



Montana State University
Agricultural Technology and Mechanical Systems
2016 State CDE
Expanded Outline



Coordinator: Dr. Dusty Perry, Montana State University
Committee Personnel: MSU Students from AgEd 294/494

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. 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.

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.

III. Eligibility

In order for a chapter to qualify as a team at Districts, and thus compete at State Convention, the chapter must have at least two members compete in the District event. For further eligibility requirements, refer to the Montana Career Development Handbook.

IV. Rules

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

- A. Each school may enter a team composed of three or four participants, with the three highest scores counting for the team total score. Team members must all be from the same chapter.
- B. Team ranking will include the top three 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 phase of the event. Appropriate footwear is required. (Work boots or work shoes recommended. No sandals or cloth shoes are allowed.)
- E. 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.
- F. 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.
- G. 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.
- H. Answer sheets, worksheets and other written materials will be furnished for each event phase.

V. 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.

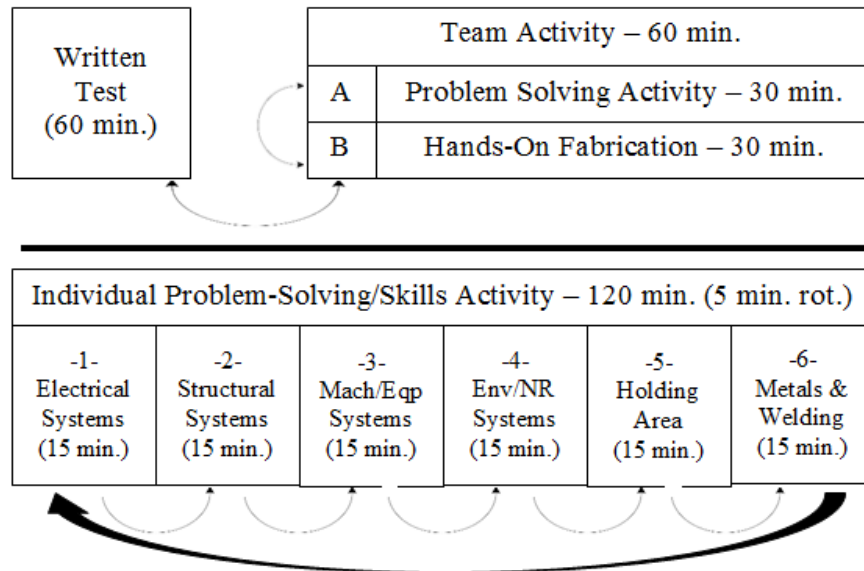
- A. Individual Problem-Solving/Skills – Each student is individually evaluated in each of the five systems areas. The specific activities occurring in each event are not publicized prior to the event. Each student is allowed 15 minutes to complete each of the five activities.
- B. Written Examination – Each student completes an examination that consists of 50 multiple-choice questions. Each question is worth two points. 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.

VI. 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 the three highest individual scores and the team activity. The team activity score is not split among the individuals.
- 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 **January 15th**.
- 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

VII. Event Rotation

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



VIII. Event Scoring

The team score for the event will be determined by summing the points earned by the top three team members and the team score summed together. Individual score and ranking does not include the team score.

INDIVIDUAL SCORING	
Written examination (50 questions at 2 points each)	100
Individual activities (5 at 30 points each)	150
<i>Total Possible Individual Score</i>	<i>250</i>
TEAM SCORING	
All individual activities for top three	750
Team activity	250
<i>Total Possible Team Score (top three)</i>	<i>1000</i>

IX. Tiebreakers

The team activity score will be used to break a tie in team ranking. If the tie remains, the combined written exam scores of the top three individuals will be used. 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).

X. Awards

Team and individual awards will be as addressed in the Montana Career Development Handbook.

XI. National CDE Participation

The highest ranking eligible team will represent Montana at the National Career Development Event. See page the Montana Career Development Handbook for more details.

XII. 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. 2016 Event Information

1. Theme - The theme for the 2016 Montana ATMS CDE will be “Animal Production.” All activities of the event will relate to this theme.
2. Instructional Areas – The 2016 event will cover the following instructional areas:
 - a) Electrical Systems – Transformers
 - b) Environmental & Natural Resources Systems – Land Measurement
 - c) Machinery and Equipment Systems – Skid-Steer Loaders
 - d) Metals & Welding – Arc Welding
 - e) Structural Systems – Carpentry

XIII. Tentative Topics for Future Montana ATMS CDEs

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

XIV. Resources for Montana ATMS CDEs

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

2016 Electrical Systems Skill Activity – Electrical equipment is widely used in animal production systems, including applications in structures, machinery, and livestock containment. Thus, agricultural technicians and producers must be able to interpret manufacturers’ technical information, plan and install, and troubleshoot these systems. With the various uses of electrical systems, specifically those involving animal systems, transformers are often utilized to adjust voltage for the

appropriate specifications. Producers and system managers must rely on their knowledge of AC electrical circuits to insure systems operate efficiently. Specific competencies for this event may include:

1. Read and interpret basic electrical schematics.
2. Understand how large and small scale transformers operate.
3. Interpret a transformer nameplate.
4. Proper installation of a bell transformer.
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 Technology 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 (6th) Ed. By Ray V. Herren (2010).
2. 2014 National Electric Code, National Fire Protection Association Agricultural Wiring Handbook (16th ed.). Available from the Rural Electricity Resource Council

2016 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. Simple repairs/fabrication are often required when dealing with animal production. Specifically, the ability to make simple welds can save a producer time and money. Specific competencies may include:

1. Ability and knowledge of SMAW processes and safety.
2. Ability to utilize 6011, 6013, and 7018 welding rods.
3. Understand how to set an amperage range on a SMAW machine.
4. 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. Lincoln Facilitators Guide to SMAW –
<http://www.lincolnelectric.com/es-mx/education-center/Documents/SMAWFacilitatorGuide.pdf>
 - b. Agricultural Mechanics: Fundamentals and Applications (6th) Ed. By Ray V. Herren (2010).

2016 Environment and Natural Resource Systems Skill Activity – When dealing with the management and production of animal systems, it is important to have a comprehensive understanding of the land systems around them. Land Surveying is one method that can assist in the determination of grade, boundaries, and property lines. Primary competencies for this event include:

1. Read and interpret a Philadelphia Rod.
2. Calculate difference in elevation.

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. Grade Rods: All about Grade Rods
<http://www.johnsonlevel.com/News/GradeRodsAllAboutGradeRod>
2. Leveling Rods
<http://www.free-ed.net/free-ed/Resources/Trades/carpentry/Building01/default.asp?iNum=0402>

2016 Machine and Equipment Systems Skill Activity – The Machine and Equipment Systems area will utilize information pertaining to a Bobcat Skid-Steer Loader. Skill activities might include safety, maintenance, set-up, adjusting, sizing, and trouble shooting. Please check back for more information at a later date. 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 limited assistance for any student that may have a physical limitation of some type.

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.

Skid-Steer Safety and Operation

1. OSHA Guidelines:
https://www.osha.gov/dte/grant_materials/fy09/sh-19503-09/skid_steer_loader_safety.pdf
2. CDC Guidelines:
<http://www.cdc.gov/niosh/docs/2011-128/pdfs/2011-128.pdf>

3. Gempler's Guidelines:
<https://www.gemplers.com/docs/tailgate-training-tip-sheets/60-skid-steer-dangers-en.pdf>

Specification Interpretations

1. Bobcat S150 and S160:
http://onesourcerental.com/specs/bobcat_s160_specs.pdf
2. Bobcat S175 and S185:
http://www.ableequipment.com/pdf/Bobat_S185.pdf
https://bidadoomedia.s3.amazonaws.com/PDF/Bobcat/S185_SSL_Specifications_%5B1%5D.pdf
3. Bobcat S220:
<http://totalequipmentrental.com/wp-content/uploads/2013/03/BOBCAT-S220.pdf>
4. Bobcat 553:
http://trademachines.com/assets/media/content/sites/2/2015/07/Bobcat-553.en_.pdf

2016 Structural Systems Skill Activity – Animal management and production often requires simple fabrication/modification to maximize efficiency. With financial resources often a limiting factor, repurposing materials is emerging as a common practice. Specifically, reclaiming available lumber resources has proven effective. Therefore, contestants will be required to fabricate/modify an item from reclaimed wood. Specific competencies may include:

1. Read and interpret a working drawing.
2. Accurately use a measuring tool.
3. Work with non-uniform reclaimed wood.
4. Estimate materials needed and potential materials sources.

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).
2. Making Good with Salvaged Wood:
<http://www.woodcraftmagazine.com/pdf/posts/144/65-SalvageWood-4.pdf>
3. Working with Reclaimed Woods:
<http://www.leevalley.com/US/newsletters/Woodworking/7/3/article1.pdf>

2016 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 250 points. 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.

Utilizing electric fences in animal management and production practices is gaining popularity across the country. Applications vary from temporary, semi-permanent, or permanent electric fences powered by 110 volt, solar, battery, or solar/battery fence energizers. Teams will be asked to demonstrate their knowledge and understanding of the following competencies related to electrical fencing:

1. Determine appropriate equipment requirements and limitations.
2. Demonstrate an understanding of electrical fence operation.
3. Identify key operational factors in the selection, installation, maintenance, and troubleshooting of permanent electric fences.

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 that will be used during 2016 Team Activity. If teams bring their own tools, duplicate tools that we provided will be removed from their work station.

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 Team Activity. Note: Specific references are listed below, but others may be added at a later date.

1. Animal Management Solutions for Producers – Gallagher Product Catalog:
<https://am.gallagher.com/assets/Documents/65154.pdf.pdf>
2. Electric Fence Systems – Gallagher Recommended Fence Set-ups:
<https://am.gallagher.com/us-en/getting-started/electric-fence-systems>
3. Electric Fence System Configurations – Permanent Gallagher Set-ups:
<https://am.gallagher.com/us-en/getting-started/electric-fence-systems/fence-config-all>
4. Gallagher Literature and Brochures:
<https://am.gallagher.com/us-en/support/brochures>