

Agricultural Mechanics and Technology 1

Exam Information	Description
Exam number 110 Items 41 National Career Cluster 52 Certification available Yes	The Agricultural Mechanics and Technology 1 industry certifications exam assesses learners' knowledge of the principles and techniques of power, structural, and technical systems used in the agricultural industry, particularly agricultural production and service. Learners are tested on the basic skills in areas of hot and cold metal work, tool reconditioning, plumbing, painting, bill of materials preparation, small gas engines, and welding, including the basic practices associated with soil and water management and safety and proper use of tools and equipment.

Exam Blueprint and Performance Skills

Standard	Percentage of exam score
1. Personal And Leadership Development	4%
2. Supervised Agricultural Experience	4%
3. Safety Practices	12%
4. Agricultural Structures	19%
5. Plumbing Knowledge And Skills	10%
6. Internal Combustion Engines	13%
7. Metals	38%

*Includes performance skill evaluation

Standard 1 - Personal & Leadership Development

Candidates will participate in personal and leadership development activities.

Objective 1 Candidates will use communication skills to effectively communicate with others.

1. Understand when it is appropriate to listen and to speak.
2. Understand and follow verbal and written instructions for classroom and laboratory activities.

Objective 2 Candidates will effectively use teamwork to respectfully work with others.

1. Identify and understand different roles in working with a team

Objective 3 Candidate will use critical thinking and problem-solving skills

1. Analyze the cause of the problem.
2. Develop a solution to address the problem.
3. Implement the plan.
4. Evaluate the effectiveness of the plan.
5. Use generally accepted industry standards to analyze, evaluate, troubleshoot, and diagnose the challenges associated with a specific repair, maintenance, or fabrication project.

Objective 4 Candidates will be dependable, reliable, steady, trustworthy, and consistent in performance and behavior.

1. Set and meet goals on attendance and punctuality.
2. Prioritize, plan, and manage work to complete assignments and projects on time.

Objective 5 Candidates will be accountable for results.

1. Use an achievement chart for activities and behaviors in class that encourages a personal evaluation of classroom performance.
2. File a weekly/bi-weekly written report on progress toward completion of assignments and projects.

Objective 6 Be familiar with the legal requirements and expectations of the course.

1. Be familiar with the course disclosure statement and all requirements for successful completion of the course.
2. Demonstrate workplace ethics, e.g. fair, honest, disciplined.

Optional: Standard performance evaluations on the final page of this document

Standard 2 - Supervised Agricultural Experience

Candidates will participate in work-based learning activities through the Supervised Agricultural Experience (SAE) Program.

Objective 1 Candidates will demonstrate employability skills.

1. Use a career search network to find career choices.
2. Identify appropriate CTE Pathway for selected career choice.
3. Write a resume including a list of demonstrated skills.
4. Write a letter of application.
5. Complete a job application.
6. Participate in an actual or simulated job interview.

Objective 2 Candidates will participate in a work-based learning experience outside the classroom.

Objective 3 Candidates will develop a job portfolio specific to their selected work-based learning experience.

1. Candidates will keep a personal record/journal/log of their work-based learning experience; including pictures, financial records, skills learned, hours associated with the project, goals, reflection, etc.

Optional: Standard performance evaluations on the final page of this document

Standard 3 - Safety Practices

Candidates will demonstrate appropriate safety practices in agricultural power, structural, and technical systems in laboratory and work settings.

Objective 1 Explain the meaning and importance of safety in agricultural power, structural, and technical systems.

1. Define safety and describe why it is important.

2. Identify safety hazards, and demonstrate the actions needed to minimize or eliminate risk associated with agricultural power, structural, and technical systems in learning and/or work situations.

Objective 2 Implement safety practices related to agricultural power, structural, and technical systems in learning and work situations.

1. Identify, select, and properly use appropriate personal protective equipment (PPE).
2. Verify that all equipment is in good operating condition and that appropriate safety devices are in place and working (e.g., guards in place, tool rests adjusted, etc.).
3. Maintain neat, well-organized, well-ventilated, and safe work areas.

Objective 3 Identify fire hazard conditions and actions to take in case of fire.

1. Explain combustion and identify three conditions necessary for it to occur.
2. Describe fire prevention in agricultural power, structural, and technical systems.
3. Explain classes of fires and appropriate extinguishers.

Objective 4 Take appropriate actions in an accident or emergency.

1. Demonstrate the use of simple first aid in an accident with an injury.
2. Locate first-aid kits, and investigate their contents and use in power, structural, and technical systems settings.
3. Discuss appropriate safety responses in an accident or emergency.

Optional: Standard performance evaluations on the final page of this document

Standard 4 - Agricultural Structures

Candidates will plan, construct, and appropriately maintain agricultural structures.

Objective 1 Create and/or use sketches, plans, and specifications for agricultural structures.

1. Identify symbols and drawing techniques used in creating sketches and plans.
2. Use scale measurement and dimensions with sketches and plans.
3. Identify and interpret different views of a construction drawing.
4. Develop sketches or plans for an agricultural structure.

Objective 2 Determine materials for agricultural structures.

1. Identify types and grades of materials used in constructing agricultural structures, including lumber, plywood, manufactured materials (e.g. particle board and wafer board), roofing, insulation, and doors and windows.
2. Identify common fasteners and other devices used in constructing agricultural structures.
3. Identify the dimensions and sizes of materials and fasteners used in agricultural structures.

Objective 3 Construct a small agricultural structure or project.

1. Identify and demonstrate safe and proper use of common tools used in agricultural construction.
2. Select materials for a construction project.
3. Prepare a bill of materials for a small structure or project, including a cost estimate.
4. Measure, mark, and cut materials according to plans for an agricultural structure.
5. Assemble an agricultural structure by properly fitting materials and using fasteners.
6. Evaluate a completed structure in terms of plans and quality of work.

Objective 4 Select and use appropriate protective coatings, such as paints and preservatives.

1. Discuss the importance of properly selecting and using paints and preservatives.
2. Identify and use appropriate application methods for coating materials, including surface preparation and safety.
3. Maintain painting tools and equipment through proper cleaning, storage, and on-job use.

Optional: Standard performance evaluations on the final page of this document

Standard 5 - Plumbing Knowledge and Skills

Candidates will demonstrate basic plumbing knowledge and perform simple plumbing skills.

Objective 1 Demonstrate basic plumbing knowledge and skills.

1. Distinguish plumbing materials and products (copper, iron, steel, PVC, and PEX).
2. Describe the meaning and importance of plumbing systems for air, water, wastes, and other fluid-based materials.
3. Identify components of plumbing supply systems and waste systems, including pipe, tubing, valves, faucets, fittings, and fixtures.
4. Describe how plumbing system components are sized, and appropriately match sizes to jobs.
5. Prepare a bill of materials for a plumbing job.

Objective 2 Perform simple plumbing jobs.

1. Identify and select appropriate tools for a plumbing job.
2. Measure, cut, fit, and install PVC and/or PEX materials as used in water supply systems.
3. Measure, cut, thread, and install iron or steel pipe materials as used in water supply systems.
4. Demonstrate the use of sweating\soldering in plumbing applications.
5. Repair and maintain plumbing systems.

Optional: Standard performance evaluations on the final page of this document

Standard 6 - Internal Combustion Engines

Candidates will select, operate, maintain, and repair small internal combustion engines.

Objective 1 Select and operate internal combustion engines.

1. Identify components and systems of internal combustion engines.
2. Describe the operation of internal combustion engines by cycle and fuel used.
3. Use the operator's manual to operate and maintain an engine properly.
4. List and explain the criteria to use in selecting an engine.
5. Obtain and/or prepare the proper fuel for an internal combustion engine.

Objective 2 Analyze and troubleshoot internal combustion engines.

1. Identify the major components of internal combustion engines and the functions of each.
2. Explain the meaning of troubleshooting and list the common engine problems identified/solved by troubleshooting.

Objective 3 Maintain internal combustion engines.

1. Perform routine maintenance, such as cleaning an engine, changing the oil, and cleaning or replacing the air filter.
2. Replace and adjust spark plugs as needed.
3. Winterize or otherwise prepare an engine for extended storage.
4. Practice environmental responsibility through the proper disposal of engine wastes, such as oil and filters.

Objective 4 Understand the operation of small equipment powered by internal combustion engines.

1. Identify safety hazards and practices to follow to assure safe operation with small equipment, including mowers, tillers, blowers, and edgers.
2. Explain the meaning and importance of pre-operation inspections, including those of fuel and oil levels, the air system, and the condition of engine components.
3. Start and safely operate engine-powered equipment.
4. Stop and properly cool down and store engine-powered equipment.

Optional: Standard performance evaluations on the final page of this document

Standard 7 - Metals

Candidates will fabricate with metal.

Objective 1 Explain kinds of metals and their uses.

1. Identify kinds of metals by appearance and testing, such as spark testing.
2. Classify metals according to characteristics and uses.
3. Identify, maintain, recondition, and use tools in hot and cold metal work.

Objective 2 Fabricate with hot and cold metal.

1. Select and use appropriate safety practices in metal fabrication.
2. Apply cold metal processes in fabrication, including measuring and marking, cutting, bending, tapping and threading, filing and drilling, and riveting.
3. Discuss the use of hot metal processes, including annealing, tempering, bending, welding, cutting, and hole punching.

Objective 3 Use shielded metal arc welding (SMAW) processes.

1. Set up for SMAW operations on carbon steel.
2. Start and restart an arc and backfill at the edge while running a bead on carbon steel.
3. Build a weld pad on carbon steel in the flat position.
4. Make 1F (flat position-fillet weld) welds on carbon steel.
5. Make 2F (horizontal position-fillet weld) welds on carbon steel.
6. Make 1G (flat position-groove weld) welds on carbon steel.
7. Make 2G (horizontal position-groove weld) welds on carbon steel.

Objective 4 Use manual oxyfuel gas cutting processes.

1. Perform safety inspections of equipment and accessories.
2. Set up for manual oxyfuel gas cutting operations on carbon steel.
3. Perform straight cutting operations on carbon steel.
4. Perform shape-cutting operations on carbon steel.
5. Perform bevel-cutting operations on carbon steel.
6. Pierce a hole through a carbon steel plate.

Objective 5 Use gas metal arc welding (GMAW) processes.

1. Set up for GMAW operations on carbon steel.
2. Start and restart an arc and backfill at the edge while running a bead on carbon steel.
3. Use Short Circuit Transfer welding process to make 1F (flat position-fillet weld) welds on carbon steel.
4. Use Short Circuit Transfer welding process to make 2F (horizontal position-fillet weld) welds on carbon steel.
5. Use Short Circuit Transfer welding process to make 1G (flat position-groove weld) welds on carbon steel.

6. Use Short Circuit Transfer welding process to make 2G (horizontal position-groove weld) welds on carbon steel

Optional: Standard performance evaluations on the final page of this document

Performance Skills Evaluation

Exam name: Agricultural Mechanics and Technology

Candidate Name: _____

Performance assessments may be completed and evaluated any time before the certification is issued. The following performance skills can be used in connection with the associated standards and exam. The evaluator will function as the subject matter expert to determine if the candidate meets the skills requirements with a Yes/No for passing.

Standard 1 – Personal and Leadership Development File a weekly/bi-weekly written report on progress toward completion of assignments and projects.	Pass:
Standard 2 – Supervised Agricultural Experience Candidates will keep a personal record/journal/log of their work-based learning experience; including pictures, financial records, skills learned, hours associated with project, goals, reflection, etc.	Pass:
Standard 3 – Safety Practices Maintain a neat, well-organized laboratory or shop working area.	Pass:
Standard 4 – Agricultural Structures Assemble an agricultural structure by properly fitting materials and using fasteners.	Pass:
Standard 5 – Basic Plumbing Knowledge and Skills Perform simple plumbing jobs.	Pass:
Standard 6 – Internal Combustion Engines Start, operate, and shut down an internal combustion engine.	
Standard 7 – Internal Combustion Engines - Use SMAW to make 1G (flat position-groove weld) welds on carbon steel. - Use GMAW/Short Circuit Transfer welding process to make 1G (flat position-groove weld) welds on carbon steel. - Use a manual oxy/fuel system to perform straight-cutting operations on carbon steel.	

Evaluator Name: _____

Date: _____