

Montana State University  
Agricultural Technology and Mechanical Systems  
2018 State CDE  
Abbreviated Guidelines

**Coordinator:** Dr. Dusty Perry, Montana State University  
**Committee Personnel:** MSU Students from AgEd 363 – Youth Event Management

**I. Purpose**

To challenge FFA members to prepare for the expectations of the agriculture mechanics work place by developing their skills and knowledge in applied physical sciences. This event allows students and teams to demonstrate subject matter and skill mastery, effective communication, problem solving techniques and the ability to function individually and as a team.

**II. National Guidelines:**

A. The Montana ATMS CDE will follow the 2017-2021 National FFA CDE/LDE Handbook guidelines with the follow exceptions:

1. The metals and welding skill area will replace the nationally suggested compact equipment skill area.
2. Montana will not include the team report component of the team activity.
3. Individual skill area rotations will be 15 minutes as opposed to the nationally suggested 25 minutes.
4. The individual exam will consists of 50 multiple-choice questions as opposed to the nationally suggested 25.

**III. Overview**

A. Motivate high school Agricultural Education students to develop understandings and learn skills in the following content areas:

1. Electrical Systems – AC/DC power, electrical safety, electrical standards, sensing devices, electrical wiring, controls, electronics, motors and other electrical loads, operating instructions, and manufacturer’s recommendations.
2. Environmental/Natural Resource Systems – water quality, sustainable agricultural practices, soil and water conservation, biological waste handling.
3. Metals and Welding – metallurgy, metal fabrication, multiple metal fusion processes (gas metal arc welding – GMAW, shielded metal arc welding – SMAW, flux-cored arc welding – FCAW, etc.).
4. Machinery and Equipment Systems – repair and maintenance, materials handling, processing, adjustments, metal fabrication.
5. Structural Systems – structures, storage, concrete, masonry, plumbing, electrical, fabrication, construction, building materials, ventilation, heating, air conditioning.

B. Develop hands-on performance operations in agricultural mechanics.

C. Develop the ability to gather information and solve problems related to agricultural mechanics.

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- D. Develop the ability to follow safety practices in all agricultural mechanics activities.
- E. Obtain knowledge and skills in agricultural mechanics which will be helpful in future careers related to agricultural mechanics.
- F. Develop interpersonal and teamwork skills.

**IV. Eligibility**

In order for a chapter to compete at State Convention, they must have had at least two students participate at a district-level competition. For further eligibility requirements, refer to the 2017-2021 National FFA CDE/LDE Handbook.

**V. Rules**

The abbreviated rules governing the Montana State ATMS CDE are as follows:

- A. Teams will consist of four members. Team ranking is determined by combining the scores of all students from each team. Team members must all be from the same chapter.
- B. Team ranking will include all four student scores and the team problem.
- C. Each participant will participate in all phases of the event.
- D. **Participants must supply and wear** Industrial Quality Eye Protection spectacles (Style B), or goggles during the skill phases of the event. Coveralls or a shop coat may be worn during the skill phases of the event. Appropriate footwear is required. (Work boots or work shoes recommended. No sandals or cloth shoes are allowed.)
- E. Necessary equipment such as basic welding helmets or goggles as required for welding, shields, gloves, welding leathers, hearing protection devices, etc., will be provided by event host.
- F. Special equipment may be required to be furnished by the contestants. Such equipment will be noted in the pre-CDE information provide to chapters prior to the event.
- G. Failure to wear appropriate safety protection or working in an unsafe manner could result in removal from that CDE area or disqualification from the CDE.
- H. Participants shall report to the chair of the event by 6:30 a.m. on the event day. Registration and parking information will be provided prior to event day.
- I. Answer sheets, worksheets and other written materials will be furnished for each event phase.

**VI. Event Activities**

Three types of activities will be included in the ATMS event. These include: A) individual problem-solving/skill development activities and B) written exam questions and C) team activity.

- A. Individual Problem-Solving/Skills – Each student is individually evaluated in each of the five systems areas. The specific activities occurring in each event are not publicized prior to the event. Each student is allowed 15 minutes to complete each of the five activities.

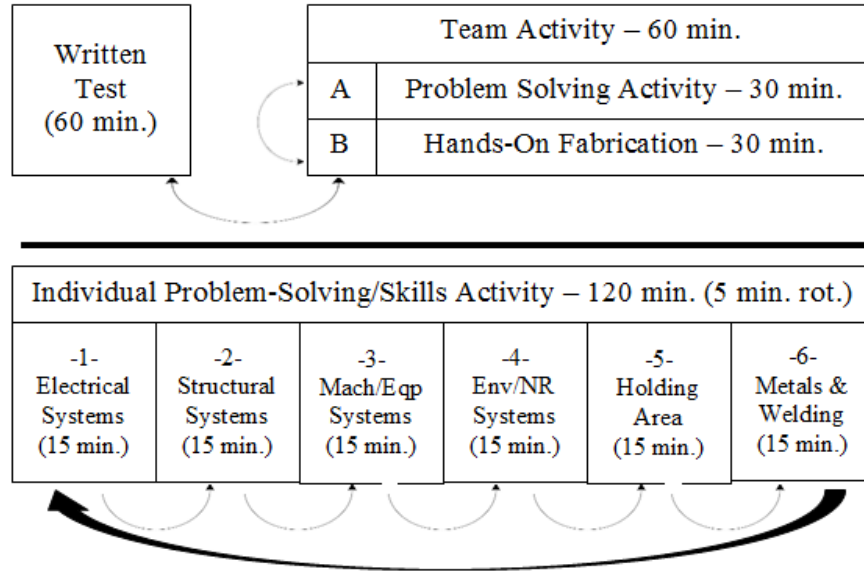
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- B. Written Examination – Each student completes an examination that consists of 50 multiple-choice questions. Each question is worth one point. There are 10 questions from each of the five agricultural mechanics systems areas. Students will have 60 minutes to complete this portion of the career development event.
- C. Team Activity – The individuals on each state team will work together and be evaluated as a team while solving complex, multi-system agricultural problems. The problem scenario is presented to the team on the day of the event and members utilize the materials and equipment provided to undertake and prepare a written solution. Teams organize themselves, assigning duties and completing tasks together or separately depending on individual skills and abilities. The team activity will be evaluated as follows:
- Teamwork process: 100 points
  - Finished product: 250 points
  - **Total for team activity: 350 points**
- VII. Event Format**
- A. Team members will work independently on problem solving and skill development activities and on the written test. Individual scores and rankings will be based on these areas.
- B. Team members will work together on a team problem solving activity. The team score will be a combination of all individual scores and the team activity. Each individual receives 25.0% of the total team activity score.
- C. The Agricultural Technology and Mechanical Systems CDE will follow the annual national theme, and be modified from the five system areas designated by the National CDE Handbook. Montana areas are Machinery and Equipment Systems, Electrical Systems, Metals and Welding, Structural Systems, and Environmental and Natural Resource Systems. The event organizers will provide a list of possible competencies and skills by February 15<sup>th</sup>.
- D. The focus of the event will be on areas of the Montana Agricultural Education Curriculum. New technologies will be included as they emerge and are presented to the agricultural educators.
- E. The following themes, provided by National FFA, are given to offer direction for students and advisors.
1. 2015 - Integrated Pest Management
  2. 2016 - Animal Production Systems
  3. 2017 - Materials Handling Systems
  4. **2018 - Processing Systems**

**VIII. Event Rotation**

The following diagram will be utilized as the rotation scheme for the Montana ATMS CDE.



**IX. Event Scoring**

The team score will be a combination of all individual scores and the team activity. Each individual receives 25.0% of the total team activity score.

INDIVIDUAL SCORING	
Written examination (50 questions at 1 point each)	50
Individual activities (5 at 30 points each)	150
Team activity (1/4 of total team activity score)	87.5
<b>Total Possible Individual Score</b>	<b>287.5</b>
TEAM SCORING	
All Written Examinations	200
All individual activities	600
Team activity	350
<b>Total Possible Team Score (top three)</b>	<b>1150</b>

**X. Tiebreakers**

- A. The team activity score will be used to break a tie in team ranking. If the tie remains, the combined written exam scores will be used.
- B. Individual ties will be broken using written exam scores. If a tie still exists, the problem-solving/skill scores will be used (in the order identified in section XIII of this document).

**XI. Awards**

Awards are presented to teams as well as individuals based upon their rankings.

**XII. National CDE Participation**

The highest ranking eligible team will represent Montana at the National Career Development Event.

**XIII. Resource Information**

A. Suggested internet website links and text references for the Montana ATMS CDE will follow those of the National ATMS CDE and can be found at:  
<http://web.missouri.edu/~schumacherl/natcon.html>

B. The themes for future National ATMS CDEs include:

1. 2015 - Integrated Pest Management
2. 2016 - Animal Production Systems
3. 2017 - Materials Handling Systems
4. **2018 - Processing Systems**

Each year, a theme will be identified, as well as the topic emphasis for each of the five ATMS content problem-solving/skill activity areas.

C. 2018 Event Information

1. Theme - The theme for the 2018 Montana ATMS CDE will be "Processing Systems." All activities of the event will relate to this theme.
2. Instructional Areas – event will cover the following instructional areas:
  - a) Electrical Systems – 120 volt power, single pole switches, and electric motors.
  - b) ENR – pH testing and adjusting
  - c) Machinery and Equipment Systems – Round bale balers (parts identification, safety procedures, and efficiency calculations).
  - d) Metals & Welding – Arc Welding
  - e) Structural Systems – Rebar layout
3. Team Activity – Concrete frame construction, rebar layout, and concrete mixing/pouring.

**XIV. Tentative Topics for Future Montana ATMS CDEs**

CDE AREA	2015	2016	2017	2018
Theme:	Integrated Pest Management	Animal Production	Materials Handling	<b>Processing Systems</b>
Electrical Systems	Electrical Wiring	Electrical Wiring	Electrical Wiring	<b>Electrical Wiring</b>
Environmental/ Natural Resource Systems	Soil & Water Management	Land Measurement	Manure Management	<b>Soil &amp; Water Management</b>
Machinery and Equipment Systems	Crop Sprayers	Skid loaders	Combines	<b>Balers</b>
Metals and Welding	MIG Welding	Arc Welding	MIG Welding	<b>Arc Welding</b>
Structural Systems	Plumbing	Carpentry	Carpentry	<b>Concrete</b>

**XV. Resources for Montana ATMS CDEs**

The following is an expanded detail of resources made available for the individual problem-solving/skills activities.

2018 Electrical Systems Skill Activity – Electrical systems are widely used in processing systems, including applications in structures and machinery. Thus, agricultural technicians must be able to interpret manufacturers’ technical information, plan and install, and trouble shoot these systems. With basic service entrance panels being the source of processing systems, technicians must be familiar with a service entrance panel and its accompanying switches. Specific competencies for this event may include:

1. Read and interpret basic electrical schematics.
2. Understanding of service entrance panel (breaker box).
3. Understanding of single-pole switches.
4. Proper wiring of an electric motor via provided schematic.
5. Use appropriate standards for agricultural applications, including the National Electric Code (NEC).

Suggested References for Activity – In addition to the general references specified for the Agricultural and Mechanical Systems CDE, the following references may be useful in preparing for the Electrical Systems Skill Activity. Note: Specific references are listed below, but others may be added at a later date.

1. Agricultural Mechanics: Fundamentals and Applications (6<sup>th</sup>) Ed. By Ray V. Herren (2010).
2. 2014 National Electric Code, National Fire Protection Association Agricultural Wiring Handbook (16<sup>th</sup> ed). Available from the Rural Electricity Resource Council.
3. Understanding Motor Controls by Stephen L. Herman.

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2018 Metals and Welding Systems Skill Activity – The Metals and Welding Systems Skill Activity will be a hands-on and problem solving based activity. Students will be allowed to use a basic calculator at this station, but no cell phone calculators will be allowed. Welding is both an agricultural processing system in itself as well as a frequent method in repairing/creating agricultural processing systems. Specific competencies may include:

1. Ability and knowledge of SMAW processes and safety.
2. Ability to utilize 3/32” 6013 electrode.
3. Ability to interpret standard weld symbols.
4. Understand how to set a SMAW machine to the proper amperage.
5. Basic mathematic computations related to fabrication.

Suggested References for Activity –In addition to the general references specified for the Agricultural Technology and Mechanical Systems CDE, the following references may be useful in preparing for the Metals and Welding Systems Skill Activity. Note: Specific references are listed below, but others may be added at a later date.

1. Team members should understand SMAW processes and safety procedures:
  - a. <http://www.lincolnelectric.com/assets/US/EN/literature/WC475.pdf>
  - b. <http://www.lincolnelectric.com/en-us/support/process-and-theory/Pages/aws-classifications-detail.aspx>
  - c. <http://www.lincolnelectric.com/en-us/education-center/welding-safety/Pages/welding-safety.aspx>
  - d. <http://weldersuniverse.com/>
  - e. Agricultural Mechanics: Fundamentals and Applications (6th) Ed. By Ray V. Herren (2010).

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2018 Environment and Natural Resource Systems Skill Activity – The environmental and natural resource activity will test competitors on their ability to understand and properly use scientific equipment, including a pH meter. Competitors will need to understand how to take and adjust a solution’s pH. Primary competencies for this event include:

1. Demonstrate proper handling of pH meters.
2. Demonstrate proper handling of chemicals.
3. Successful testing of a known solution.
4. Successful adjustment of a known solution to a designated pH.

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Suggested References for Activity – In addition to the general references specified for the Agricultural Technology and Mechanical Systems CDE, the following references may be useful in preparing for the Environment and Natural Resource Systems skills activity. Note: Specific references are listed below, but others may be added at a later date.

1. [http://www.mae.gov.nl.ca/waterres/training/adww/ruralreactions/09\\_deborah\\_smith\\_ph\\_adjustment.pdf](http://www.mae.gov.nl.ca/waterres/training/adww/ruralreactions/09_deborah_smith_ph_adjustment.pdf)
2. <https://youtu.be/MOje6IXIsWY>
3. <http://ag.umass.edu/greenhouse-floriculture/fact-sheets/effects-of-ph-on-pesticides-growth-regulators>
4. [http://www.epa.gov/opp00001/factsheets/pest\\_ti.htm](http://www.epa.gov/opp00001/factsheets/pest_ti.htm)

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2018 Machine and Equipment Systems Skill Activity – The Machine and Equipment Systems area will utilize information pertaining to Case IH balers. Skill activities might include safety, maintenance, set-up, adjusting, sizing, and trouble shooting. The skill activity will be as generic as possible so that students will not be put at a disadvantage if they do not have access to a particular type of machine. When practicing for the event, remember that the skill activity is designed to be performed by an individual in a 15 minute time period. However, there will be an assistant available to provide assistance for any student that may have a physical limitation. Additional competencies for this event include:

1. Broad-based safety inspection of combine and operator hand signals.
2. Calculating forage yields from a given number of acres.
3. Calculating field capacity of farm machines.

Suggested References for Activity – In addition to the general references specified for the Agricultural Technology and Mechanical Systems CDE, the following references may be useful in preparing for the Machine and Equipment Systems skills activity. Note: Specific references are listed below, but others may be added at a later date.

1. <https://www.caseih.com/northamerica/en-us/products/balers>
2. <https://www.agry.purdue.edu/ext/forages/rotational/articles/PDFs-articles/calculating-hay-yields.pdf>
3. <https://store.extension.iastate.edu/Product/Estimating-Field-Capacity-of-Farm-Machines-pdf>

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2018 Structural Systems Skill Activity – Materials handling systems often require simple fabrication/modification to maximize efficiency. The focus of this year's fabrication is concrete. Specific competencies may include:

1. Read and interpret a rebar footing diagram.
2. Safely operate basic power tools and concrete equipment.
3. Accurate use of measuring tools.



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4. Read and interpret proper concrete mixing formulas.
5. Mark out rebar grid spacing using proper tools.

Suggested References for Activity – In addition to the general references specified for the Agricultural Technology and Mechanical Systems CDE, the following references may be useful in preparing for the Structural Systems skills activity. Note: Specific references are listed below, but others may be added at a later date.

1. Agricultural Mechanics: Fundamentals and Applications (6th) Ed. By Ray V. Herren (2010).

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2018 Team Activity – All team members must wear safety glasses during the team event. To enter the CDE area, students must have safety glasses in their possession.

Team members will work together to complete the activity in one hour. This team event is worth 350 points (100 points for the teamwork process and 250 points for the finished product). If a team member exhibits or performs any unsafe practice, points will be deducted from the total team score.

Equipment provided by the Team: Teams will be expected to provide appropriate personal protective clothing, a tape measure, pencils, and a calculator.

Building upon the concrete aspect of processing systems, teams will be asked to use electrical saws, drills, and impact drivers to construct a wooden frame. Then, teams will be asked to mix concrete and pour the mixture into the frames. They will be judged on their ability to work as a team, safely operate tools/equipment, estimate materials costs, and on the overall precision of completed project.

***Please understand that the event coordinator reserves the right to make necessary changes to this activity based on the availability of materials and resources to successfully conduct this activity.***

Note: All necessary tools will be provided. If teams bring their own tools, duplicate tools that we provided will be removed from their work station.

## Team Activity Process Rubric

### 100 Points

	Very strong evidence of skill is present 10-8 points	Moderate evidence of skill is present 7-4 points	Strong evidence of skill is not present 3-0 points	Points earned	Weight	Total Points
<b>Communications</b>	All team members effectively communicate with each other throughout the entire activity.	Most team members communicate fairly effectively with each other during most of the activity.	Communication between team members is ineffective and sporadic during the activity.		X2	
<b>Work Distribution</b>	Work was evenly distributed between all team members and all team members were employed at all times.	Work was distributed between two to three team members and these members were employed most of the time.	Work was completed by only one team member with little employment of the other members.		X4	
<b>Time Management</b>	All team members managed their time efficiently.	Most team members managed their time fairly efficiently.	One (or no) team member managed their time efficiently.		X2	
<b>Team Organization</b>	Team started right away, had no down time, was not rushed at the end of the task.	Team was delayed in starting, had down time, and was somewhat rushed at the end of the task.	Team delayed starting, had long down times, and did not complete all tasks during the time allotted.		X2	
				<b>Total Points</b>		