



INDUSTRIAL MOTOR CONTROL

PURPOSE

To evaluate each competitor's preparation for employment and to recognize outstanding students for excellence and professionalism in the field of industrial motor controls.

ELIGIBILITY

Open to active NYS SkillsUSA members enrolled in programs with industrial motor control as an occupational objective.

CLOTHING REQUIREMENTS

NYS SkillsUSA Weld/Mach Attire:

- White crew neck short- sleeved T-shirt
- Work pants
- Leather or steel toed work shoes
- Safety glasses or goggles, (Prescription glasses can be used only if they are equipped with side shields. If not, they must be covered with goggles.)

Note: Safety glasses must have side shields or goggles. (Prescription glasses may be used only if they are equipped with side shields. If not, they must be covered with goggles.)

Contestants must wear their contest clothing to the contest orientation and bring #2 pencil, resume, and safety assurance form.

EQUIPMENT AND MATERIALS

1. Supplied by the technical committee:
 - a. All wiring panels, electrical supplies and materials as required by the problem assigned.
2. Supplied by the contestant:
 - a. Diagonal pliers
 - b. Side cutters
 - c. Long-nose pliers
 - d. Pump pliers
 - e. Wire strippers
 - f. Knife
 - g. Assorted flat blade and Phillips screwdrivers
 - h. 12' (or longer) measuring tape
 - i. Electrician's hammer
 - j. Hacksaw
 - k. Torpedo level
 - l. Crimping tools
 - m. 1/2" EMT conduit bender
 - n. Multi-meter
 - o. Latest edition of the National Electrical Code as of the January prior to the NYS SkillsUSA Championships
 - p. Supplies for drawing ladder diagram (pencil, straightedge, etc.)
 - q. Calculator
 - r. Drill or impact driver with Phillips tip
 - s. **All competitors must create a one-page résumé and submit a hard copy at orientation. Failure to do so will result in a 10-point penalty.**
 - t. **“Note: Your resume may be judged as part of your contest” Check the Contest Guidelines and/or the updates page on the NYS SkillsUSA Web site:**
<https://www.nysskillsusa.org>

RESUME REQUIREMENT

Competitors must create a one-page resume to submit at orientation. Failure to submit a resume will result in a 10-point penalty.

PROHIBITED DEVICES

Cellphones, electronic watches, and/or other electronic devices not approved by a competition's national technical committee are **NOT** allowed in the competition area. Please follow the guidelines in each technical standard for approved

PENALTIES FOR PROHIBITED DEVICES

If a competitor's electronic device makes noise or if the competitor is seen using it at any time during the competition, an official report will be documented for review by the Director of the SkillsUSA Championships. If confirmed that the competitor used the device in a manner which compromised the integrity of the competition, the competitor's scores may be removed.

SCOPE OF THE COMPETITION

The competition is defined by manufacturer and customer specifications, industry practice, federal regulations, and industry standards such as the National Electrical Code. The competition is divided into three parts: a written portion; an oral interview; and a series of testing stations designed to demonstrate knowledge of manufacturer and customer specifications, industry practice, federal regulations, and industry standards. Students are also judged on the ability to apply both that knowledge and manual proficiency in applying and installing electrical wiring methods and equipment.

KNOWLEDGE PERFORMANCE

The competition will include a written knowledge exam that will be administered during the competitors' orientation meeting. Competitors are required to take the NYS SkillsUSA Professional Development Test at orientation

The competition will also include written descriptions of required electrical installations and/or job sheets with schematic diagrams and accompanying requirements for wiring an industrial motor control installation. The purpose will be to select and install the wiring methods, devices, and equipment to complete the specified installation. All work must conform to the latest National Electrical Code specifications as of January before the NYS SkillsUSA Championships.

SKILL PERFORMANCE

The competition will include a series of testing stations designed to test the ability to perform jobs or skills selected from the following list of competencies as determined by the NYS SkillsUSA Championships technical committee.

STANDARDS AND COMPETENCIES

MOTR 1.0— Demonstrate knowledge/application of basic academic, physical and employability skills

- 1.1. Demonstrate ability to read and comprehend
 - 1.1.1. Explain the meaning of safety rules and signs
 - 1.1.2. Summarize instruction sheets for tools and equipment
 - 1.1.3. Explain technical documents, codes and standards, customer and manufacturer instructions and specifications
 - 1.1.4. Use graphs, charts, and diagrams
- 1.2. Demonstrate ability to perform basic mathematical operations necessary to the occupation
 - 1.2.1. Perform addition, subtraction, multiplication and division of whole numbers, fractions, decimals, mixed numbers, ratios, and percentages
 - 1.2.2. Convert square units and English and metric units
 - 1.2.3. Perform direct measurements of objects and distances
 - 1.2.4. Use basic algebra, calculate degrees and angles, and compute area and volume
 - 1.2.5. Read, interpret, and perform math operations based on word problems

- 1.3. Use verbal, written and nonverbal communication skills
 - 1.3.1. Explain and use verbal instructions and warnings
 - 1.3.2. Communicate orally with others
 - 1.3.3. Communicate in writing with others
- 1.4. Demonstrate physical ability through the installation and operation of equipment
 - 1.4.1. Ensure ability to hear warning signals
 - 1.4.2. Verify ability to distinguish colors
 - 1.4.3. Maintain, balance, and perform construction activities while on a ladder
 - 1.4.4. Use both hands to manipulate small objects and wires
 - 1.4.5. Operate two-handed power equipment
 - 1.4.6. Lift and carry objects up to 50 pounds
 - 1.4.7. Reach and stretch to position equipment while maintaining balance
- 1.5. Implement employability skills and workplace attributes to work independently and with a team
 - 1.5.1. Apply ability to be self-motivated, responsible, and dependable without close supervision
 - 1.5.2. Demonstrate the ability to work smoothly with others as a team
 - 1.5.3. Demonstrate ability to remain calm in emergency situations
 - 1.5.4. Maintain good working relationships with others in a work setting
 - 1.5.5. Develop alternate solutions and choose the best alternative
 - 1.5.6. Plan and organize tasks to meet deadlines
 - 1.5.7. Implement the ability to supervise and monitor others

MOTR 2.0 — Follow OSHA rules and safety regulations to ensure job site and equipment safety

- 2.1. Apply job site and shop rules and regulations (OSHA)
- 2.2. Select and use electrical and hand tools correctly
- 2.3. Perform proper techniques and practices for working on and around live equipment
- 2.4. Apply knowledge of proper grounding methods

MOTR 3.0 — Apply knowledge of the National Electric Code

- 3.1. Read and interpret the National Electrical Code
- 3.2. Demonstrate ability to apply National Electrical Code requirements

MOTR 4.0 — Interpret and draw wiring and ladder diagrams

- 4.1. Draw wiring diagrams and ladder diagrams
- 4.2. Interpret wiring diagrams and ladder diagrams
- 4.3. Read and understand customer job specifications

MOTR 5.0 — Read and interpret written and oral customer and manufacturer specifications/instructions

MOTR 6.0— Perform electrical calculations including sizing of circuits and conductors, and calculate conduit fill

- 6.1. Size branch circuit conductors
- 6.2. Size feeder conductors
- 6.3. Size control conductors
- 6.4. Size overcurrent protection for branch circuit
- 6.5. Size overcurrent protection for feeder circuit
- 6.6. Size overloads protection
- 6.7. Calculate conduit fill

MOTR 7.0— Select materials and equipment to meet customer needs

- 7.1. Select materials and equipment based on manufacturer and customer specifications/instructions, wiring and ladder diagrams, calculations, and applicable codes and standards

MOTR 8.0— Select and use hand, electrical and cutting tools properly

- 8.1. Demonstrate dexterity and proper use of hand tools
- 8.2. Demonstrate the ability to properly select and use electrical ohmmeters and volt-ohmmeters
- 8.3. Select and properly use special equipment (conduit benders, KO punches, etc.)
- 8.4. Properly select and operate electrical power tools
- 8.5. Properly select and use conduit cutting and reaming equipment

MOTR 9.0— Lay out components on mounting boards based upon customer specifications

MOTR 10.0— Select and install proper wiring methods, boxes, and enclosures

- 10.1. Select the proper wiring methods, boxes and enclosures based on manufacturer and customer specifications, wiring/ladder diagrams and applicable codes and standards
- 10.2. Install the selected wiring methods
- 10.3. Mount boxes and enclosures according to manufacturer and customer specifications and instructions, federal regulations, and applicable codes and standards
- 10.4. Bend and install raceways using the proper tools and supplies

MOTR 11.0— Demonstrate the ability to properly install and connect devices and equipment

- 11.1. Install and connect disconnect switches
- 11.2. Install and connect push buttons
- 11.3. Install and connect selector switches
- 11.4. Install and connect indicator lights
- 11.5. Install and connect limit switches
- 11.6. Install and connect control transformers
- 11.7. Install and connect control relays

- 11.8. Install and connect timing relays (all types)
- 11.9. Install and connect contractors
- 11.10. Install and connect motor starters
- 11.11. Install and connect photoelectric switches
- 11.12. Install and connect temperature control
- 11.13. Install and connect counters
- 11.14. Install and connect overload relays
- 11.15. Install and connect solid-state motor starters
- 11.16. Install, connect, and properly wire a dual-voltage motor
- 11.17. Install and connect reversing motor starters
- 11.18. Install and connect press-to-test pilot lights

MOTR 12.0— Troubleshoot and repair power and control circuits

- 12.1. Use a wiring diagram or ladder diagram, and an electrical multimeter
- 12.2. Demonstrate the ability to troubleshoot a fault in either a power or control circuit

MOTR 13.0— Complete necessary job tickets, reports, and as-built drawings

- 13.1. Demonstrate the ability to prepare necessary job tickets, reports and as-built drawings as directed by your supervisor

MOTR 14.0— SkillsUSA Framework

The SkillsUSA Framework is used to pinpoint the essential Elements found in Personal Skills, Workplace Skills, and Technical Skills Grounded in Academics. Students will be expected to display or explain how they used some of these Essential Elements. Please reference the graphic, as you may be scored on specific elements applied to your project. For more, visit: www.skillsusa.org/who-we-are/skillsusa-framework/.

