lighting outlets

**5% Basic Low Voltage Wiring**

- Components of fire and security alarm systems
- Class 1, 2, and 3 low voltage systems
- Low voltage cable

---

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

---

- **Designing Electrical Systems** by James Stallcup (American Technical Publishers)
- **National Electrical Code** with Massachusetts Amendments (National Fire Protection Association Publishers)
- **Delmar Standard Textbook On Electricity** by Herman (Delmar Press)
- **American Electricians Handbook** by Croft and Summers (McGraw-Hill)
- **Official OSHA Construction Safety Handbook** by JJ Keller & Associates, Inc.

---

**Materials Needed for the Written Exam**

---

- Candidate must have the most current National Electrical Code Books available.
- 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**

---

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 (\*).

The general lighting load for dwellings expressed in volt-amperes per square foot is \_\_\_\_\_ volt-ampere(s).

- a. 1/4
- b. 1/2
- \*c. 3
- d. 4

If the reactive volt-amperes on an A.C. circuit is 12 kva and the true power is 16 kw, what is the value of the apparent power supplied in kva?

- \*a. 20 kva
- b. 24 kva
- c. 28 kva
- d. 32 kva

## Performance Exam

- Administration Time: 4 hours
- Administration Method: Onsite at an approved Teacher Testing Location

### Performance Exam Content Coverage

#### **21 % A.C. Motor Control**

- Develop Schematic Diagrams with required symbols according to industry standards
- Make terminations and splices to MEC code and according to manufacturer listing and labeling
- Wire motor controls as instructed; must be operational

#### **16 % EMT**

- Bend EMT to task specifications

#### **16 % Conduit**

- Bend and terminate conduit to task specifications utilizing a segment bender (hickey bender)

#### **21 % N.M. Cable**

- Prepare Wire Diagrams using correct format symbols. Diagram must be neat and legible. Circuit must be accurate.
- Construct a lighting circuit according to MEC standards. Must be neat, clean and installed to task requirements and operational

#### **21 % Bell Wiring/Low Voltage Wiring**

- Develop schematic diagrams with required symbols according to industry standards
- Wire Bell/Low Voltage system as instructed and according to code and industry standards. Must be operational.

#### **5 % Safety**

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

- |   |                                     |  |
|---|-------------------------------------|--|
| • Face mask (cotton face covering or respirator which fully cover the nose and mouth) | • 9" Lineman's Pliers               | • Pencils                              |
| • Eye protection  | • 6" straight blade screwdriver     | • 6' ruler or tape                     |
| • Disposable gloves   | • Knife                             | • Electrical Multimeter                |
| • Industry-approved work boots/shoes  | • Hack saw and blades               | • #2 Phillips head screwdriver         |
|   | • Slip joint (channel locks/pliers) | • Claw hammer                          |
|   | • MEC Code Book, current edition    | • Torpedo level                        |
|   |                                     | • Four-function calculator, if desired |

**Note:** No bending guides will be allowed. No books or notes will be allowed. Cell phones are prohibited during the exam administration.

## Onsite Performance Exam Requirements

---

- 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)

---

- **Designing Electrical Systems** by James Stallcup (American Technical Publishers)
- **National Electrical Code** with Massachusetts Amendments (National Fire Protection Association Publishers)
- **Delmar Standard Textbook on Electricity** by Herman (Delmar Press)
- **American Electricians Handbook** by Croft and Summers (McGraw-Hill)
- **Official OSHA Construction Safety Handbook** by JJ Keller & Associates, Inc.
- **Electrician's Guide to Conduit Bending** by Cox (COXCO)
- **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](#)