

South Dakota FFA
Ag Mechanics CDE Competencies

The Ag Mechanics CDE is also divided into five system areas.

- Machinery and Equipment Systems
- Electrical Systems
- Compact Equipment
- Structural Systems
- Environmental and Natural Resource Systems

The Individual Ag Mechanics CDE consists of three parts:

- Hands-On Operations
 - Each participant will complete 5 specific hands-on performance operations (1 from each area listed above).
 - 5 skills each worth 20 points = 100 points

- Problems Solving
 - Each participant will complete 5 problem solving/skill development activities (1 from each area listed above). (5 problems each worth 20 points = 100 points)

- Written Exam
 - Test should consist of 25 questions (around 5 questions from each of the five areas listed above).
 - 25 questions each worth 2 points each = 50 points

- Team Problem
 - A problem-solving activity and/or team hands-on activity involving the gathering of information and the use of logical solutions based on commonly accepted standards.
 - 100 points
 - Team problem does NOT count toward individual scores.

Preparation Resources:

- Past State and National FFA CDE Exams and Practicums

Machinery/Equipment Systems:

Equipment – Cat Skid Steer: Models 242, 259, 262

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 27: Engine Operation and Maintenance
- Chapter 28: Mobile Power Equipment Maintenance

Operator's Manual for Skid Steer

Area of Focus:

Identify the recommended service and maintenance operations from the operator's manual.

understand functions of machinery's hydraulic system.

understand functions of machinery's diesel engine components.

understand functions of machinery's electrical system.

Install, adjust and service: belts, chain, filters, and fluid levels.

Possible Skills:

- ID parts and components of skid steer.
- Understand how to perform adjustments and replace components on skid steer.
- Understand the meaning of safety stickers and symbols used on equipment.
- Select fuels, lubricants, hydraulic fluids, and coolants for proper operation.

Possible Problem Solving:

- Use manual to calculate capacities of the equipment.
- Use manual to determine service plan.
- Use diagnostic tools to determine service and repair needs.
- Calculate hydraulic force, pressure, and area.

Electrical systems:

Three-Way Switch Installation

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 19: Electrical Principles
- Chapter 20: Electrical Components and Equipment

Areas of Focus

Understand the principles of electricity.

Understand appropriate standards for agricultural applications, including the National Electrical Code (NEC) and OSHA standards.

Understand electric schematics and symbols.

Use electrical test instruments such as VOA (volt-ohm-amp) meter, DMM (digital multimeter) and tachometer.

Select adequate and appropriate lighting fixtures, switches, and receptacles for wiring project.

Possible Skills:

- Identify types of electrical protective components.
- Wire three-way switch components (examples: switch-switch-light, light-switch-switch, switch-light-switch).
- Demonstrate how to properly use diagnostic tools like voltmeter, ammeters, multimeters.
- Identify electric symbols.
- Identify electrical tools.

Possible Problem Solving:

- Calculate the relationship between volts, amps, and ohms.
- Select proper wire size for application.
- Calculate amperage of the circuit with a current amount of fixtures

Compact Equipment:

Equipment: John Deere Gator XUV 835 Models

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 27 Engines Operation and Maintenance
- Chapter 28 Mobile Power Equipment Maintenance

Small Gas Engine Textbook – ATP

Operator's Manual for John Deere Gator

Areas of Focus:

Interpret horsepower, torque and other power measurement criteria.

Use measuring tools and test instruments such as micrometer and telescoping gauges, dial indicator, torque wrench, and feeler gauge.

Identify the recommended service and maintenance operations from the operator's manual.

Understand compact equipment's electrical and hydraulic systems.

Understand compact equipment's drive train, suspension, and steering systems.

Possible Skills:

- Identify engine components and purpose.
- Identify compact equipment's parts and systems.
- Measure engine component and determine if part is within tolerance or reject.
- Use operator's manual to diagnose issues with the compact equipment's electric, powertrain, and hydraulic system.
- Properly set a torque wrench or read what a torque wrench is set at.

Possible Problem Solving:

- Calculate force, pressure, torque, work, power and horsepower as it applies to engine and transmission components.
- Calculate load capacity of compact equipment.
- Use manual to determine service plan.

Structural Systems:

MIG Welding & Rafter Structures

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 13: Agricultural Building Methods and Structures
- Chapter 23: Welding Fundamentals
- Chapter 24: Arc Welding and Plasma Arc Cutting

Welding – GMAW – Students will possibly MIG weld at state convention.

Areas of Focus:

Select, assemble, and check welding equipment and supplies.

Operate welding equipment and accessories for metal joining operations.

Understand welding blueprints and symbols.

Select and assemble proper rafter design for building requirements.

Identify rafter components and purposes.

Possible Skills:

- Weld a 1F, 2F or 3F Tee, Lapp or Butt joint using the GMAW process.
- Identify GMAW welding parts (tips, cones, insulator, gas diffusers, etc).
- Using a chart to determine proper wire speed and voltage for a specific thickness of metal and shielding gas used.
- Identify different rafter designs and components.
- Cut and assemble rafter components.

Possible Problems:

- Calculate building roof area.
- Calculate materials needed for metal project.
- Calculate slope and load capacity of rafter.
- Creating welding blueprints with welding symbols.

Environmental and Natural Resources Systems:

GPS/ GIS Systems and Mapping Applications

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 9: Surveying and GPS/ GIS Applications

GPS apps and websites

- App: GPS test
- App: GPS satellites viewer
- John Deere GPS website: <https://satpredictor2.deere.com/>

Areas of Focus:

Understand how to utilize GPS systems and components.

Understand how to properly utilize the GPS Apps and websites listed in the references.

Interpret and evaluate GIS data to come to a conclusion about a scenario specific to agricultural and environmental service systems.

Read and interpret maps including conservation, land use, soils, topographic, aerial, and remote sensing & geological surveys.

Interpret legal land descriptions and determine land area.

Possible Skills:

- Identify elevation points on a topographic map.
- Identify a land area using the land's legal land description.
- Identify parts of a GPS component (example: ID drone parts).
- Identify longitude and latitude of an area using a GPS system.

Possible Problems:

- Calculate distance between two points using a GPS system.
- Calculate the acres or hectares of a land area.

