South Dakota FFA

Ag Mechanics CDE Competencies

The Ag Mechanics CDE is 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 these 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 problems do NOT count toward individual scores.

Preparation Resources:

- Past State and National FFA CDE Exams and Practicums
- ATP: Agricultural Technical Systems and Mechanics Textbook

***Machinery/Equipment Systems**:*

Equipment – New round baler of any brand

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 any new large round baler

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 electrical system.

Install, adjust and service: belts, chains, etc.

Possible Skills:

- Know how to perform adjustments to equipment.
- ID parts and components of baler.
- Know meaning of safety stickers and symbols used on equipment.
- Identify safety colors and their applications.
- Identify components of the NFPA Hazard Signal Systems.

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.
- Know sources of professional safety regulations and standards.
- Calculate bale size for storage/space requirements.

***Electrical systems**:*

120v Electrical Systems
(Emphasis on 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: **New Compact Loader Tractor**

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 Tractor & Loader

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

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.
- Calculate gear rations.

Structural Systems*:*

Building Materials and Concrete

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 6: Materials
- Chapter 10: Concrete Principles
- Chapter 11: Concrete Placing and Finishing

Areas of Focus:

Understand how to select and assemble proper building materials for building requirements.

Understand the main components of concrete.

Understand how to safely use hand and portable power tools.

Understand how to determine the size, specifications and layout of a building

Possible Skills:

- Identify concrete tools used for placing, finishing, and detailing.
- Perform a slump test for concrete or measure the slump of concrete.
- Cut and assemble different wood structures.
- Identify different fastener types and usage.
- Identify defects warpages of lumber.

Possible Problems:

- Calculate cubic yards of concrete needed for a given area.
- Calculating materials needed for a volume of concrete.
- Calculating need lumber for a building project.
- Calculate water-cement ratio.
- Interpret grade stamps for lumber and pressure treated lumber.
- Develop a bill of materials.

***Environmental and Natural Resources Systems**:*

Mapping & Fertilizer Application

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 9: Surveying and GPS/ GIS Applications
- SD FFA Land/Homesite Handbook
  - https://climate.sdstate.edu/
  - https://websoilsurvey.nrcs.usda.gov/app/

Areas of Focus:

Understand how to read and interpret maps including: conservation, land use, soils, topographic, aerial.

Understand how to properly utilize the resources and/or websites listed in the references.

Understand how to interpret legal land descriptions and determine land area.

Understand the usage of basic fertilizer equipment.

Understand how to layout and map contour lines.

Possible Skills:

- Identify elevation points on a topographic map.
- Level a transit and make a rod reading.
- Identify a land area using the land's legal land description.
- Read Soil maps and determine land usage.

Possible Problems:

- Calculate the acres or hectares of a land area.
- Calculated fertilizer rates needed for a field using land size and soil information.
- Convert latitude/longitude between various written formats (decimal degrees, degrees decimal minutes, degrees, minutes, seconds).
- Determine soil types and select appropriate structures or practices.