

Agricultural Technology & Mechanics

Rule years 2026–2029 · Revision 1 · Published October 9, 2026

0. General Rules & Eligibility

Career Development Events are governed by the NAEA CDE Committee. All events follow [CDE General Rules and Eligibility](#).

Qualification for this event

District qualification	Top 25% of schools per district
Students per team	4
Grades	9–12
National qualifying event?	Yes
Timeframe	FFA Convention
Host	NCTA Ag Mechanics Dept.
Event Superintendents	Dan Stehlik, Taylor Klintworth

1. Overview

Agricultural Technology and Mechanical Systems combine strong technical content with the development of practical, hands-on skills. The subject matter areas and skill development practices have been grouped into three 'systems' areas, so named because of the complex interaction and synergistic processes common to agriculture. The term 'system' emphasizes the interactive relationships among agricultural technology and mechanical systems. These three systems are Small Gas Engines or Hydraulic/Pneumatic Systems, Electrical Systems, and Machines.

Objectives

- **Team Activity:** Work as a team to compute and convert measurements and calculations related to the year's theme.
- **Individual Activities:**
 - Identify small gas engine parts and specialty tools, read a micrometer, and answer questions on small gas engine safety, maintenance, theory, and systems (even years).
 - Identify hydraulic/pneumatic parts and symbols, and answer questions on hydraulic/pneumatic safety, power systems, and cylinder computations (odd years).
 - Wire a switch, receptacle, and lamp circuit to code, and answer questions on AC and DC electrical safety, devices, theory, and Ohm's Law.
 - Observe and identify parts, conditions, and features of a theme-related machine, and use an operator's manual to find specifications, capacities, and safety information.

2. Eligibility & Team

Open to students in Grades 9–12. Teams are 4 students. Top 25% of schools per district advance. This event is national-qualifying.

- A team may compete with fewer than 4 individuals but will incur a deduction in points from the team score.

3. What to Bring

Attire

ZERO TOLERANCE POLICY: Each student must have the following to participate. **No exceptions.**

- Safety Glasses, worn when using tools.
- Closed-toed shoes
- Long pants, in good repair (NO holes or frays, etc.)
- Note: Oversized or loose-fitting clothing is dangerous and is therefore banned (i.e., hoodies, etc.)

A long- or short-sleeved collared shirt or coveralls are recommended.

- T-shirts are **NOT recommended**.
- Official FFA Dress is allowed but is **NOT recommended**.
- Lanyards should be tucked out of sight.
- Hair longer than collar length should be secured.

Supplies

Everyone will be given a safety briefing during orientation. Please observe all safety rules, and if you see something that doesn't look safe, let a competition official know. Teams will need to bring the following items with them (each individual will need all of these things):

- #2 pencils for each person
- Safety glasses for each person! **Failure to wear safety glasses during the electrical rotation will result in no score for that activity.**
- Calculator (**NO** cell phones & **NO** graphing calculators)
- Wire stripper
- Flat screwdriver
- Phillips screwdriver
- Needle-nose pliers
- Diagonal Cutters
- **NO** knives are allowed

4. Event Format

Timing

- A. Schools will be divided into two groups. Teams should arrive and register no more than 30 minutes before the start time and no less than 5 minutes before. Each section should be completed within 2 hours and 45 minutes, from start to finish.
 - I. Section I, the morning section, including teams from ½ of the districts, will start promptly. Please be there 30 minutes early.
 - II. Section II, the afternoon section, including teams from the other ½ of the districts, will start promptly. Please be there at least 30 minutes early.
 - III. All complete teams will start with the Team Activity and will be together for one 30-minute team event. Upon completing the Team Activity, students will be separated and rotated through the individual components.

IV. Individuals will be divided among the 6 individual activities with only one student from each team in an individual event area. The individual components will rotate every 15 minutes. (Approximately 20 contestants will begin at each activity table.)

B. Check the CDE schedule for specific arrival, start and end times, and the event location.

Format

Theme

The Team Activity and both machine/equipment activities relate to the year's theme. The theme follows the former National FFA rotation and is announced in the fall before each year's event.

Event Components

A. **Team Activity**—All four team members work together to compute or convert measurements and calculations related to the year's theme. Scenarios may be hands-on, such as counting grain in a square yard and converting to an acre basis, estimating field loss, calculating transport weights, or computing insect counts from sticky cards. Basic formulas and conversions are provided and are often shared before the event. Teams need calculators (**not** phones) and pencils for notes and calculations. Each team can earn up to 150 points.

B. **Individual Activities**—Each team member rotates through 6 individual activities, with a maximum of 15 minutes per activity. Each activity is worth up to 50 points, for a total individual score of 300 points.

I. Small Gas Engines (even years)

1. Practicum: identify small gas engine parts (including vertical shaft, horizontal shaft, 4-cycle, 2-cycle, overhead valve, and L-head valve engines) and specialty tools from the lists in Appendix A, and demonstrate correct micrometer reading. A total of 25 items will be displayed.
2. Test: 25 questions on small gas engine safety, maintenance, assembly, theory, and systems (lubrication, ignition, carburetion, compression, governing, etc.).

II. Hydraulic/Pneumatic (odd years)

1. Practicum: identify hydraulic/pneumatic parts and symbols from the lists in Appendix B. A total of 25 items will be displayed.
2. Test: 25 questions on hydraulic/pneumatic safety, power systems, and cylinder computations for force, speed, psi, cylinder ram travel distance, and pressure. Questions may also compare hydraulic systems or cylinder sizes (for example, which cylinder will travel farther or lift more).

III. Electricity (every year)

1. Practicum: connect a single-pole switch to a receptacle to a lamp, in that order, as shown in the schematic at the top of the score sheet (Appendix C), which is provided when the rotation begins.
 - a. Boxes are pre-mounted on a 1-foot by 2-foot board, 3 inches apart. The first box has an entry wire pre-attached to begin the circuit.
 - b. Provided: two 16-inch pre-cut lengths of 12-gauge wire with ground (as used for 120-volt, 20-amp, 30-foot circuits), the devices, and four wire nuts.
 - c. Strip the outer sheath 4–6 inches. **Do not** attach ground wires to devices or boxes, and **do not** attach devices to the boxes; leave the wiring exposed.
 - d. Scoring: each completed switch and receptacle is worth 20 points and the completed lamp 10 points (50 points total). Each code violation deducts 1 point. Violations include incorrect wire color to screw, wires not hooked clockwise under screws, individual wire insulation not stripped about 3/8–1/2 inch, more than 1/8 inch of bare wire exposed at a screw, insulation under a screw, nicked insulation, outer sheath inside the box less than 1/4 inch or more than 3/4 inch, devices not

connected in the order shown, and copper showing outside a wire nut or a loose wire nut, plus any others listed on the score sheet.

e. Competitors provide their own hand tools and safety glasses (see Section 3). **Failure to wear safety glasses during this rotation will result in no score.**

f. Twenty boards, plus 10 extras, are set out for each rotation; completed boards are scored and reset after each rotation.

2. Test: 25 questions on AC and DC electrical safety, devices, theory, Ohm's Law, practices, or equipment.

IV. **Machine/Equipment (every year)**—Both activities use theme-related equipment. A general description of the item is shared before the event; the specific brand and size are not.

1. Operator's Manual Test: 25 questions on a specified theme-related item, answered from its operator's manual (provided at the event). Manuals are condensed to remove unnecessary pages, and questions generally follow the order of the pages provided. The general type of item is announced once permission to copy the manual is obtained.

2. Observation: 10–25 questions on the parts or condition of a theme-related machine, such as tire size or pressure, power source, safety decals or features, fluid levels, possible damaged parts, and specific features. Any necessary tools or measuring devices (such as a tire pressure gauge) are provided. **Do not** climb on or move parts of the machine unless instructed. The general type of machine is announced as soon as it and its transport to the site are arranged.

3. Past tests are in Section 6 (Study Resources), and operator's manuals for similar equipment can often be found online.

5. Scoring & Tiebreakers

Individual Scoring

Component	Detail	Points
Small Engine / Hydraulic Practicum	25 Items × 2 Points	50
Small Engine / Hydraulic Test	25 Questions × 2 Points	50
Electrical Wiring Practicum	Switch 20 + receptacle 20 + lamp 10, less 1 point per code violation (Appendix C scorecard)	50
Electrical Wiring Test	25 Questions × 2 Points	50
Theme Machinery / Equipment Practicum	Observation of the theme-related machine (10–25 questions)	50
Theme Machinery / Equipment Test	25 Questions × 2 Points	50
Grand total		300

Individual Tiebreakers

Individual: (total score for each)

- A. Electrical
- B. Machines
- C. Small Gas Engines or Hydraulic/Pneumatic

Team Scoring

Component	Detail	Points
Sum of Individual Scores	4 Students × 300 Points	1,200
Team Activity	Theme-related calculations and conversions; scored on calculation accuracy	150
Grand total		1,350

Team Tiebreakers

Team Scores: (total team scores for each)

- A. Team Activity Score
- B. Electrical
- C. Machines
- D. Small Gas Engines or Hydraulic/Pneumatic

6. Study Resources

Approved study resources

- [UNL CDE Study Materials Folder \(OneDrive\)](#) — Practice materials and examples for this CDE.
- The event superintendent will annually notify teachers of appropriate study materials and manuals that will be utilized in the event.
- [Agricultural Technology & Mechanics page on the Nebraska CDEs website](#) — Previous years' tests and sample activities, in the study materials folder.

Past Exams

- [Electricity Tests](#) — Past Electricity Tests (reverse-chronological), combined from the archived sources.
- [Equipment Practicum](#) — Past Equipment Practicum (reverse-chronological), combined from the archived sources.
- [Operator Manual Tests](#) — Past Operator Manual Tests (reverse-chronological), combined from the archived sources.
- [Small Gas Engine & Hydraulic Tests](#) — Past Small Gas Engine & Hydraulic Tests (reverse-chronological), combined from the archived sources.
- [Team Activity Tests](#) — Past Team Activity Tests (reverse-chronological), combined from the archived sources.

7. After the Event

All teachers and students are allowed to walk through the CDE after the completion of the last team of Section II until 30 minutes after the conclusion of Section II of this CDE.

List of Appendices

- [Appendix A: Small Engine Parts & Tools](#)
- [Appendix B: Hydraulic/Pneumatic Symbols & Parts](#)
- [Appendix C: Electrical Wiring Activity Scorecard](#)

Appendix A: Small Engine Parts & Tools

WRITE THE NUMBER FROM BESIDE THE PART OR TOOL NEXT TO ITS CORRECT NAME

Small Gas Engine Parts		
___ Air Filter	___ Engine Head Gasket	___ Piston
___ Armature	___ Fins	___ Piston Rings
___ Butterfly Valve (throttle)	___ Flywheel	___ Points
___ Camshaft	___ Flywheel Magnet	___ Rocker Arm
___ Carburetor - Gravity	___ Fuel Filter	___ Serial Number
___ Carburetor - Vacuum	___ Exhaust Valve	___ Spark Plug
___ Carburetor - Diaphragm	___ Fuel Tank	___ Starter Clutch
___ Carburetor Float	___ Governor	___ Starter Recoil Spring
___ Carburetor Vacuum Tubes	___ Horizontal Shaft Block	___ Starting Cord
___ Choke	___ Intake Valve	___ Tappet
___ Code Number	___ Lifter Rod	___ Throttle Cable
___ Condenser	___ Mechanical Governor	___ Timing Marks
___ Connecting Rod	___ Model Number	___ Valve Spring
___ Crankshaft	___ Muffler	___ Valve Spring Keeper
___ Crankshaft Bearing	___ Needle Valve	___ Vane
___ Cylinder Head	___ Oil Dipper	___ Vertical Shaft Block
___ Dipstick	___ Oil Slinger	___ Woodruff Key
___ Engine Block Gasket		

Small Gas Engine Tools		
___ Caliper	___ Leaf (Feeler) Gauge	___ Starter Clutch Wrench
___ Contact Tachometer	___ Micrometer	___ Telescoping Gauge
___ Cylinder Hone	___ Piston Ring Compressor	___ Valve Face Grinder
___ Cylinder Pressure Gauge (Compression Tester)	___ Piston Ring Expander	___ Valve Seat Grinder
___ Flywheel Brake (Holder)	___ Ridge Reamer	___ Valve Spring Compressor
___ Gear Puller	___ Spark Tester	___ Wire (Gap) Gauge

Appendix B: Hydraulic/Pneumatic Symbols & Parts

WRITE THE NUMBER FROM BESIDE THE PART OR SYMBOL NEXT TO ITS CORRECT NAME

Pneumatic/Hydraulic Parts Pneumatic/Hydraulic Parts

_____ Check Valve	_____ Hose	_____ Pneumatic Air Filter
_____ Compressor-Pneumatic	_____ Hydraulic Coupler - John Deere	_____ Pneumatic Lubricating Oil
_____ Cylinder Bore	_____ Hydraulic Oil Filter	_____ Pump
_____ Cylinder Cap	_____ Hydraulic Pressure Switch	_____ Reservoir-Pressurized
_____ Cylinder Piston	_____ Motor - Hydraulic	_____ Reservoir-Non-Pressurized
_____ Cylinder Ram	_____ Motor - Pneumatic	_____ Temperature Gauge
_____ Cylinder-Double Port	_____ Hydraulic Coupler - Pioneer	_____ Pneumatic Pressure Switch
_____ Cylinder-Single Port	_____ Hydraulic Oil	_____ Pressure Gauge
_____ Flow Control Valve -Variable	_____ O-Ring	

Pneumatic/Hydraulic Symbols

_____ In-line Quick Disconnect - Hydraulic	_____ Hydraulic Filter	_____ Pneumatic Tank
_____ Check Valve	_____ Hydraulic Line	_____ Pressure Gauge
_____ In-line Quick Disconnect - Pneumatic	_____ Hydraulic Reservoir	_____ Pressure Switch
_____ Check Valve with Spring	_____ Non-Pressurized Hydraulic Reservoir	_____ Pump
_____ Line	_____ Pressurized In-line Quick Disconnect	_____ Temperature Gauge
_____ Cylinder - Double Port	_____ Motor	_____ Three Way Closed Center Valve
_____ Cylinder - Single Port	_____ Pneumatic Filter	_____ Three Way Open Center Valve
_____ Flow Control Valve - Variable	_____ Pneumatic Line	_____ Variable Pump

Appendix C: Electrical Wiring Activity Scorecard

Name _____

Contestant Number _____

School _____

Do **not** tighten box clamps or attach devices and ground wires to boxes. Connect or wire-nut **all** wires.

Switch Complete (20)	Receptacle Complete (20)	Lamp Complete (10)		Total (50)
			=	

NEC Violations: One-Point Deduction for Each

Romex less than ¼" inside Box _____

Cardboard Inside Box _____

Excess Copper Showing _____

Nicks or Cuts in Insulation _____

Wires Counter-clockwise or Not Under Screw _____

Wire Nuts Pull Off or Not On _____

Significantly Less Than 6 Inches Wire in Box _____

Total Violations _____

Wiring Score _____

Subcommittee

Standing subcommittee for this event

Name	School / Organization	Role
Ben Robison	Alma	Chair
Taylor Klintworth	NCTA	Superintendent
Dan Stehlik	NCTA	Superintendent
Boyd Bowder	St. Paul	Exec liaison
Melissa Bonifas	Blue Hill	Member
D.J. Mottl	North Bend	Member

What changed — 2026–2029 rev 1 EDITORIAL

October 9, 2026

- First version published on CDE Rules Hub.