

# Massachusetts CTE Teacher Testing Program Electricity Content Outline

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## Written and Performance Exam General Overview

- The intent of this exam is to assess the candidate’s ability to teach the skills found in the Massachusetts Technical Education Framework.
- The written exam is a state-developed exam aligned to the frameworks which can be accessed [here](#). The performance exam is a NOCTI-developed teacher test and has been determined by DESE to align to the state frameworks.
- Many questions and tasks require a synthesis of knowledge based on experience in the field and may not be found in any book.
- Use this exam outline and the Massachusetts Technical Education Framework to focus your preparation for the exams.
- Candidates are encouraged to prepare for their written exam by reviewing textbooks and reference material which have been listed as part of this exam outline. These resources can be found using online search tools, online vendors, and websites.

## Written Exam

- Number of Questions: 100
- Administration Time: 3 hours
- Passing Score: 70.0%
- Administration Method: Remote Proctored Online Testing Session

## Written Exam Content Coverage

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- 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

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

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- **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.

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**Materials Needed for the Written Exam**

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- Candidates must have the most current National Electrical Code Book (NEC) available.
- A four-function calculator is included in the online testing system. No other calculators are permitted.
- Scrap paper and pencil/pen are permitted.

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**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 (\*).

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

## NOCTI Performance Exam

- Administration Time: 3 hours and 20 minutes
- NOCTI Criterion-Referenced Cut Score/Passing Score: 93.2%
- Administration Method: Onsite at a DESE approved Massachusetts Area Testing Center (MATC) location. Candidates must register and schedule their exam session through NOCTI.

### Performance Exam Content Coverage

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#### **34 % Bend Conduit**

*Participant will safely install boxes onto the wall, and use proper bending and cutting techniques to install conduit.*

#### **42 % Switching and GFCI Receptacle in a Residential Setting**

*Participant will properly mount boxes, install wiring and devices, and complete the job in a neat operational manner following safety standards.*

#### **24 % Install Two Smoke Alarms in a Commercial Setting**

*Participant will properly install interconnected components to operate correctly following safety standards.*

### Performance Exam Requirements

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#### Candidate Supplied

Candidates must bring all appropriate Personal Protective Equipment (PPE), attire/uniform, and any other safety items as is routinely expected to be used by an employee in the related industry. If the candidate does not bring what is needed to safely complete all jobs on the exam as required in the workplace, the testing session will need to be rescheduled at the candidate's expense.

- Appropriate PPE for the industry
- Appropriate attire/uniform for the industry

#### Site Supplied

Additional equipment and supplies needed to complete the jobs on the performance test will be provided by the testing site.

### Performance Exam Site Requirements

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Testing sites may have individual requirements based on location and any relevant and current guidance from the Center for Disease Control and Prevention (CDC).