

South Dakota FFA

Ag Mechanics CDE Competencies

The South Dakota FFA Ag Mechanics CDE will be modeled after the National event and will consist of different themes each year. The themes are as follows:

2022	Materials Handling System
2023	Processing Systems
2024	Plant Production Systems
2025	Integrated Pest Management
2026	Animal Production System

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 @ 20 points == 100 points

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

MACHINERY/EQUIPMENT SYSTEMS:**Equipment – Brandt Field Grainbelt – any 15 or 20 series grainbelt**

Text Reference – Chapter 27 Agricultural Equipment and Maintenance

Area of Focus:

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

Identify functions of machinery components.

Identify safe adjustment [level] on power equipment.

Install, adjust and service belt and chain drives.

Adjust and/or calibrate chemical application, seeding, fertilizing, harvesting, processing and materials handling machinery.

Possible Skills:

- ID parts and components of grainbelt
- Know how to perform adjustments to equipment.
- Know meaning of safety stickers and symbols used on equipment.
- Identify chains, belts and components of drive systems

Possible Problem Solving:

- Use manual to determine capacities of the equipment.
- Use manual to match correct model with the specific job.
- Calculate loading and unloading capacities of the equipment.

ELECTRICAL SYSTEMS:

Electric Motors

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 20 – Electrical Components and Equipment
Page 528-533 Electric Motors

Basics of Electric Motors -- AAVIM

Areas of Focus

Select motors based upon type of application.

Interpret electric motor nameplate data.

Identify electric motors and motor parts.

Identify methods of providing electric motor protection.

Interpret power (horsepower, kilowatt), power factor, torque and other motor selection criteria.

Possible Skills:

- Identify electric motor nameplate information
- Wire a motor for correct voltage (high or low) and rotation (clockwise or counterclockwise)
- Identify types of electric motors – single-phase, three phase,
- Identify electric motor parts – rotor, stator, commutator, brushes, etc.

Possible Problem Solving:

- Calculate horsepower, power factor
- Calculate pulley size and shaft speed of drive and driven components

COMPACT EQUIPMENT:

Equipment: Briggs & Stratton WP2-35 Petrol Water Pump

- (This pump can also be used in the Environment/Natural Resources Section)

Text Reference

Agricultural Technical Systems and Mechanics Textbook--ATP

- Chapter 28 Engines and Mobile Power Equipment

Small Gas Engine Textbook -- ATP

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, vernier calipers, torque wrench, and feeler gauge.

Possible Skills:

- Measure gaps or clearances of motor parts – armature gap, valve clearance on an OHV engine, etc.
- Measure engine component and determine if part is within tolerance or reject.
- Use charts to determine proper torque specifications and clearances for engine components.
- 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 Small Gas Engines and their applications.
- Calculate speeds of shafts given different gear reduction ratios.
- Calculate pumping capacity of SGE and water pump.

STRUCTURAL SYSTEMS:

Heating/Cooling and Ventilation of structures

Structures -- Ventilation and Heat Transfer

Text Reference – Chapter 13 Agricultural Building Methods and Structures

- Chapter 13 Agricultural Building Methods and Structures
- Chapter 14 – Building and Energy Efficiency

Welding – GMAW – we will have access to a welder at state competition – not sure if we will be able to weld but will have the machine for ID purposes for sure.

Areas of Focus:

Determine ventilation air requirements for intake and exhaust fan capacity.

Select, assemble, and check welding equipment and supplies.

Operate welding equipment and accessories for metal joining operations.

Select and apply appropriate wall, roofing, insulation and vapor barrier materials.

Possible Skills:

- Identify different insulation products and R-values of each
- 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 determine proper wire speed and voltage for a specific thickness of metal and shielding gas used.

Possible Problems:

- Calculate building area to determine heating space.
- Calculate air flow
- Calculate R-value of walls given material and R-Value for each product
- Identify problems welds and determine solution.

ENVIRONMENTAL AND NATURAL RESOURCES SYSTEMS:

Irrigation and/or water movement in hydroponic and aquaculture systems.

Text Reference – Chapter 17 Plumbing

Areas of Focus:

Describe and/or calculate surface and subsurface drainage and irrigation techniques.

Determine power requirements and pump size for specific applications.

Apply water pressure, flow and head concepts.

Assemble turf irrigation equipment.

Install components of irrigation systems for specific applications.

Possible Skills:

- Cut and assemble pvc pipe
- Cut and assemble pex pipe using crimp or band fasteners
- Cut and assemble threaded fittings using Teflon tape.

Possible Problems:

- Calculate water volume in a structure (tank, pond, etc)
- Calculate water flow in hydroponics or aquaculture systems
- Calculate capacity of water collection systems
- Calculate pumping capacity of water pump