

# AGRICULTURAL MECHANICS

## **Philosophy for Virginia FFA Career Development Events**

Students are important customers of agricultural education and the FFA who recognize quality and value in products and activities. When provided an opportunity to fashion their educational experiences, they generally make wise decisions based on needs, perceptions, image and the opinions of others influence students. They value change based on their perceived personal needs as well as the needs of others. They sometimes value change for the sake of variety. Adults are concerned about the experiences of students and want to help organize experiences that will meet the future needs of students while accomplishing the purposes of agricultural education and the FFA organization. The Virginia FFA Association should assume the leadership role in developing and continuously improving relevant FFA career development events and awards. Although the Virginia FFA Association should be aware of the needs of local chapters and should react to those needs, it should help initiate opportunities that reflect relevant and emerging technology.

Virginia FFA career development events and awards should be developed with significant input from FFA members, teachers, partners, respective industry sponsors, and others involved in agricultural education. Virginia career development events and awards should reflect instruction that currently takes place in the entire agricultural education program, including classroom instruction, laboratory instruction, individualized instruction, and/or supervised agricultural experience. However, it is appropriate for the state organization to develop career development events and awards that stimulate instruction in emerging areas that reflect both current and future community, national, and global work force needs. The authority for insuring the relevance of an FFA activity is ultimately vested in the Virginia FFA Advisory Council.

The state association should promote individual, chapter, and team career development events and awards. Chapter and team career development events and awards should be based on cooperation and teamwork while recognizing the value of competition and individual achievement. The role of career development events and awards is to motivate students and encourage leadership, personal growth, citizenship, and career development.

Students should be recognized for achievement in career development events and awards. Quality standards should be used as a basis for achievement. The state association should ensure that the recognition is appropriate and meaningful. Recognition for achievement should be reflective of the total effort required by the chapter/team/individual and should take place at all levels of participation.

The Virginia FFA Association shall encourage accessibility and provide opportunities for achievement and recognition for students with diverse backgrounds. High expectations should be consistently communicated to those who are involved in career development events and awards.

## **GENERAL RULES and OFFICIAL POLICIES**

*Violations of any of the following rules may be grounds for the event superintendent to disqualify the participants.*

State FFA Staff and CDE Superintendents will use the published rules and procedures to organize and implement the State FFA Career Development Events. Event activities may not be conducted due to lack of necessary materials, expertise or extreme impact to event budgets.

### **TEAM ACTIVITIES**

The primary goal of team career development events and awards is to develop individual responsibilities, foster teamwork, and promote communications while recognizing the value of ethical competition and the value of individual achievement. A team career development event/award requires two or more members from one chapter working cooperatively. Team career development events and awards are intended to be an outgrowth of instruction.

Team career development events and awards should:

- include problem solving and critical thinking.
- promote an appreciation for diversity by reducing barriers to participation.
- promote new directions and focus on future needs of members and society.
- include cooperative activities.
- encourage broad participation among members and recognize excellence within levels of experience.
- recognize individual and team achievement, develop general leadership, and recognize levels of ability.
- provide local recognition for superior performance at the state and national level.

### **ELIGIBILITY OF PARTICIPANTS**

- 1) Each participant must be a current bona fide dues paying FFA member in good standing with the local chapter, state FFA association, and the National FFA Organization at the time of the career development event (or by May 1 for the Virginia FFA, whichever date comes first.) In the event a participant's name is not on the chapter's official roster for the years in which the dues were payable to the National FFA Organization, a past due membership processing fee of \$35, in addition to the dues must be paid.
- 2) The participant, in a State Senior Career Development Event, must be:
  - a. A high school FFA member, (a graduating senior is considered eligible to compete in state career development events the convention directly after graduation.)  
(High school refers to grades 9-12.)
  - b. A middle school team consisting of all 8<sup>th</sup> grade FFA members.
  - c. While in school, be enrolled in at least one agricultural education course during the school year and/or follow a planned course of study; either course must include a supervised agricultural experience program, the objective of which is preparation for an agricultural career. For this purpose a student needs to be enrolled in at least one agricultural education course during the year they qualified for the event. If the student was previously enrolled in an agriculture class and was an FFA member, they may compete in a contest if they have scheduling issues (ex. Advanced Placement classes) that do not allow them be enrolled in an agriculture class but they must still have an SAE.
- 3) The participant in a State Junior Career Development Event must be:
  - a. at the time of the state competition has qualified as either a 7<sup>th</sup>, 8<sup>th</sup> or 9<sup>th</sup> grade member.
  - b. While in school, be enrolled in at least one agricultural education course during the school year and/or follow a planned course of study; either course must include a supervised agricultural experience program, the objective of which is preparation for an agricultural career. For this purpose a student needs to be enrolled in at least one agricultural education course during the year they qualified for the event.
- 4) The participant in a State Middle School Career Development Event must be:
  - a. At the time of the state competition has qualified as either a 6<sup>th</sup>, 7<sup>th</sup> or 8<sup>th</sup> grade member.
  - b. While in school, be enrolled in at least one agricultural education course during the school year and/or follow a planned course of study; either course must include a supervised agricultural experience program, the objective of which is preparation for an agricultural career. For this purpose a student needs to be enrolled in at least one agricultural education course during the year they qualified for the event.

- 5) To compete in the creed speaking event, the member has qualified as either a 7<sup>th</sup>, 8<sup>th</sup> or 9<sup>th</sup> grader by state convention.
- 6) CDE participants who start an event and do not complete the event without notifying event officials at the time of departure will be disqualified. This can affect the overall team rank and position. In some events this will also disqualify the entire team
- 7) The state supervisor/executive secretary of agricultural education must certify that participants are eligible. If an ineligible student is entered in any career development event, the entire team of which that student is a member may be declared ineligible.
- 8) The first contest that a school wins in the current year will be the contest that the individuals on that team will represent Virginia at the National FFA Convention. To explain, if an FFA chapter puts more than one current winner of an FFA contest on an additional team, then the second place team will be declared the State Winner and will compete at the National FFA Convention. If one person is a duplicate and the National rules allow for a three-person team, then the first place team will represent Virginia. If a student that wins a contest is declared ineligible, or cannot attend the Convention, then the other members of the team will be allowed to compete for individual awards only. (A medical waiver may be granted if a member of a winning team is unable to attend due to a medical condition.)
- 9) Individuals who have been state winners or have represented the state in any official national FFA career development event are not eligible to enter the same FFA event again. However, FFA junior division state winners are eligible for state senior division. Individuals on a state winning team cannot compete in that division again.
- 10) A chapter may enter any number of career development events; however, a chapter may have no more than one team in each division in each event.

### **CHECK-IN**

Participants will check-in at the state FFA convention as indicated in the annual State Guidelines. Dates, hours and place of check-in will be sent annually to the agricultural education teacher. All participants will be given an identification number by which they will be designated throughout the event.

### **ADDITIONAL OPERATIONAL PROCEDURES AND POLICIES**

- 1) **Emergency Conditions:** Under emergency conditions, a state team participating in a Virginia FFA Career Development Event may be made up of less than the required members. Fewer than the required number could compete if an emergency condition such as illness, death in the family or an act of God would occur. Those individuals competing would still be eligible to qualify for individual awards.
- 2) Event committees will strive to divide teams into groups so that no two participants from a team will be in the same group. In any case, no two members will be placed side-by-side.
- 3) **Disqualification:**
  - a. Any communication, verbal or non-verbal between participants during a career development event will be sufficient cause to eliminate the team member involved from the career development event. The only exception to this would be communication between team members during the team activity portion of a given career development event.
  - b. Teams arriving after the career development event has begun may be disqualified or penalized. No member substitutions may be made after the career development event begins.
  - c. Any assistance given to a team member from any source other than the career development event officials or assistants will be sufficient cause to eliminate the team from the career development event.
  - d. Event superintendents may stop any participant if they deem their manner to be hazardous either to themselves or others. Such stoppage shall deem the individuals disqualified for that section of the career development event.
  - e. CDE participants who start an event and do not complete the event without notifying event officials at the time of departure will be disqualified. This can affect the overall team rank and position. In some events this will also disqualify the entire team.
  - f. Participants will not be allowed to utilize personal electronic communication devices, other than those approved by the event officials, during the entire course of the event. Participants who access personal electronic communication devices without prior approval of the event officials will be disqualified.

- 4) Advisors
  - a. Advisors are not allowed to be in contact with their students at any point or time during the competition.
  - b. Advisors may only be allowed at the contest site if they are assigned to supervise a group or part of the contest
- 5) Participants are expected to observe the National FFA Code of Ethics and the Proper Use of the FFA Jacket during the career development events. (Please see the latest edition of the Official FFA Manual.)
- 6) Official FFA dress is highly recommended for all participants where appropriate and is required for the awards presentation and recognition.
- 7) Participants or advisors will not be allowed in the career development event area as designated in the specific career development event rules. Infractions of this statement may result in team disqualification.
- 8) Accessibility for all students—all special needs requests should be submitted two weeks prior to the event for scheduling of assistance during event.
- 9) Results of all Virginia State FFA Career Development Events will be announced during sessions at State Convention.

### **TEAM AND INDIVIDUAL AWARDS**

The ranking of teams and individuals in each of the career development events will be on the basis of three logical groups within the total range of scores. Awards will be distributed to the winning teams and individuals at award programs following the completion of the career development events.

### **VIRGINIA FFA ADVISORY COUNCIL**

Purpose: To advise the State Staff on issues impacting both FFA Career Development Events and Awards to ensure:

- 1) All activities are consistent with industry needs.
- 2) All activities are available to all members.
- 3) All activities are conducted openly, fairly and in a quality manner.
- 4) Cooperation among various activities occurs, to the degree possible, to promote the interconnectedness of agriculture (i.e. forestry and agricultural mechanics or farm business management and dairy or livestock) and agricultural education (classroom, SAE, FFA).
- 5) New and innovative activities are being put forward for consideration.
- 6) As many students as possible have the opportunity to participate.
- 7) A constant process of local advisor in-service on proper use of these activities as tools for learning is being championed.
- 8) All activities are operated consistently with Advisory Council policy.
- 9) Activities are conducted within available budgets approved by the FFA Advisory Council and, if appropriate, Virginia FFA Foundation Board.

The Virginia FFA Advisory Council is a committee made up of sixteen members from all across the Commonwealth that meet bi-yearly. Along with sending their advice on important issues to the National FFA Board of Directors, the Council also discusses the past year's events, how to advance their association in the future, and address the suggestions and concerns brought up by agricultural teachers and other leaders of agriculture.

#### Membership of the Advisory Council

- 1) Ten members of the Virginia FFA Advisory Council are selected by the areas.
- 2) One member, who is agricultural education middle school advisor.
- 3) One member, who is a representative from Virginia Tech.
- 4) One member, who is a representative of Virginia State.
- 5) One member, who is the State FFA Advisor.

- 6) One member, who is a representative of FFA members, selected when elected State FFA President.
- 7) One member, who is the State FFA Specialist (State FFA Executive Secretary.)

#### Term

Members serve a three-year term except for the one FFA member representative who will serve a one-year term.

#### Chair

The chair of the advisory committee on awards and career development events will be elected each year.

#### Meeting Schedule

- 1) Annual fall meeting to report on the completion of activities at convention and provide input into the winter meeting agenda.
- 2) The annual spring meeting will allow for most of the committee's work to be conducted as a whole group and in sub-groups focused on specific issues or specific types of activities (e.g. team career development events, individual awards, chapter awards).

Local advisors should submit concerns suggestions to the state FFA Specialist/chair of the advisory board and their area representative at least two weeks in advance of the meeting.

#### **Rules Committee on State Career Development Events**

The advisory committee will meet only when needed and will make all final decisions on interpretation of the rules and regulations of the State FFA Career Development Events or awards programs.

Official judges' decisions are final. The announced results are the official results and awards may be duplicated as a result of the appeal.

#### **Conflict of Interest**

If there is a violation of a student whose advisor is a member of the advisory board, the advisor may not vote on the violation. A teacher from that area maybe used to fill in for the advisor whose student has possible committed the violation.

## Official Dress Recommendations, Number of Participants, and Number of Scores from Team Total

Event	Official Dress Appropriate	Number of Participants	Number of Scores Allowed (per team) for Team Total
Agricultural Communications	Yes	5	5
Agricultural Issues Forum	Yes	3-7	Team Score Event
Agricultural Mechanics Sr.	FFA Shirt	4	Top 3 Scores
Agricultural Mechanics Jr.	FFA Shirt	3	3
Agricultural Sales	Yes	4	4
Crops Judging	*Yes/FFA Shirt	4	3
Computer Applications	Yes	1	1
Creed Speaking	Yes	1	Individual Event
Dairy Cattle Evaluation	*Yes	4	Top 3 Scores
Dairy Cattle Handlers' Activity	White/Jacket	1	Individual Event
Dairy Foods	Yes	4	Top 3 Scores
Envirothon	*Yes/FFA Shirt	5	5
Extemporaneous Public Speaking	Yes	1	Individual Event
Farm Business Management	Yes	4	Top 3 Scores
Floriculture	*Yes/FFA Shirt	4	4
Food Science and Technology	Yes	4	4
Forestry Field Day	FFA Shirt	7	7
Forestry Senior	FFA Shirt	4	Top 3 Scores
Forestry Junior	FFA Shirt	4	3
Horse Evaluation	*Yes	4	Top 3 Scores
Horticulture Demonstration	FFA Shirt	1-2	1-2
Job Interview	Yes	1	Individual Event
Jr. Dairyman's	FFA Shirt	4	Top 3 Scores
Jr. Forester's	FFA Shirt	4	Top 3 Scores
Jr. Stockman's	FFA Shirt	4	Top 3 Scores
Livestock Evaluation	*Yes	4	Top 3 Scores
Marketing Plan	Yes	3	Team Score Event
Meats Evaluation & Technology	FFA Shirt	4	Top 3 Scores
Middle School Agriscience Technology	FFA Shirt	4	3
Middle School FFA Quiz Bowl	Yes	4	4
Middle School Food & Fiber	FFA Shirt	4	3
Middle School Plant Science	FFA Shirt	4	3
Middle School Small Animal Care	FFA Shirt	4	3
Nursery/Landscape	FFA Shirt	4	Top 3 Scores
Parliamentary Procedure Senior	Yes	6	Team Score Event
Parliamentary Procedure Junior	Yes	6	Team Score Event
Poultry Evaluation	FFA Shirt	4	Top 3 Scores
Prepared Public Speaking Senior	Yes	1	Individual Event
Prepared Public Speaking Junior	Yes	1	1
Small Engines	FFA Shirt	1	1
Soils Judging	FFA Shirt	4	Top 3 Scores
Tractor Operator's	FFA Shirt	1	1
Tractor Troubleshooting	FFA Shirt	2	2

Please remember that all participants are required to wear complete official dress, as outlined in the National FFA Official Manual, to all award functions.

**\*Official Dress is required for the reasons part of this CDE**

**-An FFA Shirt is any shirt purchased from the National, State or Local FFA or any plain shirt that has an FFA emblem or FFA sticker on it.**

# AGRICULTURAL MECHANICS

## I. PURPOSE

Technological advances in America continue to influence the way students must prepare for their futures. Students entering the workforce need a strong knowledge base and the ability to comprehend the interaction of complex systems. Employers want productive workers and managers that can access and use a broad range of information. The most sought after employees are those who communicate effectively, continue to stay current with modern technology, and work successfully as individuals and as team members. Students with these skills and abilities are more competitive in the job market, receive financial rewards, and are selected for advancement.

An agricultural mechanics education is comprised of strong technical content and complimented by the development of practical, hands-on skills. The subject matter areas and skill development practices have been grouped into five 'systems' areas, so named because of the complex interaction and synergistic processes common to agriculture mechanics. The term 'system' is used to emphasize the interactive relationship between each area of agricultural mechanics. These five systems areas are described and examples appear on the pages that follow.

Each agricultural mechanics activity is in response to a problem or need encountered in the workplace. The solving of such problems is dependent upon how each decision or solution, imposed on one component, will influence the other system components. Solving one component of a problem without using a 'systems approach' can, and often does, result in additional problems. An example of where this has occurred is observed in the many obstacles that agricultural producers currently face regarding environmental pollution, ground water contamination, and stricter governmental regulations. Decisions and solutions made earlier in this century have impacted the environment negatively and resulted in a new set of problems.

The State FFA Agricultural Mechanics Career Development Event recognizes students with agricultural mechanics competencies important to the modern workplace. The technical content and required skills continue to include all traditional areas of agricultural mechanics. Additionally, the operation of modern equipment, the application of new management strategies, and the mastering of advanced technologies are increasingly emphasized. This career development event selects and awards those students and teams that demonstrate: (1) mastery of the subject matter and skills common to the systems areas, (2) effective communication skills, (3) superior problem solving techniques, (4) an understanding of modern technology, and (5) the ability to function as team members working together, and as individuals working alone.

**Information specific to each annual event is available on the National FFA Agricultural Mechanics Event web page at <http://web.missouri.edu/~pavt0689/natcon.html>. This web site is updated in June, August, and November of each year.**

## II. EVENT FORMAT

### A. TEAM MAKE-UP

Teams may consist of three or four members. Team ranking is determined by combining the scores of the top three students from each team. Teams that for whatever reason or reasons have fewer than three members are not eligible for team awards, but students may receive individual awards.

**Teams must pre-register for convention.** Participation will be limited because of the need for supplies the day of the contest.

### B. EQUIPMENT

## 1. Needed- Safety Materials Students Must Provide

Each event participant must adhere to the safe practices and work habits appropriate when performing required activities. Participants are responsible and must provide all personal safety equipment including:

### *a. Industrial-quality eye protection*

INDIVIDUALS MUST WEAR STYLE B (SEE BELOW) INDUSTRIAL-QUALITY EYE PROTECTION during the team activity and the skill/problem solving activities. Those with prescription eyewear that is not Style B must also wear safety glasses or goggles while participating in this event. Safety glasses do not have to be worn while completing the written exam. Acceptable spectacles or goggles must adhere to the American National Standard Practice for Occupational and Education Eye and Face Protection, Z87.1-1979 (or Z87.1-1968) and revisions approved by ANSI. Descriptions of style A, B, and C Industrial Quality Eye Protection are as follows:

**Style A are NOT ACCEPTABLE for use in this event.** These are safety spectacles without side shields. They are for limited-hazard use requiring only frontal protection. The addition of accessory side shields that are not firmly secured does not upgrade Style A to a Style B or C.

**Style B.** Safety spectacles with wire mesh, perforated plastic or non-perforated side shields. The side shields shall be tapered, with an anatomical periphery extending at least halfway around the circumference of the lens frame. Industrial-quality eye protection for those not wearing prescription glasses shall be Style B.

**Style C are NOT ACCEPTABLE for use in this event.** Safety spectacles with semi- or flat-fold shield that must be firmly secured to the frame. Style C glasses do not provide maximum protection from the top and bottom angles.

### *b. Clothing*

Each individual shall furnish and wear appropriate clothing such as long pants and long sleeved cotton shirt, coveralls, etc. for this event. Clothing must be in good repair and fit properly. Oversized or loose fitting clothing is dangerous around agricultural equipment and is not allowed. Long-sleeves must be worn when welding or oxy-fuel cutting.

### *c. Other Materials*

Each participant must have a clipboard, two sharpened No. 2 pencils, and an electronic calculator. Calculators used in this event should be battery operated and operate in silence.

## 2. Provided- Specialized safety equipment

- a. Necessary equipment such as helmets, shields, gloves, welding leathers, hearing protection devices, etc. will be provided by the State FFA Agricultural Mechanics Career Development Event Committee.
- b. All tools and equipment will be furnished for the event. Individuals are allowed to use only the tools and equipment furnished by the national event committee. It is recommended that each team supply their own laptop or notebook style computer and printer for the team activity and occasionally for the problem-solving/skills activities.
- c. If a team member needs modified equipment due to physical size and stature, the student must supply this equipment. The team member or coach must present the student supplied equipment to the event superintendent prior to the start of the event for approval. Team members who need specialized or modified equipment due to disability as defined by the American Disabilities Act must submit the appropriate special needs request form and documentation with the team's certification form.

### **C. EVENT AREAS**

The State FFA Agricultural Mechanics Career Development Event is divided into the following five systems areas. Each system includes a broad range of information and performance skills common to agricultural mechanics.

1. **Machinery and Equipment Systems:** repair and maintenance, materials handling, processing, adjustments, fabrication, maintenance and repair
2. **Industry and Marketing Systems:** customer relations, accounting, communication, economics, service, sales, reading and interpreting regulations, safety, operating instructions, manufacturer's recommendations
3. **Energy Systems:** mechanical power, electrical power, chemical power, wind power, solar power, engine operation, maintenance, trouble-shooting, repair
4. **Structural Systems:** structures, storage, concrete, masonry, plumbing, construction, building materials, ventilation, heating, air conditioning
5. **Environmental-Natural Resource Systems:** water quality, sustainable agricultural practices, soil and water conservation, waste handling

### **D. TEAM ACTIVITIES**

#### **Team problem solving 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 events and members utilize the materials and equipment provided to undertake and prepare a written, computer mechanics generated solution. Teams organize themselves, assigning duties and completing tasks together or separately depending on individual skills and abilities. Each team receives a score and each team member receives one-third of the total team score.

### **E. INDIVIDUAL ACTIVITIES**

#### **1. Individual problem solving and skill development activities**

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 20 minutes to complete each of the five activities (100 minutes total).

#### **2. Written examination**

Each student completes an examination that consists of 50 multiple-choice questions with test worth 100 points.

### **F. SCHEDULE OF THEME ANNOUNCEMENT**

Agricultural mechanics theme for the career development event will be selected one year in advance. This information is published and distributed through the National FFA Organization, and posted at <http://web.missouri.edu/~pavt0689/natcon.html>, the agricultural mechanics web site. The theme for each year will be determined by the National FFA Agricultural Mechanics Career Development Event Committee. The event superintendent will notify National FFA Headquarters of the theme selected for the next year's event following the completion of the current year's event.

The specific theme for each year is posted on the web site during November of the previous year and information specific to each year's event is updated periodically throughout the year. Updates generally occur during June and August. The schedule for announcing event information and details on equipment selection is governed by equipment availability and late changes by equipment manufactures, dealers, and contributors. It is the committee's hope that the theme examples listed below will provide direction for students and their advisors. This short list should not stifle or limit the learning or instructional process as students and advisors prepare themselves to solve integrated system problems in the workplace of today and tomorrow.

## Themes

The schedule for agricultural mechanics themes is:

Plant Production Systems	2009
Integrated Pest Management	2010
Animal Production Systems	2011
Materials Handling Systems	2012
Processing Systems	2013

**Machinery and Equipment Systems-** application and equipment calibration, and nozzle selection, equipment testing and maintenance

**Industry and Marketing Systems-** mixing, loading, and transport safety, economics, understanding and following label instructions, governmental regulations

**Energy Systems-** power requirements, variable rate applications, and electronically controlled equipment, and valves, pumps, and pressure regulators

**Structural Systems-** storage, mixing and loading requirements, fire safety, temperature control, ventilation, construction requirements

**Environmental and Natural Resource Systems -** pesticide and pesticide container disposal, pesticide handling, drift control, impact on non-target plants, animals, and insects

## III. SCORING

Event participants are evaluated as follows:

### INDIVIDUAL SCORING

Written examination	100
Individual activities (5 @ 30 points each)	150
Team activity (1/3 of total team score)	83.3
<b>Total Possible Individual Score</b>	<b>333.3</b>

### TEAM SCORING

Top three written examinations	300
Individual activities for top three	450
Team activity	250
<b>Total Possible Team Score (top three)</b>	<b>1000</b>

## IV. TIEBREAKERS

The team score for the event will be determined by summing the points earned by the top-three team members. The following activities are used to break a tie between teams or individuals. The win goes to the individual or team with the highest written examination score(s). If still tied, the win goes to the highest problem-solving/skill scores. If still tied, the win goes to the highest team problem-solving score.

## V. AWARDS

Awards will be presented during a session at state convention. Awards are presented to teams as well as individuals based upon their rankings.

## **VI. REFERENCES**

This list of references is not intended to be inclusive. Other sources may be utilized and teachers are encouraged to make use of the very best instructional materials available. The goal of the National FFA Agricultural Mechanics Career Development Event is to guide and promote quality instructional programs in agricultural mechanics. The following list contains references that may prove helpful during event preparation. The multiple-choice test questions are written to be generic in nature and are selected from a variety of sources. It is the intent of the national event committee to reflect current technological practices, common to the agricultural production industry.

*FOS. John Deere.*

*Agricultural Power and Machinery.* McGraw-Hill.

*Mechanics in Agriculture.* Interstate Publishers.

*Agricultural Mechanics Fundamentals and Applications.*

Delmar Publishers.

*Modern Agricultural Mechanics.* Interstate Printers and Publishers.

*Developing Shop Safety Skills.* American Association for Vocational Instructional Materials.

*Power Tool Safety and Operation.* Hobar.

*Agricultural Mechanics I Lesson Plans.* UMC-IML.

*Agricultural Mechanics II Lesson Plans.* UMC-IML

*Agricultural Buildings and Structures.* Reston Publications.

*Practical Farm Buildings.* Interstate Publishers.

*National Electrical Code (1993 edition).* NFPA.

*Agricultural Structures, Volumes I and II.* UMC-IML.

*National FFA Agricultural Mechanics web site :*<http://web.missouri.edu/~pavt0689/natcon.html>

## **VII. EXAMPLES**

### **A. EVENT-RELATED COMPETENCIES**

The following list of statements with specific understandings and performances are provided as examples for the systems areas identified. Examination questions are primarily developed from "problem solving" categories. The "skills" categories are the basis for performance activities. Problem solving activities are developed from both "problem solving" and "skills" categories. In each systems area, the requirements for effective communication, problem solving activities, and the application of modern technology – specifically computers and computer software - are strongly emphasized. Industry has recently identified important skills, abilities and competencies needed by new employees. These important attributes are described following the list of system competencies:

## 1. MACHINERY/EQUIPMENT SYSTEMS COMPETENCIES

### Problem Solving

1. Identify safe tractor operation practices for field and highway conditions.
2. Identify the recommended service and maintenance operations from the operator's manual.
3. Select lubricants for machinery and equipment.
4. Identify functions of machinery components.
5. Identify parts and functions of hydraulic systems.
6. Identify and compute harvest losses.
7. Prepare machinery for storage.
8. Identify and select reduced tillage and conservation tillage equipment.
9. Explain principles of machinery management.
10. Describe functions of chemical application, fertilizing, harvesting, materials handling, processing, planting, seeding, and tillage equipment.
11. Select arc welding machines and accessories.
12. Read drawings and welding symbols.
13. Control distortion in arc welding.
14. Select appropriate electrodes and wires.
15. Select hard surfacing alloys.
16. Prepare materials and equipment for arc welding.
17. Test weld quality and strength.
18. Select shielding gases.
19. Describe the science of the welding processes.
20. Select gas welding, plasma arc and cutting equipment and supplies.
21. Assemble gas welding, plasma arc and cutting equipment.
22. Check equipment for leaks.
23. Select welding rods and fluxes.
24. Select hard surfacing alloys
25. Start-up and shut down of welding equipment.
26. Select shielding gases.
27. Describe the science of welding and cutting processes.
28. Describe cylinder sizes and gas flow extraction rates. Calculate the volume of acetylene that can be delivered per cylinder per hour.
29. Explain the functions of flashback arresters and reverse flow check valves.
30. Identify appropriate shapes of tool and equipment cutting edges.
31. Select abrasives for grinding and sharpening.
32. Describe the application of simple machines to cutting edges.
33. Identify safe adjustment [level] on power equipment.
34. Identify kinds of metal used in tool construction.
35. Identify various types and shapes of metals.
36. Select soldering equipment and tools.
37. Prepare metals for soldering.
38. Identify hand metal working tools by types and sizes.
39. Determine tap and drill sizes.
40. Select files and saw blades.
41. Read metal working plans and prints.
42. Identify metal alloys and their strength.
43. Identify and select power shears, benders, brakes and saws.
44. Calculate materials costs.
45. Identify pipe, valves and fittings by type.
46. Select pipe threading and cutting tools.
47. Select types of pipe and tubing.
48. Calculate lengths of pipe.
49. Joining dissimilar plumbing materials.
50. Select pipe sizes to meet pressure and flow requirements.
51. Select valves and controllers for turf and drip irrigation systems.
52. Identify and select pipe sealants.
53. Identify characteristics and applications of fiberglass and plastic.
54. Identify types of damage that can occur to fiberglass and plastic.
55. Identify repair procedures and techniques.
56. Select repair material needed for specific jobs.
57. Identify the appropriate tools to use when welding plastics.
58. Identify the types and properties of plastics.

### Skills

1. Check and adjust driveline components.
2. Adjust equipment hitches and drives.
3. Install, adjust and service belt and chain drives.
4. Select and use test equipment including meters, tachometers and timing devices to determine proper machine operation.
5. Adjust and/or calibrate chemical application, seeding, fertilizing, harvesting, processing and materials handling machinery.
6. Operate, test, and maintain machine systems.
7. Install, adjust and evaluate machine systems.
8. Inflate tires to proper air pressure to carry the heaviest load.
9. Adjust equipment to field and crop condition.
10. Identify different types of metals.
11. Lay out and prepare metal for arc welding.
12. Recommending metals based on load bearing strength
13. Weld basic joints in all positions.
14. Join pipe for welding.
15. Prepare for and apply hard surfacing alloys.

16. Adjust cutting machines for different metals, joints and thickness.
17. Start-up and shut down for welding equipment.
18. Light and adjust the torch flame for specific welding or cutting operations.
19. Lay out and prepare metal for welding or cutting.
20. Fuse and braze welding basic joints on mild steel and cast iron.
21. Cut mild steel, including pipe, all shapes.
22. Join steel pipe, tubing or shapes by welding.
23. Estimate and calculate welding materials costs.
24. Adjust machines for various types of thickness of metal.
25. Identify the type of metals used in agricultural instruction.
26. Cut metal with plasma cutting unit.
27. Prepare grinding and sharpening equipment.
28. Recondition hand tools such as hammers, twist drills, chisels, punches and screwdrivers.
29. Recondition keen edge wood cutting tools.
30. Recondition keen edge metal cutting tools.
31. Recondition chain saw, horticultural and turf cutting tools.
32. Recondition rotary lawn mower blades.
33. Adjust bed knife on reel mowers.
34. Solder copper joints and sheet metal.
35. Solder electrical connections.
36. Join metals with appropriate fasteners.
37. Cut threads with taps and dies.
38. Lay out and drill holes with twist drill.
39. Operate power tools such as nibblers, drills, and saws.
40. Operate hand tools such as saws and files.
41. Bend sheet and strap steel to angles or shapes.
42. Repair damaged threads.
43. Select appropriate metals for projects (strength).
44. Shape hot and cold metals using power shears, benders, brakes and saws.
45. Cut and assemble plastic pipe.
46. Cut, thread and assemble steel pipe.
47. Connect flare and compression fittings.
48. Solder copper fittings and tubing.
49. Assemble dissimilar plumbing materials.
50. Installing and setting programmable timers.
51. Select tools and materials for specific repair jobs.
52. Repair structural or cosmetic damage using proper materials.
53. Select and use appropriate safety equipment.
54. Fuse plastic parts using plastic welding processes.
55. Construct plastic projects.
56. Compile thermoplastic welds.
57. Weld plastic using hot air method.
58. Identify the types of plastics to be welded.
59. Describe the methods of welding plastics.
60. Select and use plastic welding equipment.
61. Identify weldable plastic by burn tests.
62. Weld plastics using the basic weld parts.

## 2. INDUSTRY AND MARKETING SYSTEMS COMPETENCIES

### Problem Solving

1. Complete and interpret pre-delivery and delivery instructions.
2. Describe importance of customer relations and communications.
3. Comprehend cab and environment controls (air conditioning and heating).
4. Compare costs of ownership, lease, rental and custom agreements.
5. Interpret and follow recommended service and maintenance schedules.
6. Determine proper practices and procedures for storing an engine.
7. Use of operator's manuals.
8. Identify safe machinery operating practices.
9. Select machinery parts using manufacturer's catalogs, microforms, microfiche or computers.

10. Evaluate building warranties.
11. Determine finance and insurance needs.
12. Identify and be able to describe safety practices.
13. Read and interpret drawings, plans, symbols and figuring of bill of materials.

### Skills

1. Adhere to safe operating practices during the completion of all activities.
2. Perform pre-delivery setup and adjustment.
3. Demonstrate interaction with customer/fellow employee.
4. Identify and use international operator symbols.
5. Adjust operator controls for best fit.
6. Select appropriate tools and equipment.

### 3. ENERGY SYSTEMS COMPETENCIES

#### Problem Solving

1. Identify safe tractor operation practices for field and highway conditions.
2. Identify the recommended service and maintenance operations from the operator's manual.
3. Describe how to repair a specific component or system.
4. Select fuels, lubricants, hydraulic fluids and coolants for proper operation.
5. Identify importance of oil analysis as a management tool.
6. Operation and interpretation of circuit diagrams, and flowcharts for: electrical, hydraulic, fuel, oil, cooling, intake and exhaust systems.
7. Identify the function and operating principles of tractor clutch, transmissions, control devices and brakes.
8. Explain and describe principles of power transmission.
9. Identify the parts and functions of electrical, hydraulic, lubrication, cooling, governor and fuel systems.
10. Interpret horsepower, torque and other power measurement criteria.
11. Identify and use OECD (Organization for Economic Cooperation and Development) and/or Nebraska Tractor Test results.
12. Interpret metric units in measurements.
13. Select proper ballast and tractor weighting.
14. Compare costs of alternative machine uses.
15. Understand interactive electronic components.
16. How to use load/inflation table for tires (constant deflection table).
17. Describe operating principles of two-stroke and four-stroke spark or compression ignition engines.
18. Identify the use and function of engine repair tools.
19. Evaluate engine performance under load and no-load operation
20. Evaluate engine parts or short blocks for replacement or servicing.
21. Evaluate engine parts or short blocks for replacement or servicing.
22. Determine hydraulic cylinder force and speed.
23. Use appropriate standards for agricultural applications, including the National Electrical Code (NEC), Electrical Testing Laboratory (ETL), Factory Mutual, Underwriters Laboratory (UL), Canadian Standard Association (CSA) and/or OSHA standards.
24. Plan safe electrical circuits.
25. Select conductor type and size for specific applications.
26. Calculate voltage drop.
27. Determine electrical power requirements.
28. Identify the characteristics of single and three-phase circuits.
29. Plan and evaluate proper grounding systems and ground-fault protection.
30. Determine volt, amp and ohm relationships (Ohm's and other application laws).
31. Select adequate and appropriate lighting fixtures.
32. Make connections in a computer-simulated wiring task.
33. Select motors based upon type of application.
34. Interpret electric motor nameplate data.
35. Service electric motors.
36. Identify electric motors and motor parts.
37. Identify methods of providing electric motor protection.
38. Interpret power (horsepower, kilowatt), power factor, torque and other motor selection criteria.
39. Select size and isolate standby power generators.
40. Calculate heating and cooling loads.
41. Interpret wiring diagrams.
42. Identify and describe basic principles of controls including thermostats; humidistat; photoelectric; magnetic relays; programmable controllers; proximity switches and sensors; ultrasonics; timers and other time-delay equipment; and pressure, motion, limit, float and sail switches.
43. Select controls from supply catalogs, microforms, microfiche or computers.
44. Select controls for electrical applications.
45. Use low-voltage electrical control equipment.
46. Identify and select devices for automated systems.
47. Select aquaculture air delivery systems.
48. Select aquaculture water heating devices.
49. Determine water filtration needs.
50. Establish ballast and tire pressures.
51. Use safe wiring practices for specific applications.
52. Select standby power generators and isolation equipment for specific applications.
53. Match tractors to implements.

#### Skills

1. Connect electrical and hydraulic motor drives.
2. Conduct a pre-operation inspection of a tractor.
3. Starting, stopping and operating the tractor engine.
4. Perform recommended periodic service jobs (as found in operator's manuals).

5. Use measuring tools and test instruments such as: micro metering and telescoping gauges, dial indicator, compression tester, torque wrench, VOA (volt-ohmamp)- meter, DMM (digital multi-meter), timing devices, tachometer and dynamometer for determining test procedures.
6. Test and troubleshoot electronic sensing devices.
7. Remove, service and replace electrical components.
8. Test and service batteries, charging, lighting, warning and cranking systems.
9. Test and service cooling systems.
10. Make hitch and PTO adjustments to the implement.
11. Adjust wheel tread spacing.
12. Adjust steering linkage.
13. Match tractors to implements.
14. Conduct on-board tractor monitor checks as identified in operator's manual.
15. Test and service air conditioning systems.
16. Test engine for emissions.
17. Select and use engine overhaul equipment, including valve, cylinder, piston, seal and bearing tools.
18. Service and maintain fuel, air intake and exhaust, cooling and lubrication systems.
19. Operate engine and adjust or check ignition timing, engine speed and carburetor adjustments.
20. Read schematics and sketch wiring circuits.
21. Attach conductors to terminals.
22. Install plugs and cord connector bodies.
23. Make proper splices and connections.
24. Troubleshoot electrical circuits using proper testing equipment and measuring devices.
25. Measure electrical circuits for voltage, amperage, resistance and wattage.
26. Install service entrance for single phase 120/240 V service or three-phase power.
27. Wire 120/240V service outlets.
28. Install electrical circuits, switching devices and appliances.
29. Install ground-fault circuit interrupters.
30. Make connections in a computer-simulated wiring task.
31. Troubleshoot electric motor circuits using proper testing equipment.
32. Connect a dual voltage motor to power source.
33. Change the direction of electric or hydraulic motor-rotation.
34. Disassemble and reassemble an electric motor.
35. Provide suitable motor over-current protection.
36. Service and lubricate and electric motor.
37. Check the running amperage and voltage of a motor.
38. Select and mount an electric motor on a machine.
39. Connect electric motor controls.
40. Install timer circuits and automation devices.
41. Install thermal and solid-state delay/relay controls.
42. Install a low-voltage motor control system.
43. Install sensing devices including thermostats, humidistat; photoelectric; magnetic relays; programmable controllers; proximity switches and sensors; ultrasonics; timers and other time delay equipment; and pressure, motion, limit, float and sail switches.
44. Wire devices that are capable of providing artificial heat.
45. Select and install aquaculture control and sensing systems.

#### **4. ENVIRONMENT AND NATURAL RESOURCES SYSTEMS COMPETENCIES**

##### **Problem Solving**

1. Identify environmental problems in livestock and crop handling and processing buildings.
2. Read and interpret maps including conservation, land use, soils, topographic, aerial and remote sensing, and geological surveys.
3. Describe principles involved in appropriate conservation and/or land use planning.
4. Read legal land descriptions.
5. Determine land areas.
6. Identify the types and parts of leveling instruments.
7. Determine the difference in elevation of two or more points.
8. Determine cuts, fills, cut/fill ratios, and volumes.
9. Describe the characteristics of a profile-leveling plot.
10. Identify water quality criteria for aquaculture.
11. Read and interpret a topographic map.
12. Select terracing and water diversion options for soil conservation.
13. Selecting strip-cropping principles and practices.
14. Select water management techniques including grassed waterways, parallel terrace outlets, tile outlet systems and erosion control structures.
15. Determine types of vegetative cover and mulch for erosion stabilization.
16. Determine and select appropriate cultural tillage or mechanical practices of equipment for specific soil type and residue management.
17. Compare effects of traffic patterns on soil compaction.

18. Calculate soil loss using universal equations and determine effects of the components of the equations.
19. Determine practices to improve or maintain water quality and recharge.
20. Determine appropriate types, locations and uses of erosion and sedimentation control basins.
21. Determine appropriate types, locations and uses of water impoundment structures.
22. Describe surface and subsurface drainage and irrigation techniques.
23. Calculate subsurface drainage and irrigation requirements.
24. Determine if drainage or irrigation is economically and physically feasible.
25. Select appropriate drainage including open drainage, closed gravity and pumping systems.
26. Determine land shaping and grading requirements.
27. Determine economics of alternative systems.
28. Determine water needs.
29. Select irrigation systems for specific conditions.
30. Select irrigation equipment and techniques.
31. Determine soil moisture and temperature.
32. Select surface and subsurface irrigation systems for specific application.
33. Identify and select fittings for irrigation systems.
34. Identify size system components.
35. Determine power requirements and pump size for specific applications.
36. Calculate irrigation system requirements.
37. Make water management choices.
38. Understand water quality impacted by drainage and irrigation.
39. Understand pressure, flow and head.
40. Select pumps and power sources and compare efficiencies.
41. Interpret pump characteristics curves.
42. Determine appropriate waste disposal methods.
5. Determine direction by use of a compass.
6. Record field notes for differential, profile, and topographic leveling.
7. Lay out contour lines.
8. Lay out grade stakes for cut/fills.
9. Determine soil types and selecting appropriate structures or practices.
10. Use automatic leveling and laser equipment.
11. Use water-testing equipment.
12. Lay out and mapping contour lines.
13. Measure crop residue on the land.
14. Determine soil losses.
15. Measure cross-sectional areas of a grass waterway, drainage ditch, and earthen embankment.
16. Determine field slope and length.
17. Identify soil limitations and determine the effects on land use.
18. Use maps to make selection and determine location of conservation practices or land use changes.
19. Assemble turf irrigation equipment.
20. Determine soil moisture.
21. Estimate soil permeability and infiltration rates.
22. Determine and compare evaporation losses.
23. Install drainage systems or components.
24. Determine cuts, fills and grade lines.
25. Lay out contour ditches, basins, borders, contour levees, furrow, and corrugation systems for irrigation.
26. Determine proper waste disposal procedures.
27. Lay out and assemble solid-set, lateral move, centerpivot and traveling gun irrigation systems and components.
28. Lay out and assemble trickle and drip irrigation systems or components including mainlines, lateral lines, control devices, valves, pressure regulators, gauges and filters.
29. Select and install components of irrigation systems for specific applications.
30. Calculate well capacity and demand.
31. Determine delivery rates of pumps.
32. Select pumps and power units.
33. Calculate chemical injection rates.
34. Determine percent of slope or grade.

### **Skills**

1. Set up and level the surveying instrument.
2. Take rod readings.
3. Measure distance with tape and/or instruments.
4. Lay out corners using instruments.

## **5. STRUCTURES SYSTEMS COMPETENCIES**

### **Problem Solving**

1. Select and evaluate building sites.
2. Determine the size, specifications and layout of building.
3. Select appropriate framing, siding, roofing, insulation and vapor barrier materials.
4. Develop a bill of materials.
5. Interpret plans and working drawings.
6. Identify structural components of buildings.
7. Select preservatives for building materials.
8. Evaluate building construction techniques.
9. Select hand, electric and pneumatic tools.
10. Estimate handling materials, cost and construction time.
11. Plan footings, foundations, and concrete finishing.

12. Identify and select materials for concrete form construction.
  13. Determine quantity and cost of materials for concrete and masonry jobs.
  14. Determine the appropriate water-cement ratio and aggregate for concrete masonry construction.
  15. Select materials for concrete and masonry construction.
  16. Order "ready-mix" concrete.
  17. Identify procedures for mixing and placing concrete in cold or hot weather.
  18. Identify materials and techniques to reinforce concrete and masonry construction.
  19. Identify techniques for placing, finishing and curing concrete and masonry units.
  20. Identify concrete additives to increase strength and reduce cracking.
  21. Identify concrete additives to control hydration rate.
  22. Identify and select masonry materials.
  23. Describe and select masonry mortar.
  24. Identify and select tools and equipment for concrete and masonry construction.
  25. Interpret lumber and manufactured wood product grade stamps.
  26. Determine ventilation air inlet size based on exhaust fan capacity.
  27. Identify alternative construction styles (stud frame, post frame, rigid arch, and stressed skin).
  28. Identify structural components for each alternative construction style.
  29. Specify materials for the construction of wood foundation systems.
  30. Develop plans for selected enterprises.
  31. Calculate and compare the installation and maintenance costs of crushed rock and concrete materials in the construction of feedlot surfaces.
  32. Determine size and quality of aggregates and materials.
  33. Select aggregates, concrete and mortar-mixes, and prepare a trial mix.
  34. Calculate masonry units needed for a given application.
  35. Use traditional, electronic and laser tools in concrete and masonry construction.
  36. Evaluate building systems and construction practices based on standards provided in one of the following model building codes: UBC, BOCA OR SBC.
  37. Specify and plan windbreak structures for livestock protection and reduction of snow accumulation in feedlot and farmstead drive areas.
2. Identify, select and apply construction fasteners.
  3. Use and maintain hand, electric and pneumatic tools and measuring instruments for building construction.
  4. Construct buildings or building components.
  5. Lay out and cut structural components.
  6. Construct trusses with different building materials.
  7. Install composition shingles, metal and fiberglass roofing materials.
  8. Apply paint and other finishing materials.
  9. Prepare a site for concrete and masonry construction.
  10. Construct forms.
  11. Calculate concrete or mortar mix.
  12. Determine moisture content in sand.
  13. Mix concrete or mortar on the job site.
  14. Conduct and evaluate a slump test.
  15. Place concrete or masonry reinforcement.
  16. Lay out and make isolation, control and construction joints.
  17. Place, consolidate, finish and cure concrete.
  18. Place and finish concrete masonry units.
  19. Produce special finishes on concrete.
  20. Use and maintain concrete and masonry tools and equipment.
  21. Calculate types and amount of concrete or mortar mix for a job.
  22. Adjust ventilation air inlet openings.
  23. Fabricate and install reinforcing steel bar and welded wire mesh.
  24. Specify and use admixtures that entrain air, retard set, reduce water requirements and/or improve concrete mix workability in concrete mixes.
  25. Set-up manufactured form systems for poured-in-place foundation walls.
  26. Select and apply appropriate framing, siding, roofing, insulation and vapor barrier materials

#### **GENERAL SKILLS**

1. Strong interpersonal communication abilities.
2. Knowledge combined with leadership qualities and the ability to delegate responsibilities.
3. People skills to deal with customers, the public and large groups.
4. Identify and interpret the correct resources to make an educated decision.
5. Understand and apply principles of mathematics, economics, biology and physics.
6. Have a high level of common sense, logic, and critical thinking skills.
7. Be an independent thinker with an analytical mind.
8. Ability to understand and follow detailed instruction - written and oral.

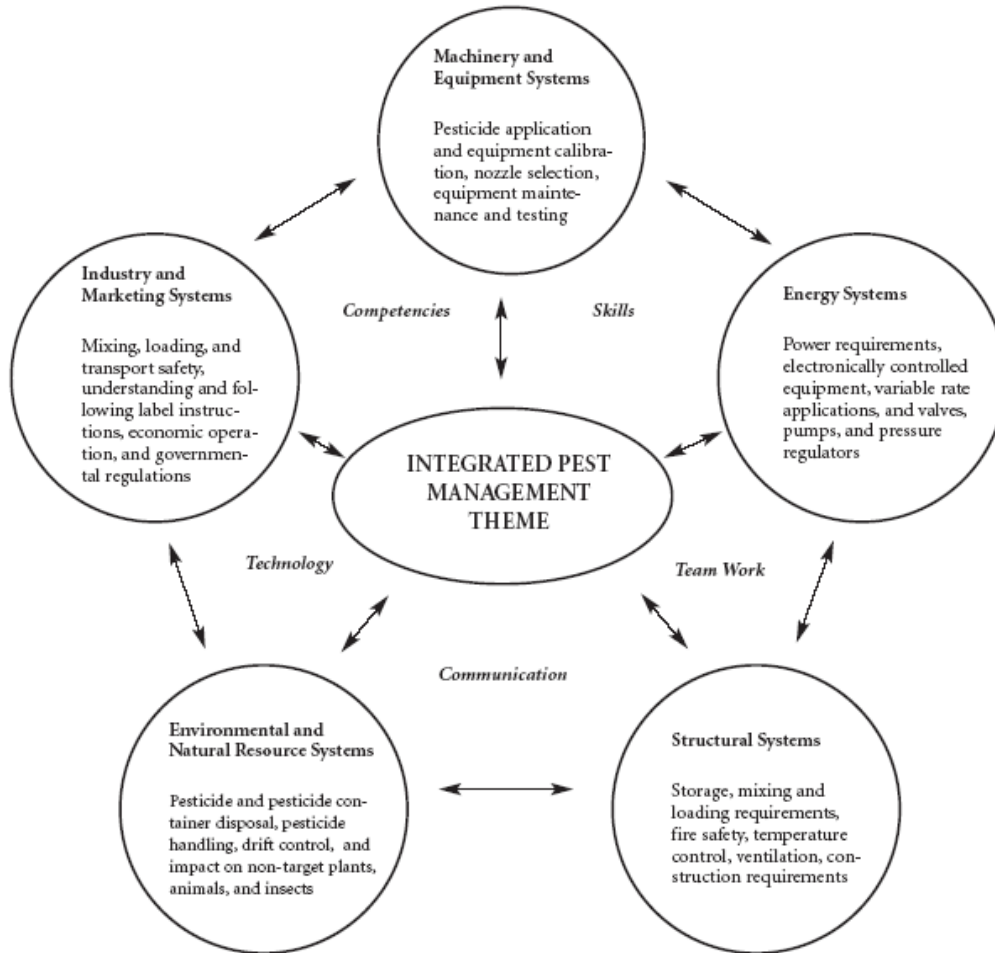
#### **Skills**

1. Lay out a building foundation.

9. Motivated to learn and having the ability to learn from various methods of instruction.
10. Be literate and remain literate in current technologies - computers, electronics, mechanical systems, etc.
11. Know how to calculate cost per units, per hour, per bushel, per acre, etc.
12. Know how to estimate value of equipment and recommend future buying decisions.
13. Know how to use technology to eliminate waste of time and resources.
14. Know about computer hardware, software, Internet, etc.
15. Know how to be productive with time, money, and people.
16. Be knowledgeable with global agriculture - encompassing planning, production, marketing, and finance.
17. Understand how cash flow is critical for business planning and operation.
18. Know how to measure and estimate costs and develop plans for business/industry improvements.
19. Be able to write annual goals with specific objectives and measurement tools for review.
20. Have skills in business operations and management.
21. Have experience with general accounting and cash flow management.
22. Be able to effectively implement the use of technology in the workplace.
23. Understand how to use a systematic approach to diagnose equipment problems.
24. Know how to service and maintain equipment so that productivity can be maintained.
25. Understand on-board computerized systems that monitor, test, store, and report equipment operation.
26. Be familiar with computerized recognition of crop productivity and quality, field conditions, and pests.
27. Understand electrical circuits - amperage, watts, voltage, resistance, and transistors.
28. Understand hydraulic system operation - flow, resistance, and temperature.
29. Understand mechanical system operation – mechanical advantage, material specifications, and gear design.
30. Have experience in reading schematics, replacing components – including control modules.
31. Know how to diagnosis electrical, computer, mechanical, and hydraulic systems.
32. Have experience in analyzing mechanical system failures.
33. Have experience with CAD software and know how to produce mechanical drawings.

A number of other issues also influence the systems associated with integrated pest management. Such things as: turf verses agriculture applications, non-restricted verses restricted use pesticides, and recent changes in governmental regulations are just a few of the additional concerns that affect the planning,

**SAMPLE INTEGRATED PEST MANAGEMENT THEME**  
**National FFA Agricultural Mechanics Career Development Sample**



This chart illustrates an integrated pest management problem that depicts interaction between all five agricultural mechanics systems. Alternative themes would emphasize related competencies and other versions of a integrated pest management theme could include other competencies. Individuals and teams must possess knowledge and skills in all systems areas to determine acceptable problem solutions.

A number of other issues also influence the systems associated with integrated pest management. Such things as: turf verses agriculture applications, non-restricted verses restricted use pesticides and recent changes in governmental regulations are just a few of the additional concerns that effect the planning, preparation and completion of this activity. The complexity of this theme is further compounded by the number of competencies and skills involved in the solving of such intricate problems. Given the complexity of such problems, individuals are better prepared when they have information/knowledge, experience and expertise within several of the systems areas.

## AGRICULTURAL MECHANICS CAREER DEVELOPMENT EVENT

### What is it?

This CDE tests both technical and agricultural mechanics skills and your ability to work with others while solving problems. During the event, members complete a written exam and demonstrate problem-solving and hands-on performance skills. The event takes a "systems" approach and emphasizes machinery and equipment systems, related industry and marketing systems, energy systems, structural systems and environmental/natural resource systems.

### Career Opportunities

#### *Career Clusters*

- Agricultural and Forestry Production
- Marketing, Merchandising, and Sales
- Science and Engineering
- Social Services
- Education and Communication

*Career opportunities found in the career cluster areas:*

- **Agricultural and Forestry Production** – field sales representative –agriculture equipment
- **Marketing, Merchandising, and Sales** – technical service representative
- **Science and Engineering** – diesel mechanic, agricultural electrician, agricultural equipment designer, machinist, equipment operator, agricultural safety engineer, irrigation engineer, welder, agricultural engineer
- **Education and Communication** – technical writer, postsecondary teacher

### Educational Requirements

**Vocational Technical & Industry Training** – welder, equipment operator, agricultural electrician, machinist,

**Associates Degree** – diesel mechanic, technical service representative

**Bachelor of Science Degree** – field sales representative- agricultural equipment, agricultural safety engineer, irrigation engineer, agricultural engineer, technical writer

**Graduate Degree** – agricultural equipment designer, postsecondary teacher

### SAE Opportunities

Rebuilding a lawnmower engine, overhauling a diesel engine, design and build a trailer, building a pole barn and fence, wiring a barn or other agricultural structure, employment at a tractor dealership

### Proficiency Award Areas

#### *Agriculture Mechanical Systems Cluster*

- Design and Fabrication
- Repair and Maintenance
- Energy Systems

### Curriculum Resources

- FOS. John Deere.
- *Agricultural Power and Machinery.* McGraw-Hill.
- *Mechanics in Agriculture.* Interstate Publishers.
- *Agricultural Mechanics Fundamentals and Applications.* Delmar Publishers.
- *Modern Agricultural Mechanics.* Interstate Printers and Publishers.
- *Developing Shop Safety Skills.* American Association for Vocational Instructional Materials.
- *Power Tool Safety and Operation.* Hobar.
- *Agricultural Mechanics I Lesson Plans.* UMC-IML.
- *Agricultural Mechanics II Lesson Plans.* UMC-IML.
- *Agricultural Buildings and Structures.* Reston Publications.
- *Practical Farm Buildings.* Interstate Publishers.
- *National Electrical Code (1993 edition).* NFPA.
- *Agricultural Structures, Volumes I and II.* UMC-IML
- National FFA Agricultural Mechanics web site: <http://web.missouri.edu/~pavt0689/natcon.html>