

Agricultural Construction

Curriculum Guide: *Agricultural Construction Volume I*

Unit: I. Arc Welding

Unit Objective:

Students will apply principles of arc welding by performing common welds, identifying welding equipment, and answering welding-related questions.

Show-Me Standards: 1.10, CA3

References:

Agricultural Construction Volume I. University of Missouri-Columbia, Instructional Materials Laboratory, 1989.

American Welding Society. Accessed November 18, 2003, from <http://www.aws.org/>.

ESAB Knowledge Centre. ESAB. Accessed November 25, 2003, from <http://www.esab.com/>.

Hobart Institute of Welding Technology. Accessed November 17, 2003, from <http://www.welding.org/>.

Lincoln Electric. Accessed November 18, 2003, from <http://www.lincolnelectric.com/>.

Machinery Safety: Welding. National Ag Safety Database. Accessed November 17, 2003, from http://www.cdc.gov/nasd/menu/topic/machinery_welding.html.

Miller Electric. Accessed November 18, 2003, from <http://www.millerwelds.com/>.

Missouri CDE Handbook. Accessed November 14, 2003, from http://www.dese.mo.gov/divcareered/ag_cde_guidelines.htm.

Missouri FFA Agricultural Mechanics Career Development Event. Accessed November 19, 2003, from <http://web.missouri.edu/~pavt0689/statecon.html>.

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Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 8.
- Students will complete JS 4.1, Welds in the Flat Position; JS 4.2, Welds in the Horizontal Position; JS 4.3, Welds in the Vertical-Up Position; JS 4.4, Welds in the Vertical-Down Position; JS 4.5, Welds in the Overhead Position; JS 5.1, Prewelding and Postwelding Procedures for GMAW; JS 5.2, Welds in the Flat Position; JS 5.3, Welds in the Horizontal Position; JS 5.4, Welds in the Vertical Position; JS 5.5, Welds in the Overhead Position; JS 6.1, Hardsurfacing; JS 7.1, Welding Cast Iron; JS 8.1, Pipe Welding T-Joints; JS 8.2, Laying Out Angles; JS 8.3, Closing the End of Pipe – Orange-Peel Plug; JS 8.4, Butt Joint – Repositioned; and JS 8.5, Butt Joint – Not Repositioned.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: pp. I-5–I-6 (1, 2, 3), p. I-17 (2), p. I-29 (1, 2, 3, 4), p. I-82 (3), p. I-119 (1), p. I-133 (3), and p. I-147 (3, 4).

Performance-Based Assessment:

Students will perform a series of welds determined by the instructor, identify arc welding equipment, and answer questions about arc welding equipment and procedures. This activity is modeled on the arc welding portion of the Agricultural Mechanics Career Development Event.

Assessment will be based on the ability to safely and correctly perform the assigned welding procedures and on the accuracy of responses to the identification and written assessment portions of the activity.

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The instructor should explain the performance-based assessment activity format at the beginning of the unit. Students will work toward completing the competencies necessary to perform the activity as they progress through the unit material. The assessment activity will be due at the completion of the unit.

1. Explain the performance-based assessment activity format at the beginning of the unit: At the completion of the unit, students will perform a series of welds, identify welding-related equipment, and answer questions about welding equipment and procedures. Welds will be determined by the instructor and announced at the time of the performance-based assessment activity.
2. Use or adapt the activity sheets found in the unit to assess student competency at welding. Review or supplement these activities as needed, based on student mastery of the procedures and equipment the students will be using. **NOTE: Students should only complete this performance-based activity if they have mastered all the relevant competencies and have the instructor's permission to perform the activity.**
3. Assign the performance-based assessment activity. The student handout can be used as an outline for the activity or adapted as desired.
 - a. Information and directions for the student handout as it is currently written are listed at the end of this instructor guide.
 - b. Section II requires some advance setup by the instructor.
4. This activity will help prepare students for the arc welding portion of the Agricultural Mechanics Career Development Event.
 - a. Refer to the *Missouri CDE Handbook* for guidelines regarding Career Development Events. The *Missouri CDE Handbook* is available from the Missouri Department of Elementary and Secondary Education at http://www.dese.mo.gov/divcareered/ag_cde_guidelines.htm.
 - b. Previous years' agricultural mechanics events can be found at <http://web.missouri.edu/~pavt0689/statecon.html>, accessed July 7, 2003.
5. Have students turn in their welds and completed handouts.

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6. The final assessment score will be based on the ability to safely and correctly perform the assigned welding procedures and on the accuracy of responses to the identification and written assessment portions of the activity. All welds must pass destructive testing.
7. ADDITIONAL ACTIVITIES:
 - a. Create a display board using the students' best welds. Possible display board themes include the following: each student's best weld, the best example of each type of weld performed by the class, and the best weld of the week.
 - b. Create a display board that identifies different metals and their characteristics. Have students contribute samples.

Section I: Welding

1. Have students perform a series of welds that they have mastered as part of the instructional activities for this unit.

Section II: Identification

1. Select ten parts of the shielded metal arc welder, gas metal arc welder, or items of related equipment that have been discussed in class.
2. Label the parts or items with tags A through J.
3. Have students identify the parts on their handouts.

Section III: Written Assessment

1. Have students answer questions about arc welding procedures, equipment, or safety. Multiple-choice and short-answer questions are suggested.
2. The answers to the questions on the student handout are listed below.

Answers to Written Assessment:

1. b
2. c
3. d

4. Students should list four of the following:
 - a. Always wear a helmet with the proper shade lens.
 - b. Always check the helmet and lens for cracks before using.
 - c. Wear long sleeves and gauntlet-style gloves.
 - d. Do not leave any skin exposed to rays from the welder.
 - e. Shout the word "Cover!" to all people standing nearby when ready to strike the arc.
 - f. Never look at the arc with an unprotected eye.

5. Students should list three of the following:
 - a. Impurities cause poor fusion or bending of base metals, reducing their strength.
 - b. Foreign material or impurities are poor conductors of electricity.
 - c. Foreign material or impurities interfere with control and manipulation of the arc.
 - d. Weld appearance is improved when impurities are removed.

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Unit I—Arc Welding
Student Handout**

Section I: Welding

Directions:

1. The instructor will give you a series of welds to perform.
2. Perform the assigned welds.
 - Wear appropriate safety equipment at all times.
 - Follow all assigned safety procedures. You can lose points for not following safety precautions and other assigned procedures.
 - Inspect the equipment, materials, and work area to ensure safe and correct operation.
 - Perform the welds using the assigned procedure.
 - Inspect your work.
 - Follow shutdown and cleanup procedures and return all equipment and materials to their assigned places.
 - Turn in your work to the instructor.
3. Complete sections II and III of the activity and turn your completed handout in to the instructor.
4. Your final assessment score will be based on your ability to safely and correctly perform the assigned welding procedures and on the accuracy of your responses to the identification and written assessment portions of the activity. All welds must pass destructive testing.

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Section II: Identification

Directions:

Go to the identification station. Write the names of the tagged parts or items in the spaces below. Be sure to write each name next to its correct tag letter.

- | | |
|----|----|
| A. | F. |
| B. | G. |
| C. | H. |
| D. | I. |
| E. | J. |

Section III: Written Assessment

Circle the letter that corresponds to the correct answer.

- To weld a lap joint in flat position with a shielded metal arc welder, which choice is the correct work angle and travel angle?
 - 90-degree work angle and a 45-degree travel angle
 - 45-degree work angle and a 25- to 30-degree travel angle
 - 90-degree work angle and a 25- to 30-degree travel angle
 - 45-degree work angle and a 90-degree travel angle
- A bright silver metal that is slightly magnetic and relatively hard to chip is likely to be which of the following?
 - Wrought iron
 - Aluminum
 - Stainless steel
 - Cast iron
- For gas metal arc welding, the lens should *not* be lighter than number _____.
 - 4
 - 7
 - 9
 - 11

Complete the following short-answer questions.

4. List four ways to avoid exposure to harmful light rays when arc welding. (Each answer is worth 1 point for a maximum value of 4 points.)
 - a.
 - b.
 - c.
 - d.

5. List three reasons why metals should be cleaned before being welded. (Each answer is worth 1 point for a maximum value of 3 points.)
 - a.
 - b.
 - c.

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Scoring Guide**

Name _____

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Assessment Area Section I	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Positioning	Metal was positioned properly	Failed	Poor	Fair	Good	Excellent	X 3	
Electrode and Amperage Selection	Electrode was appropriate and amperage was correctly set	Failed	Poor	Fair	Good	Excellent	X 3	
Distortion	Welds show no signs of distortion	Failed	Poor	Fair	Good	Excellent	X 4	
Appearance	Appearance indicates correct speed of travel, amperage setting, and arc length	Failed	Poor	Fair	Good	Excellent	X 5	
Strength	Welds are strong and sound	Failed	Poor	Fair	Good	Excellent	X 5	
Safety and Work Habits	Student followed all safety precautions	Passed				Failed	X (-20)	Negative <u>Points</u> *
	Student followed all assigned procedures	Excellent	Good	Fair	Poor	Failed	X (-8)	Negative <u>Points</u> *
TOTAL								/80 pts.

Assessment Area		Total
Section II: Identification		
Section III: Written Assessment		
TOTAL		/20 pts.

Final Assessment Total _____/100 pts.
 * Overall combined score cannot be lower than 0.

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 Comments:

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Unit: VI. Project Construction

Unit Objective:

Students will demonstrate an understanding of the skills and procedures necessary to build a project by selecting an appropriate project; devising elevation drawings, a bill of materials, and a plan of procedure for the project; and applying their plan to complete the project within the allotted time.

Show-Me Standards: 2.5, MA2

References:

Agricultural Construction Volume I. University of Missouri-Columbia, Instructional Materials Laboratory, 1989.

Agricultural Mechanics Building Plans. University of Missouri-Columbia, Instructional Materials Laboratory, 1994.

Agricultural Mechanics Plans (Set). University of Missouri-Columbia, Instructional Materials Laboratory.

Master Plans Trailer Plans Store. Accessed December 15, 2003, from <http://www.trailerplans.com/>.

Instructional Strategies/Activities:

- Students will engage in study questions in lessons 1 through 14.
- Students will complete HO 2.1, Project Construction Check List; WS 3.1, Estimated Bill of Materials; WS 3.3, Where Are Materials Obtained?; WS 4.1, List of Tools and Procedures; WS 4.2, Tools – Safety Precautions; WS 5.1, Time Estimation Sheet; WS 6.1, Interpreting the Project Plan for a Pipe Sawhorse; WS 10.1, Quality Control – Project Evaluation Check List; WS 13.1, Actual Costs of Materials and Labor; and WS 14.1, Hand and Power Tools Used in Completing a Project.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. VI-5 (1, 3, 4), p. VI-15 (2), pp. VI-25–VI-26 (2, 3), p. VI-41 (1, 2, 3, 4), p. VI-51 (1, 2), p. VI-57 (1, 2), p. VI-68 (2, 4), p. VI-79 (1, 2, 3), p. VI-91 (2, 3, 4), p. VI-99 (1, 3, 4), p. VI-118 (2, 3), and p. VI-131 (1, 2).

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Performance-Based Assessment:

As part of the instructional strategies and activities for this unit, students will complete an estimated bill of materials, a list of tools and procedures and safety precautions, and a time estimation sheet for sample project plans included with the unit. For the performance-based assessment activity, students will apply the skills and procedures discussed in the unit to select, plan, and complete an appropriate project.

Assessment will be based on the overall quality of the work and the ability to safely and correctly complete the project within the available time.

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The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. As part of the instructional strategies and activities for this unit, students will complete an estimated bill of materials, a list of tools and procedures and safety precautions, and a time estimation sheet for sample project plans included with the unit.
2. For the performance-based assessment activity, have students apply the skills and procedures discussed in the unit to choose and complete an appropriate project. Use the handouts and work sheets in the unit to help students select, plan, and complete their projects. **NOTE: Students should only complete this performance-based activity if they have mastered all the relevant competencies and have the instructor's permission to perform the activity.**
3. The student handout for this activity is a checklist that includes key steps in the project completion process based on the handouts and worksheets included in the unit.
 - a. Students can use the checklist to track the progress of their project and ensure that they perform the necessary steps in the proper sequence.
 - b. Supplement or modify the student handout to reflect projects or assignments as needed.
4. Have students turn in their completed project.
5. A scoring guide based on WS 10.1, Quality Control – Project Evaluation Check List, is included with this activity that can be used to assess students' projects.
 - a. Because this performance-based activity represents a more comprehensive project than other unit activities, the number of points possible has been set at 500 instead of 100.
 - b. Adjust the total point values, assessment criteria, and weight as needed.
6. The final assessment score will be based on the overall quality of the work and the ability to safely and correctly complete the project within the available time.

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Unit VI—Project Construction
Student Handout**

Name _____

Project Completion Checklist

Use the checklist below to track the progress of your project.

Procedure	Date Due
<input type="checkbox"/> Complete Lesson 1: Safety Procedures for Project Construction.	
<input type="checkbox"/> Complete and turn in HO 2.1, Project Construction Check List.	
<input type="checkbox"/> Complete and turn in WS 3.1, Estimated Bill of Materials.	
<input type="checkbox"/> Turn in signed Parental Permission Form, WS 3.2.	
<input type="checkbox"/> Complete elevation drawings for the project.	
<input type="checkbox"/> Develop a plan of procedure and list of tools needed.	
<input type="checkbox"/> Review safety precautions for the tools to be used. You can lose points for not following safety precautions and other assigned procedures.	
<input type="checkbox"/> Complete and turn in WS 5.1, Time Estimation Sheet.	
<input type="checkbox"/> Perform a quality control inspection of the project during construction. Use WS 10.1.	
<input type="checkbox"/> Complete project construction.	
<input type="checkbox"/> Prepare the surface and apply the finish.	
<input type="checkbox"/> Perform a quality control inspection of the project following completion. Use WS 10.1.	
<input type="checkbox"/> Complete and turn in WS 13.1, Actual Cost of Materials and Labor.	
<input type="checkbox"/> Complete and turn in WS 14.1, Hand and Power Tools Used in Completing a Project.	
<input type="checkbox"/> Turn in the completed project.	

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Name _____

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Assessment Area	Criteria	0 Points	1 Point	2 Points	3 Points	4 Points	Weight	Total
Quality of Work	<input type="checkbox"/> Fasteners are appropriate <input type="checkbox"/> Measurements are accurate <input type="checkbox"/> Parts fit for maximum strength <input type="checkbox"/> Tools and equipment were used correctly	Failed	Poor	Fair	Good	Excellent	X 50	
Project Design	<input type="checkbox"/> Reinforcement is sufficient <input type="checkbox"/> Clearances are sufficient <input type="checkbox"/> Materials are appropriate <input type="checkbox"/> Project is proportional and pleasing to the eye	Failed	Poor	Fair	Good	Excellent	X 25	
Project Suitability	<input type="checkbox"/> Correct size for use <input type="checkbox"/> Suitable for purpose <input type="checkbox"/> Salable <input type="checkbox"/> Clean and presentable	Failed	Poor	Fair	Good	Excellent	X 25	
Finish Application	<input type="checkbox"/> Surface was properly prepared <input type="checkbox"/> Primer and finish are appropriate <input type="checkbox"/> Primer and finish are properly applied <input type="checkbox"/> Finish application is high quality	Failed	Poor	Fair	Good	Excellent	X 25	
Safety and Work Habits	Student followed all safety precautions	Passed				Failed	X (-125)	Negative Points *
	Student followed all assigned procedures	Excellent	Good	Fair	Poor	Failed	X (-50)	Negative Points *
TOTAL								

Final Assessment Total _____/500 pts.

* Overall combined score cannot be lower than 0.

Comments:

