

# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** I. Working With Plans

**Unit Objective:**

Students will demonstrate an understanding of the importance planning has on effective work procedure by drawing a construction plan and developing a plan of procedure, a cutting bill of materials, and a purchasing bill of materials.

**Show-Me Standards:** 1.8, MA2

**References:**

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

*Agricultural Structures.* University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

*Computer Applications in Agriculture.* University of Missouri-Columbia, Instructional Materials Laboratory, 2001.

**Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 and 2.
- Students will complete AS 1.1, Reading a Plan; AS 1.2, Drawing a Plan; and AS 2.1, Preparing a Plan of Procedure.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. I-5 and p. I-32.

**Performance-Based Assessment:**

Students will develop a construction plan for a project by making three scale drawings – one each for the top, front, and side of the project. Students must also devise a plan of procedure, a cutting bill of materials, and a purchasing bill of materials for a project.

Assessment will be based on the completeness, accuracy, and appearance of the drawings and the overall thoroughness and accuracy of the plan of procedure and bills of materials.



### Unit I—Working With Plans Instructor Guide

The instructor should distribute the student handouts at the beginning of the unit and assign the performance-based assessment activities in conjunction with the relevant lesson material as indicated in the instructor guide. Students will complete the activities as they progress through the unit lessons.

1. Use AS 1.2 (Student), *Drawing a Plan*, to assess student competency at preparing a construction plan. Students will use computer-aided drafting (CAD) equipment or pencils and paper to make three elevation drawings of a storage building.
  - a. For a complete description of the activity, see AS 1.2 (Instructor), p. I-25.
  - b. Answers for the activity are located on p. I-6.
2. Use AS 2.1, *Preparing a Plan of Procedure*, to assess student competency at developing a plan of procedure and preparing a cutting bill of materials and purchasing bill of materials. Students will use elevation drawings of a pine workbench to develop a plan of procedure and bills of materials for the project.
  - a. For a complete description of the activity, see AS 2.1, pp. I-37–I-38.
  - b. Answers for the activity are located on p. I-32.
3. For additional practice in working with plans and developing bills of materials, see Unit VI, *Project Construction*, in *Agricultural Construction Volume I* and AS 18, *Electronic Bill of Materials*, in *Computer Applications in Agriculture*. Both are available from the Instructional Materials Laboratory, University of Missouri-Columbia, accessed December 1, 2003, at <http://www.iml.coe.missouri.edu/>.
4. The student handout includes checklists based on these activity sheets that students can use to evaluate their work.
5. The student handout and scoring guide can also be adapted for use with students' class projects, if desired.
6. The final assessment score will be based on the completeness, accuracy, and appearance of the drawings and the overall thoroughness and accuracy of the plan of procedure and bills of materials.

## **Agricultural Structures**

---

7. **ADDITIONAL ACTIVITY:** Have students determine the time frame for the completion of a project. For a work sheet that could be used for this activity, see WS 5.1, Time Estimation Sheet, p. VI-53 of *Agricultural Construction Volume I*.

**Unit I—Working With Plans**  
**Student Handout**

Complete the activities below; use the checklists to evaluate your work.

**AS 1.2, Drawing a Plan**

1. Use the procedure outlined in AS 1.2 to draw a construction plan.
2. Check your work and make any necessary changes.
  - Scale is appropriate and all dimensions are to scale.
  - Plan includes all necessary dimensions and specifications.
  - Drawings are correctly labeled.
  - Lines and symbols are used correctly.
  - Plan includes front, side, and top elevations.
3. Turn in your completed activity sheet. Due date \_\_\_\_\_.
4. Your final assessment score will be based on the completeness, accuracy, and appearance of your drawings.

**AS 2.1, Preparing a Plan of Procedure**

1. Complete AS 2.1, Preparing a Plan of Procedure.
2. Check your work and make any necessary changes.
  - Plan includes all steps needed to complete the project.
  - Cutting bill of materials includes materials needed for the project in their final dimensions.
  - Purchasing bill of materials includes all materials in standard sizes, as well as any fasteners, hinges, etc., if needed.
3. Turn in your completed activity sheet. Due date \_\_\_\_\_.
4. Your final assessment score will be based on the overall thoroughness and accuracy of the plan of procedure and bills of materials.



# Agricultural Structures

**Unit I—Working With Plans**  
**Scoring Guide**

Name \_\_\_\_\_

| Activity                      | Criteria  | Points Possible | Points Earned | Comments |
|-------------------------------|---|-----------------|---------------|----------|
| Drawing a Plan                | <ul style="list-style-type: none"> <li><input type="checkbox"/> Scale is appropriate and all dimensions are to scale</li> <li><input type="checkbox"/> Plan includes all necessary dimensions and specifications</li> <li><input type="checkbox"/> Drawings are correctly labeled</li> <li><input type="checkbox"/> Lines and symbols are used correctly</li> <li><input type="checkbox"/> Plan includes front, side, and top elevations</li> </ul> |                 |               |          |
| Preparing a Plan of Procedure | <ul style="list-style-type: none"> <li><input type="checkbox"/> Plan includes all steps needed to complete the project</li> <li><input type="checkbox"/> Cutting bill of materials includes materials in their final dimensions</li> <li><input type="checkbox"/> Purchasing bill of materials includes all materials in standard sizes, as well as any fasteners, hinges, etc.</li> </ul>  |                 |               |          |

**Total Points Earned** \_\_\_\_\_





# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** II. Home and Farmstead Planning

**Unit Objective:**

Students will apply principles of farm and homestead planning by devising a farmstead plan and explaining their design decisions in paragraph form.

**Show-Me Standards:** 1.8, CA6

**References:**

*Agricultural Structures*. University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Agriculture Publications. MU Extension. University of Missouri-Columbia. Accessed August 25, 2003, from <http://muextension.missouri.edu/explore/agguides/>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

Missouri Cooperative Soil Survey. Accessed March 22, 2004, from <http://soils.missouri.edu/>.

NASCO On-Line Catalogs. Accessed August 25, 2003, from <http://www.nascofa.com/prod/Home>.

## **Agricultural Structures**

---

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 3.
- Students will complete AS 1.1, Evaluating Home Sites; AS 1.1, Farmstead Planning; AS 1.2, Planning a Farmstead; and AS 3.1, Resources for Manure Management.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. II-7, p. II-18, and p. II-30.

### **Performance-Based Assessment:**

Students will design a farmstead plan and explain their design decisions on separate paper in paragraph form. Students must explain how they designed their farm in relation to topography, wind, natural resources, type and size of business, service and utilities, home, neighbors, and how regulatory agencies would view the plan.

Assessment will be based on the overall content and presentation of the farmstead plan and explanations. Spelling, grammar, and punctuation also will be factors in the assessment.

### Unit II—Home and Farmstead Planning Instructor Guide

The instructor should distribute the student handouts and assign the performance-based assessment activity in conjunction with the relevant lesson material as indicated in the instructor guide. The activity will be due at the completion of the lesson.

1. Emphasize the importance of following local building codes and zoning laws when planning a farmstead. Discuss relevant building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. Use AS 1.2, Planning a Farmstead, to assess student competency at preparing a farmstead plan. Students will sketch the layout for their ideal farmstead and explain how their plan addresses the factors covered in the study questions for lesson 2. (The activity sheets Farmstead Planning and Planning a Farmstead are labeled AS 1.1 and AS 1.2, respectively, but are located in lesson 2.)
  - a. Have students design their farm plan as an aerial view to include all the facilities and indicate where they are located in relation to each other.
  - b. For a complete description of the activity, see AS 1.2, p. II-25.
  - c. Answers for this activity will vary.
  - d. If desired, have students present their farm plans on a poster instead of the activity sheet. Display completed posters in class.
  - e. If desired, have students design their farm plan using collage or presentation software. Have students present their plan to the class as an oral report. Adjust the student handout and scoring guide as needed.
3. The final assessment score will be based on the overall content and presentation of the farmstead plan and explanations. Spelling, grammar, and punctuation also will be factors in the assessment.
4. ADDITIONAL ACTIVITY: Have students research a particular code or regulation that affects farmstead planning in their area. What is the regulation designed to protect? How does it affect farmstead planning? Lead a class

## **Agricultural Structures**

---

discussion in which students present their findings or have students explain their assigned regulation in a brief oral report.

### Unit II—Home and Farmstead Planning Student Handout

1. Using the activity sheet Planning a Farmstead, design your ideal farm. Draw your plan as an aerial-view map to include all the facilities and indicate where they are located in relation to each other. See the activity sheet for a complete list of instructions.
2. Explain, on separate paper in paragraph form, how your design addresses each of the considerations below.
  - Topography
  - Wind
  - Natural resources
  - Type and size of business
  - Services and utilities
  - Location of the home
  - Location of neighbors
  - How government agencies would view the plan
3. Your final assessment score will be based on the overall content and presentation of the farmstead plan and explanations. Spelling, grammar, and punctuation also will be factors in the assessment.



## Agricultural Structures

### Unit II—Home and Farmstead Planning Scoring Guide

Name \_\_\_\_\_

| Assessment Area                    | Criteria   | 0 Points | 1 Point | 2 Points | 3 Points | 4 Points  | Weight | Total |
|------------------------------------|--|----------|---------|----------|----------|-----------|--------|-------|
| Farm Plan Design                   | Plan addresses all discussion question topics and represents a good, workable design | Failed   | Poor    | Fair     | Good     | Excellent | X 8.75 |       |
| Written Explanation of Plan Design | Responses are complete and facts are accurate  | Failed   | Poor    | Fair     | Good     | Excellent | X 8.75 |       |
| Presentation                       | Plan is well organized and eye-appealing   | Failed   | Poor    | Fair     | Good     | Excellent | X 5    |       |
| Technical Considerations           | Spelling, grammar, and punctuation are correct                                       | Failed   | Poor    | Fair     | Good     | Excellent | X 2.5  |       |
| <b>TOTAL</b>                       |  |          |         |          |          |           |        |       |

Final Assessment Total \_\_\_\_\_/100 pts.

Comments:





# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** III. Building Construction

**Unit Objective:**

Students will demonstrate an understanding of correct building construction procedures by laying out joists and rafters, applying roofing skills, and answering questions about roofing materials.

**Show-Me Standards:** 1.10, MA2

**References:**

*Agricultural Structures*. University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Agriculture Publications. MU Extension. University of Missouri-Columbia. Accessed August 25, 2003, from <http://muextension.missouri.edu/explore/agguides/>.

CEV Multimedia. Accessed December 4, 2003, from <http://www.cev-inc.com/>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

## **Agricultural Structures**

---

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 9.
- Students will complete AS 1.1, Safety on the Construction Site; AS 2.1, Identifying Building Designs; AS 3.1, Construction Materials; AS 4.1, Identifying Fasteners; AS 5.1, Diagramming Flooring; JS 5.1, Joist Layout; AS 6.1, Wall Construction; JS 7.1, Rafter Layout; AS 8.1, Applying Roofing Materials; and AS 10.1, Heating, Cooling, and Ventilation Needs.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. III-4, p. III-15, p. III-25 (1), p. III-37, p. III-71, p. III-88, and p. III-113 (1, 2).

### **Performance-Based Assessment:**

Students will lay out joists and rafters, use roofing skills to apply model shingles, and answer key questions about applying roofing materials.

Assessment will be based on the ability to safely and correctly perform the assigned procedures and to answer questions about applying roofing materials.

### Unit III—Building Construction Instructor Guide

The instructor should distribute the student handouts at the beginning of the unit and assign the performance-based assessment activities in conjunction with the relevant lesson material as indicated in the instructor guide. Students will complete the activities as they progress through the unit lessons.

1. Emphasize the importance of following local building codes and zoning laws when building new structures or making repairs. Discuss relevant local building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. Use JS 5.1, Joist Layout, to assess student competency at laying out joists for floor framing. Students will lay out and assemble an 8' x 10' section of floor joists. For a complete description of the activity, see JS 5.1, p. III-65. **NOTE: This activity calls for students to use hand and power tools. 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. Use JS 7.1, Rafter Layout, to assess student competency at laying out rafters. Students will lay out the ridge cut, seat cut, and tail cut for a rafter on boards, paper, or cardboard. For a complete description of the activity, see JS 7.1, p. III-107.
4. Use AS 8.1, Applying Roofing Materials, to assess student competency at applying shingles. Students will use appropriate roofing techniques to apply paper shingles to a desk or shop table. They will also answer three key questions about applying roofing materials.
  - a. For a complete description of the activity, see AS 8.1, pp. III-125-III-126.
  - b. Answers for the activity are located on p. III-114.
5. The student handout for this performance-based assessment activity is a checklist based on these activity sheets that students can use to evaluate their work.

## **Agricultural Structures**

---

6. The student handout and scoring guide can also be adapted for use with students' class projects, if desired.
7. The final assessment score will be based on the ability to safely and correctly perform the assigned procedures and to answer questions about applying roofing materials.
8. **ADDITIONAL ACTIVITIES:**
  - a. Have students make models of building styles and building substructures discussed in the unit, such as a shed with a hip or gable roof, a truss, and a stud frame wall with a door and window opening. Small wood stock such as strips of balsa or Popsicle sticks would be suitable for these projects.
  - b. As an alternative to a larger class project, have students build a smaller project, such as a dog house, that requires them to apply many of the same construction skills.

**Unit III—Building Construction  
Student Handout**

Complete the activities below; use the checklists to evaluate your work.

**JS 5.1, Joist Layout**

1. Use the procedure outlined in JS 5.1 to lay out floor joists.
2. Follow all assigned safety procedures. You can lose points for not following safety precautions and other assigned procedures.
3. Check your work and make any necessary changes.
  - Measurements and cuts are accurate.
  - Joists are centered.
  - Joists fit well and are fastened for optimum strength.
  - Project is square and straight.
4. Have the instructor check your work. Due date \_\_\_\_\_.
5. Your final assessment score will be based on your ability to safely and correctly lay out floor joists.

**JS 7.1, Rafter Layout**

1. Use the procedure outlined in JS 7.1 to lay out the ridge cut, seat cut, and tail cut for a rafter on a board or piece of paper.
2. Check your work and make any necessary changes.
  - Measurements are correct.
  - Ridge cut, seat cut, and tail cut are accurately laid out.
3. Have the instructor check your work. Due date \_\_\_\_\_.
4. Your final assessment score will be based on your ability to correctly lay out rafters.

**AS 8.1, Applying Roofing Materials**

1. Use the procedure outlined in AS 8.1 to apply model three-tab shingles.
2. Check your work and make any necessary changes.
  - Measurements are accurate.
  - Cuts are accurate.
  - Courses are properly staggered.
  - Courses are properly overlapped.
  - Shingles are square and run straight.
  - Cap shingles are properly overlapped.
  - Cap shingles are running the right direction.
3. Have the instructor check your work. Turn in your completed activity questions. Due date \_\_\_\_\_.
4. Your final assessment score will be based on your ability to correctly apply roofing material and on your responses to the activity questions.



## Agricultural Structures

### Unit III—Building Construction Scoring Guide

Name \_\_\_\_\_

| Activity                   | Criteria  | Points Possible | Points Earned | Comments |
|----------------------------|---|-----------------|---------------|----------|
| Joist Layout               | <ul style="list-style-type: none"> <li><input type="checkbox"/> Measurements and cuts are accurate</li> <li><input type="checkbox"/> Joists are centered, square, and straight</li> <li><input type="checkbox"/> <b>Student followed all safety precautions</b></li> <li><input type="checkbox"/> <b>Student followed all assigned procedures</b></li> </ul>  |                 |               |          |
| Rafter Layout              | <ul style="list-style-type: none"> <li><input type="checkbox"/> Measurements are correct</li> <li><input type="checkbox"/> Ridge cut, seat cut, and tail cut are accurately laid out</li> </ul>   |                 |               |          |
| Applying Roofing Materials | <ul style="list-style-type: none"> <li><input type="checkbox"/> Measurements and cuts are accurate</li> <li><input type="checkbox"/> Courses are correctly staggered and overlapped</li> <li><input type="checkbox"/> Shingles are square and run straight</li> <li><input type="checkbox"/> Cap shingles are properly overlapped and running in the right direction</li> <li><input type="checkbox"/> Activity questions are answered correctly</li> </ul> |                 |               |          |

**Total Points Earned** \_\_\_\_\_





# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** IV. Concrete

**Unit Objective:**

Students will apply principles of correct concrete construction procedures by making a concrete patio block.

**Show-Me Standards:** 2.5, MA2

**References:**

*Agricultural Structures*. University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Agriculture Publications. MU Extension. University of Missouri-Columbia. Accessed August 25, 2003, from <http://muextension.missouri.edu/explore/agguides/>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

**Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 7.
- Students will complete AS 1.1, Concrete Safety; AS 2.1, Mixing Concrete; AS 3.1, Subgrade Preparation; AS 3.2, Laying Out a Building; AS 3.1, Reinforcing Concrete; JS 5.1, Pouring a Concrete Curb; AS 6.1, Curing Concrete; and JS 7.1, Preparing Forms for a Concrete Wall.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following locations: p. IV-14 (1), p. IV-28 (1, 2), p. IV-46, and p. IV-68.

## **Agricultural Structures**

---

### **Performance-Based Assessment:**

Students will use common equipment, materials, and procedures to make a concrete patio block. To complete the project, students must make a form for the patio block; determine the volume of the form; calculate and mix the correct amount of Portland cement, sand, gravel, and water to fill the form; and cure the 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.

### Unit IV—Concrete Instructor Guide

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. Emphasize the importance of following local building codes and zoning laws when working with concrete. Discuss relevant local building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. Use or adapt the activity sheets found in the unit to assess student competency at working with concrete. Review or supplement these activities as needed, based on student mastery of the procedures and the equipment and materials 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. For the performance-based assessment activity, have students apply the skills and procedures discussed in the unit to make an appropriate project out of concrete. The student handout includes a procedure for making a patio block.
4. The student handout also includes a Project Completion Checklist and a Project Evaluation Checklist. Students can use the checklists to track the progress of their project and evaluate their work. Supplement or modify the student handout to reflect actual projects as needed.
5. Have students turn in their completed projects.
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.

## **Agricultural Structures**

---

7. **ADDITIONAL ACTIVITY:** As a class project, contact your local Habitat for Humanity affiliate to find out how students can help work on a Habitat project.

**Unit IV—Concrete  
Student Handout**

**Pouring a Concrete Patio Block**

**Objective:** Pour concrete to make a patio block.

**Materials and Equipment:**

Wood and screws for forms  
Tape measure  
Drill  
Shovel or spade  
Container for mixing concrete  
Gravel  
Sand  
Portland cement  
Water  
Oil  
Hand trowel or wood float  
Safety goggles\*  
Latex gloves  
Face mask  
Calculator

\*Everyone participating in or observing this procedure must wear the proper eye protection. Safety practices should be followed at all times while in the shop area.

**Procedure:**

1. The purpose of this activity is to build a concrete patio block. To complete the project, you will need to make a form for the patio block; determine the volume of the form; calculate and mix the correct amount of gravel, sand, Portland cement, and water to fill the form; and cure the project.
2. Construct a form using the materials provided by your instructor. Build the form so that the patio block will be 3 1/2" x 18" x 18" when it is completed. Be sure to use screws so the form can be removed more easily after the concrete has set.
3. Using a calculator, determine the volume of the form.

Volume of the form \_\_\_\_\_

## Agricultural Structures

---

- Using the mixture ratio 1:2:3:6, determine the amount of Portland cement, sand, gravel, and water needed. Confirm the amounts with your instructor before proceeding.

Cement \_\_\_\_\_

Sand \_\_\_\_\_

Gravel \_\_\_\_\_

Water \_\_\_\_\_

- Lightly coat the inside of the form with oil to prevent the form from sticking to the block.
- After you have determined the amount of ingredients needed, mix the concrete thoroughly. When the concrete is ready, begin pouring the concrete into the form. Pour until the form is filled halfway and then use a hand trowel to work up and down through the concrete, especially around the edges. This will remove air bubbles and move the aggregate away from the edges to create a smoother finish.
- Pour the concrete to the top of the form. Using a hand trowel, work the concrete that was added to the form to remove air pockets.
- Using a straight board as a screed, work the top until the entire surface is level and even.
- Allow the concrete to begin to set.
- Once the surface of the concrete starts to dry and no water is standing on top of the poured concrete, take a small hand trowel and smooth the surface of the block.
- Allow the patio block to cure for at least 3 to 4 days or preferably up to 1 week for maximum strength.
- After the concrete has set completely, remove the block from the form.
- Perform assigned cleanup procedures. Return materials and equipment to their proper places.
- Turn your completed patio block in to the instructor for grading.

Name \_\_\_\_\_

Use the Project Completion Checklist and Project Evaluation Checklist to track the progress of your project.

**Project Completion Checklist**

| <b>Procedure</b>  | <b>Date Due</b> |
|---|-----------------|
| <input type="checkbox"/> Master all competencies necessary to complete the project.   |                 |
| <input type="checkbox"/> Receive instructor approval to build the project.  |                 |
| <input type="checkbox"/> Review safety precautions for equipment and materials to be used. You can lose points for not following safety precautions and other assigned procedures.  |                 |
| <input type="checkbox"/> Complete project construction.   |                 |
| <input type="checkbox"/> Perform a quality control inspection of the project following completion. Use the Project Evaluation Checklist.  |                 |
| <input type="checkbox"/> Turn in the completed project. Your final assessment score will be based on the overall quality of the work and your ability to safely and correctly complete the project within the available time. |                 |

## Agricultural Structures

---

### Project Evaluation Checklist

| Quality Control and Shop Procedures   | Criteria  |
|---|---|
| Quality of Work   | <ul style="list-style-type: none"><li><input type="checkbox"/> Form was properly constructed.</li><li><input type="checkbox"/> Volume of the form was figured correctly.</li><li><input type="checkbox"/> Amounts of cement, sand, gravel, and water were figured correctly.</li><li><input type="checkbox"/> Concrete was mixed to the proper consistency.</li><li><input type="checkbox"/> Concrete is properly finished.</li><li><input type="checkbox"/> Project is good enough to sell.</li><li><input type="checkbox"/> Work was completed on time.</li></ul>   |
| Safety and Work Habits: Observe these safety procedures whenever you are in the shop. | <ul style="list-style-type: none"><li><input type="checkbox"/> Know how to use the tools and materials before you attempt to use them. Only use tools and materials the instructor has approved you to use.</li><li><input type="checkbox"/> Wear appropriate personal protective equipment.</li><li><input type="checkbox"/> Follow safety guidelines from your instructor and safety information on labels, equipment, and signs in the work area.</li><li><input type="checkbox"/> Follow assigned setup and cleanup procedures.</li><li><input type="checkbox"/> Return equipment and materials to their assigned places.</li></ul> |



## Agricultural Structures

### Unit IV—Concrete Scoring Guide

Name \_\_\_\_\_

◆ Page 9 ◆

| Criteria  | 0 Points         | 1 Point     | 2 Points    | 3 Points    | 4 Points      | Weight         | Total                    |
|---|------------------|-------------|-------------|-------------|---------------|----------------|--------------------------|
| Form was properly constructed                                     | Failed           | Poor        | Fair        | Good        | Excellent     | X 3            |                          |
| Volume of the form was figured correctly                          | Failed           | Poor        | Fair        | Good        | Excellent     | X 5            |                          |
| Amounts of cement, sand, gravel, and water were figured correctly | Failed           | Poor        | Fair        | Good        | Excellent     | X 6            |                          |
| Concrete was mixed to the proper consistency                      | Failed           | Poor        | Fair        | Good        | Excellent     | X 4            |                          |
| Concrete is properly finished                                     | Failed           | Poor        | Fair        | Good        | Excellent     | X 2            |                          |
| Project is good enough to sell                                    | Failed           | Poor        | Fair        | Good        | Excellent     | X 3            |                          |
| Work was completed on time  | Failed           | Poor        | Fair        | Good        | Excellent     | X 2            |                          |
| <b>Student followed all safety precautions</b>                    | <b>Passed</b>    |             |             |             | <b>Failed</b> | <b>X (-25)</b> | <u>Negative Points</u> * |
| <b>Student followed all assigned procedures</b>                   | <b>Excellent</b> | <b>Good</b> | <b>Fair</b> | <b>Poor</b> | <b>Failed</b> | <b>X (-10)</b> | <u>Negative Points</u> * |
| <b>TOTAL</b>  |                  |             |             |             |               |                |                          |

Final Assessment Total \_\_\_\_\_/100 pts.

\* Overall combined score cannot be lower than 0.

Comments:



# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** V. Electricity

**Unit Objective:**

Students will demonstrate an understanding of how to work with electricity and wiring by diagramming a wiring plan for an agricultural structure, identifying sources of electrical grounding in the structure, and completing a bill of materials for the project.

**Show-Me Standards:** 1.10, CA3

**References:**

*Agricultural Structures*. University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Home Electrical Wiring. DoItYourself.com Inc. Accessed December 5, 2003, from <http://doityourself.com/electric/index.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

NFPA Online. National Fire Protection Association. Accessed December 5, 2003, from <http://www.nfpa.org/catalog/home/index.asp>.

Students may use additional outside sources to complete this activity.

## **Agricultural Structures**

---

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 12.
- Students will complete AS 1.1, Electricity on the Internet; AS 2.1, Electrical Terms; AS 3.1, Calculating Feeder Wire Size; AS 4.1, Grounding and GFCIs; AS 5.1, Evaluating Lights, Outlets, Switches, and Circuit Protection; AS 6.1, Diagramming Electrical Wiring; AS 7.1, Diagramming the Service Stack; AS 8.1, Identifying SEP Components; JS 9.1, Wiring a Three-Way Switch; AS 10.1, Calculating Electrical Costs; AS 11.1, Assessing Lightning Protection; and AS 12.1, Using Test Devices.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. V-14, p. V-28, p. V-47, p. V-61, p. V-71, p. V-119, p. V-150, and p. V-180.

### **Performance-Based Assessment:**

Students will diagram a wiring plan for a machinery shed using the appropriate symbols and identify sources of electrical grounding in the building. They will also complete a bill of materials for the project.

Assessment will be based on the overall content and presentation of the work.

### Unit V—Electricity Instructor Guide

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. Emphasize the importance of following local building codes and zoning laws when working with wiring and electricity. Discuss relevant local building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. The student handout includes an activity that can be used to assess student performance. For this activity, students will diagram a wiring plan for a machinery shed using the appropriate symbols, identify sources of electrical grounding in the building, and complete a bill of materials for the project.
  - a. Provide each student with two blank transparency sheets. Students will place the transparencies over the diagram of the machinery shed and develop their wiring plan in stages.
  - b. Provide students with dry-erase markers in assorted colors to add the fixtures, receptacles, switches, and wiring to the plan.
3. Have students turn in their completed activity sheets and transparencies. Answers will vary.
4. The final assessment score will be based on the overall content and presentation of the work.



**Unit V—Electricity  
Student Handout**

Name \_\_\_\_\_

**Objective:** Wire a machinery shed.**Materials Needed:**

Diagram

Transparencies

Dry-erase markers

1. The instructor will give you a diagram of a machinery shed. Develop a wiring plan for the building using the steps below. Be sure to determine what local building and zoning codes apply to the structure and design a wiring plan that complies with all relevant codes.
2. Identify the best position for the electrical service panel and ground rod and mark the locations on the diagram using their symbols.
3. Place a transparency sheet over the diagram. Determine the best location for the fixtures, receptacles, and switches listed below and draw their symbols on the transparency using a dry-erase marker.
  - 6 ceiling light fixtures
  - 3 wall-mount light fixtures
  - 9 duplex receptacles (3 must be GFCIs)
  - Wall switches (You decide how many.)
4. Place a second transparency over the diagram and the first transparency. Determine how many circuits you need and draw in the circuits. Draw lines from the switches to the fixtures they control. Use different colors to make the wires easier to follow.
5. Complete a bill of materials for the project. See the back side of this sheet for a bill of materials form. Include all the materials that will be needed to complete the electrical work in the building—light bulbs, receptacles, cover plates, wire, etc.

## **Agricultural Structures**

---

Date \_\_\_\_\_

Project Title \_\_\_\_\_

### **Bill of Materials**

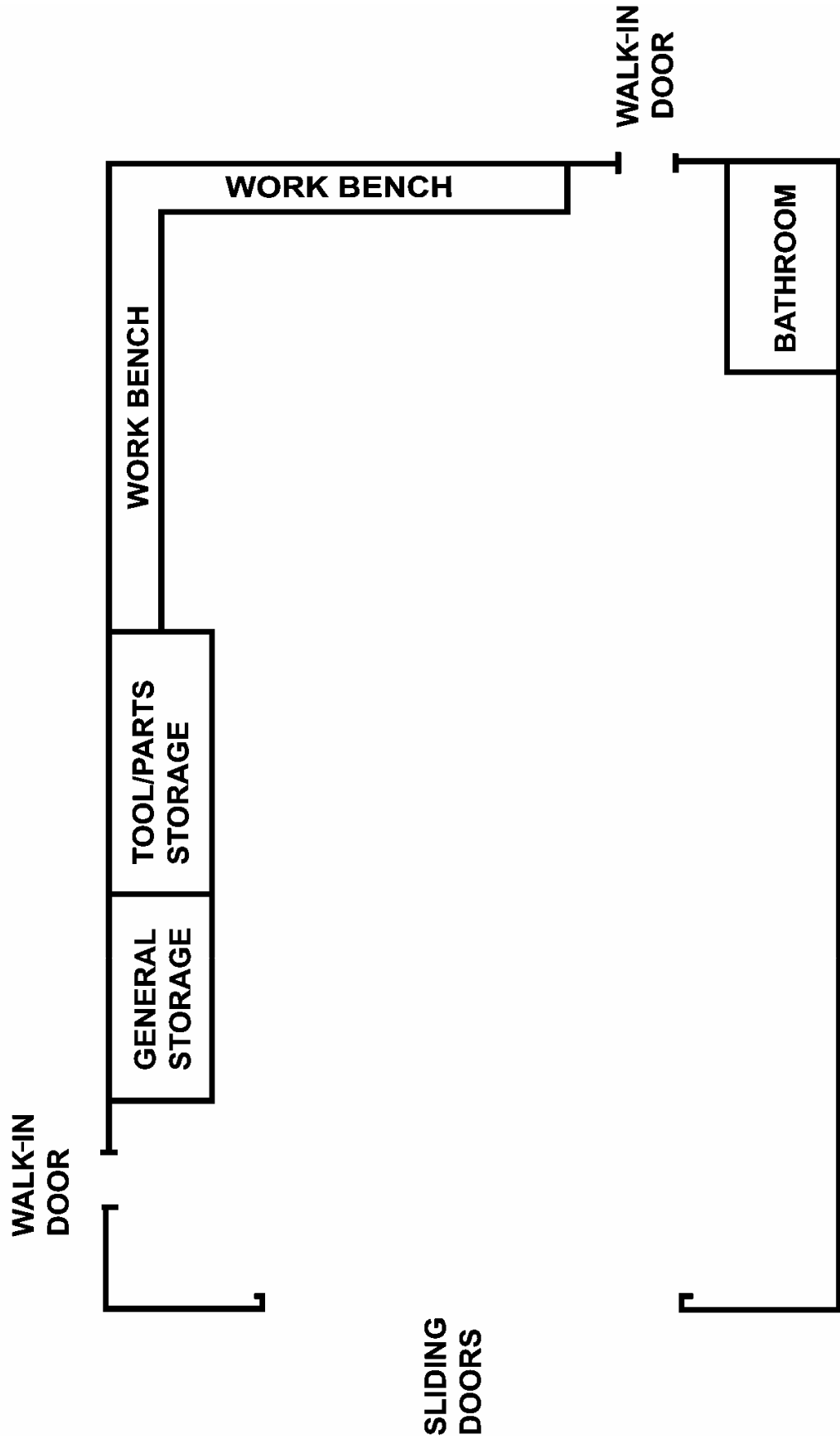
Determine the materials you will need for this project and complete the bill of materials below.

| <b>No. of Pieces or<br/>Amount of<br/>Material</b> | <b>Material or<br/>Electrical<br/>Hardware</b> | <b>Estimated Cost<br/>per Unit</b> | <b>Cost</b> |
|--|--|------------------------------------|-------------|
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |
|  |  |                                    |             |

**Estimated Total Cost** \_\_\_\_\_



# MACHINERY SHED 60'X80'





# Agricultural Structures

## Unit V—Electricity Scoring Guide

Name \_\_\_\_\_

◆ Page 9 ◆

| Assessment Area           | Criteria   | 0 Points | 1 Point | 2 Points | 3 Points | 4 Points  | Weight | Total |
|---------------------------|--|----------|---------|----------|----------|-----------|--------|-------|
| Wiring Diagram            | <ul style="list-style-type: none"> <li>❑ Electrical service panel and ground rod are properly positioned</li> <li>❑ Fixtures, receptacles, and switches are well positioned</li> <li>❑ Wiring is properly run</li> <li>❑ Symbols are correct and plan is clear and easy to read</li> </ul> | Failed   | Poor    | Fair     | Good     | Excellent | X 10   |       |
| Bill of Materials         | Bill of materials includes all materials needed, their cost, and the total cost of the project   | Failed   | Poor    | Fair     | Good     | Excellent | X 7.5  |       |
| Building and Zoning Codes | Wiring complies with all relevant building and zoning codes  | Failed   | Poor    | Fair     | Good     | Excellent | X 7.5  |       |
| <b>TOTAL</b>              |  |          |         |          |          |           |        |       |

Final Assessment Total \_\_\_\_\_/100 pts.

Comments:



# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** VI. Plumbing

**Unit Objective:**

Students will demonstrate an understanding of plumbing equipment and procedures by applying different techniques to join dissimilar types of pipe – copper, PVC, CPVC, and black iron.

**Show-Me Standards:** 2.5, CA3

**References:**

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

*Agricultural Structures.* University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Agriculture Publications. MU Extension. University of Missouri-Columbia. Accessed August 25, 2003, from <http://muextension.missouri.edu/explore/agguides/>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals.* MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications.* MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

## **Agricultural Structures**

---

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 5.
- Students will complete AS 1.1, Determining Water Needs; AS 2.1, Working With Plumbing Safely; AS 3.1, Pipe Usage; AS 4.1, Cutting and Joining Plastic Pipe; and JS 4.1, Sweating Copper Pipe.
- Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. VI-4 and p. VI-47 (1, 2).

### **Performance-Based Assessment:**

Students will use different techniques to join dissimilar types of pipe – copper, PVC, CPVC, and black iron.

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.

### Unit VI—Plumbing Instructor Guide

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. Emphasize the importance of following local building codes and zoning laws when installing or repairing plumbing. Discuss relevant local building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. Use or adapt the activity sheets found in the unit to assess student competency at performing basic plumbing procedures. Review or supplement these activities as needed, based on student mastery of the procedures and the tools and materials 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. For the performance-based assessment activity, have students apply the skills and procedures discussed in the unit to complete an appropriate plumbing project, such as the one that accompanies this enhancement. This plan requires students to join dissimilar types of pipe – copper, PVC, CPVC, and black iron.
4. The student handout for this activity is a Project Completion Checklist and Project Evaluation Checklist that can be used with the project. Students can use the checklists to track the progress of their project and evaluate their work. Supplement or modify the student handout to reflect actual projects as needed.
5. Have students turn in their completed projects.

## **Agricultural Structures**

---

6. Test the completed projects by attaching a water source to one side and a copper hose bib to the other. All joints should be watertight.
7. 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.



**Unit VI—Plumbing  
Student Handout**

Name \_\_\_\_\_

Use the Project Completion Checklist and Project Evaluation Checklist to track the progress of your project.

**Project Completion Checklist**

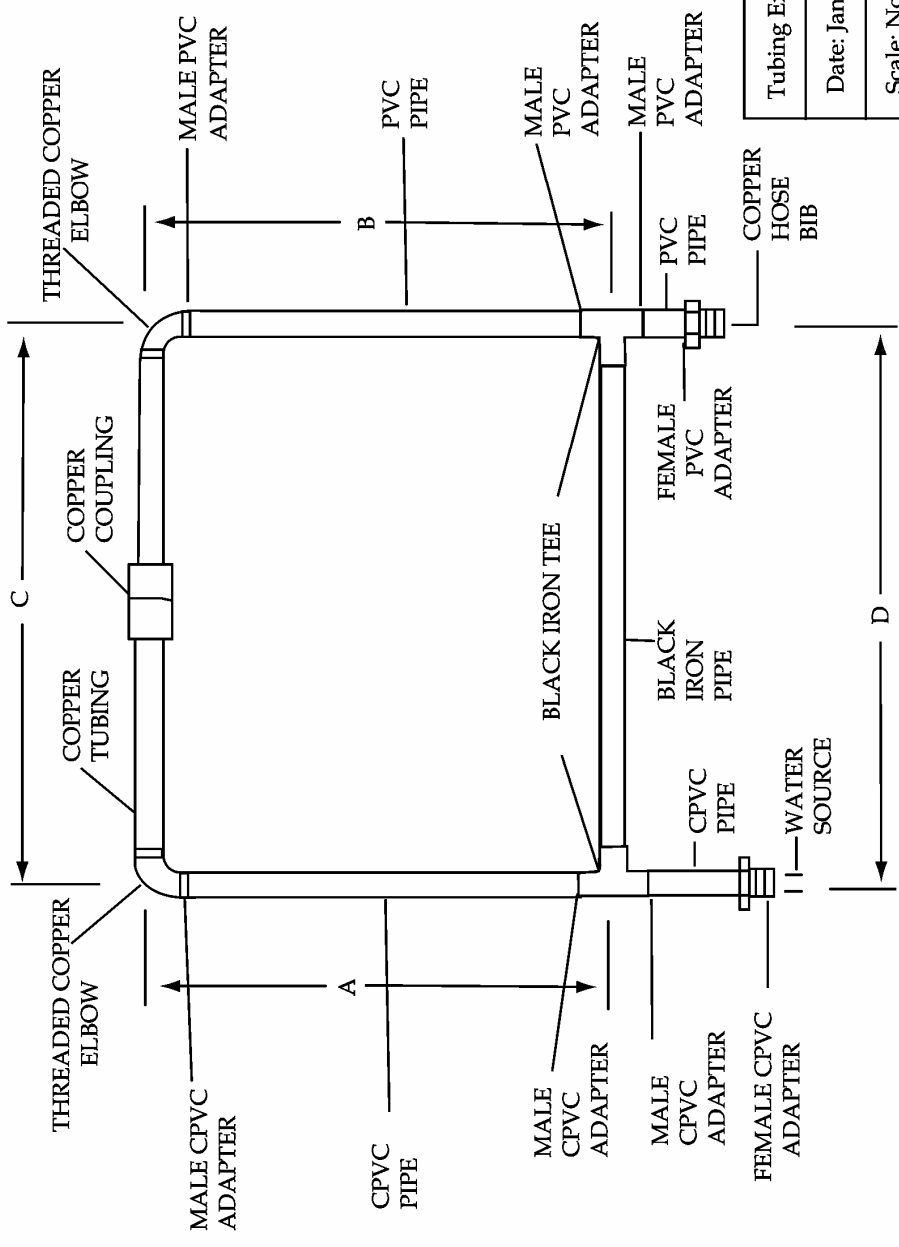
| <b>Procedure</b>  | <b>Date Due</b> |
|---|-----------------|
| <input type="checkbox"/> Master all competencies necessary to complete the project.   |                 |
| <input type="checkbox"/> Review safety precautions for tools and materials to be used. You can lose points for not following safety precautions and other assigned procedures.  |                 |
| <input type="checkbox"/> Complete project construction.   |                 |
| <input type="checkbox"/> Perform a quality control inspection of the project following completion. Use the Project Evaluation Checklist.  |                 |
| <input type="checkbox"/> Turn in the completed project. Your final assessment score will be based on the overall quality of the work and your ability to safely and correctly complete the project within the available time. |                 |

## Agricultural Structures

---

### Project Evaluation Checklist

| Quality Control and Shop Procedures   | Criteria   |
|---|--|
| Quality of Work   | <ul style="list-style-type: none"><li>❑ Fittings and pipe were properly cleaned and prepared.</li><li>❑ Assembly procedures – cementing, soldering, etc. – are correct for the materials being joined.</li><li>❑ Measurements are correct and project has the correct dimensions.</li><li>❑ Parts fit well for optimum strength.</li><li>❑ Work was completed on time.</li></ul>   |
| Safety and Work Habits: Observe these safety procedures whenever you are in the shop. | <ul style="list-style-type: none"><li>❑ Know how to use the equipment before you attempt to use it. Only use tools and materials the instructor has approved you to use.</li><li>❑ Wear appropriate personal protective equipment.</li><li>❑ Follow safety guidelines from your instructor and safety information on labels, equipment, and signs in the work area.</li><li>❑ Follow assigned setup and cleanup procedures.</li><li>❑ Return equipment and materials to their assigned places.</li><li>❑ Do not use equipment that does not function properly.</li><li>❑ Do not use cleaners, cements, or other products with missing or unreadable labels.</li><li>❑ Tell the instructor about any damaged or malfunctioning equipment.</li></ul> |



|                               |
|-------------------------------|
| Tubing Exercise               |
| Date: January 2004            |
| Scale: None                   |
| Drawn by: Richard Linhardt    |
| Revised by: Marshall Swafford |
| Plan No. 900                  |

Plan adapted from *Agricultural Mechanics Building Plans*. University of Missouri-Columbia: Instructional Materials Laboratory.

## Agricultural Structures

---

### Bill of Materials:

- 1 - 1/2" x 18" black iron pipe
- 1 - 1/2" x 18" copper tubing
- 1 - 1/2" x 2' PVC pipe
- 1 - 1/2" x 2' CPVC pipe
- 3 - 1/2" PVC male adapters
- 2 - 1/2" threaded copper elbows
- 1 - 1/2" copper coupling
- 3 - 1/2" CPVC male adapters
- 2 - 1/2" black iron tees
- 1 - 1/2" PVC female adapter
- 1 - 1/2" copper hose bib
- 1 - 1/2" CPVC female adapter
- 1 - can pipe primer
- 1 - can CPVC cement
- 1 - can PVC cement
- 1 - roll wire solder
- 1 - piece steel wool
- 1 - jar soldering flux
- 1 - propane torch
- 1 - roll 1/2" Teflon tape

### Construction Procedure:

Assemble the project as shown. The pieces should be lengths such that A equals B and C equals D.

When connecting copper to copper: Clean the inside of the fitting and the outside of the tubing using steel wool or a similar abrasive. Apply a thin coat of soldering flux to the outside of the tubing and the inside of the fitting. Apply heat to the fitting until the solder flows. Touch the solder to the heated fitting and allow the solder to flow around the fitting to produce a leakproof seal.

When connecting plastic to plastic: Clean the inside of the fitting and the outside of the tubing using pipe primer or a similar pipe cleaner. Apply a thin coat of pipe cement to the outside of the tubing and the inside of the fitting and connect the pipe and fitting.

When connecting plastic to copper or iron: To ensure a leakproof seal when connecting threaded materials, wrap the external threads of each connecting piece with Teflon tape and tighten the pieces with a pipe wrench.

# Agricultural Structures

## Unit VI—Plumbing Scoring Guide

Name \_\_\_\_\_

| Criteria  | 0 Points         | 1 Point     | 2 Points    | 3 Points    | 4 Points      | Weight         | Total             |
|---|------------------|-------------|-------------|-------------|---------------|----------------|-------------------|
| Fittings and pipe were properly cleaned and prepared            | Failed           | Poor        | Fair        | Good        | Excellent     | X 5            |                   |
| Assembly procedures are correct for the materials being joined  | Failed           | Poor        | Fair        | Good        | Excellent     | X 5            |                   |
| Measurements are correct and project has the correct dimensions | Failed           | Poor        | Fair        | Good        | Excellent     | X 3            |                   |
| Parts fit well for optimum strength                             | Failed           | Poor        | Fair        | Good        | Excellent     | X 4            |                   |
| Project is watertight   | Failed           | Poor        | Fair        | Good        | Excellent     | X 6            |                   |
| Work was completed on time                                      | Failed           | Poor        | Fair        | Good        | Excellent     | X 2            |                   |
| <b>Student followed all safety precautions</b>                  | <b>Passed</b>    |             |             |             | <b>Failed</b> | <b>X (-25)</b> | Negative Points * |
| <b>Student followed all assigned procedures</b>                 | <b>Excellent</b> | <b>Good</b> | <b>Fair</b> | <b>Poor</b> | <b>Failed</b> | <b>X (-10)</b> | Negative Points * |
| <b>TOTAL</b>  |                  |             |             |             |               |                |                   |

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

Comments:



# Agricultural Structures

**Curriculum Guide:** *Agricultural Structures*

**Unit:** VII. Fencing

**Unit Objective:**

Students will apply principles of correct fence installation by devising a fencing plan that complies with local codes and includes the materials used, cost, and layout of the fence.

**Show-Me Standards:** 3.8, SS7

**References:**

*Agricultural Structures*. University of Missouri-Columbia, Instructional Materials Laboratory, 1999.

Call 1-800-DIG-RITE First. University of Missouri Outreach & Extension. Lincoln University. Accessed March 24, 2004, from <http://outreach.missouri.edu/webster/ag-edge/legal/dig-rite.html>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Appeals*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7613.htm>.

Cook, J. B., & Nickolaus, G. F. *Basic Procedures in Administration of Zoning Regulations: Making Applications*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/commdm/dm7612.htm>.

Local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners

Matthews, S. F. *Missouri Fencing and Boundary Laws*. MU Extension. University of Missouri-Columbia. Accessed December 2, 2003, from <http://muextension.missouri.edu/explore/agguides/agecon/g00810.htm>.

Phillips, R. E. *Constructing Wire Fences*. MU Extension. University of Missouri-Columbia. Accessed August 20, 2003, from <http://muextension.missouri.edu/explore/agguides/agengin/g01192.htm>.

## **Agricultural Structures**

---

Zulovich, J. M. *Selecting Wire Fencing Materials*. MU Extension. University of Missouri-Columbia. Accessed August 20, 2003, from <http://muextension.missouri.edu/explore/agguides/agengin/g01191.htm>.

Students may use additional outside sources to complete this activity.

### **Instructional Strategies/Activities:**

- Students will engage in study questions in lessons 1 through 5.
- Students will complete AS 1.1, Building Legal Fences; AS 2.1, Constructing Model Brace Assemblies; JS 3.1, Constructing Barbed Wire Fencing; AS 4.1, Tensioning Fences; and AS 5.1, Splicing Wire.
- Additional activities that relate to the unit objective can be found under the heading "Other Activities" in the following locations: p. VII-5, p. VII-16 (1), and p. VII-54.

### **Performance-Based Assessment:**

Each student will devise a fencing plan for an area designated by the instructor. The plan will include the materials used, cost, and an aerial-view drawing to indicate the layout of the fence. Students must also determine what local building and zoning codes apply to the fence and must design a fence that complies with all relevant codes.

Assessment will be based on the overall content and presentation of the fencing plan.



### Unit VII—Fencing Instructor Guide

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. Emphasize the importance of following local building codes and zoning laws when working with fencing. Discuss relevant local building codes and zoning laws.
  - a. Information regarding building codes and zoning laws is available from local regulatory agencies, such as the planning and development department, public works department, and county board of commissioners.
  - b. General information about Missouri building codes and zoning laws is also available from the MU Extension, University of Missouri-Columbia, accessed December 3, 2003, from <http://muextension.missouri.edu/explore/agguides/>.
2. Describe an area to be enclosed with fencing, such as a pasture or a yard. Include as much detail as necessary to describe the area and its intended use, such as the dimensions of the area, whether or not the fence must enclose or keep out livestock, and the uses of the adjoining land.
3. Have students devise a fencing plan for the described area.
  - a. Have students make an aerial-view scale drawing to indicate fence layout and post spacing. Have students use computer-aided drafting (CAD) equipment or pencils and paper to make their drawing, as preferred. Drawing to scale was discussed in Unit 1, Working With Plans.
  - b. Have students compile a bill of the materials they will need, the estimated cost of each item, and the estimated total cost of the fence. A bill of materials work sheet is included with the student handout.
  - c. Students must also determine what local building and zoning codes apply to the fence and design a fence that complies with all relevant codes.
4. The final assessment score will be based on the overall content and presentation of the fencing plan.



### Unit VII—Fencing Student Handout

1. The instructor will describe an area to be enclosed with fencing.
2. Develop a fencing plan for the described area. Be sure to determine what local building and zoning codes apply to the fence and design a fence that complies with all relevant codes.
3. Make an aerial-view scale drawing to indicate fence layout and post spacing.
4. Complete a bill of materials for the project. Include all the materials that will be needed to complete the fence. A form for a bill of materials is included on the back of this sheet.
5. Your final assessment score will be based on the overall content and presentation of your fencing plan.

## **Agricultural Structures**

---

Name \_\_\_\_\_

Date \_\_\_\_\_

Project Title \_\_\_\_\_

### **Bill of Materials**

Determine the materials you will need for this project and complete the bill of materials below.

| <b>No. of Pieces<br/>or Amount of<br/>Material</b> | <b>Material</b> | <b>Estimated<br/>Cost per Unit</b> | <b>Cost</b> |
|--|-----------------|------------------------------------|-------------|
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |
|  |                 |                                    |             |

**Estimated Total Cost** \_\_\_\_\_

# Agricultural Structures

## Unit VII—Fencing Scoring Guide

Name \_\_\_\_\_

| Assessment Area           | Criteria   | 0 Points | 1 Point | 2 Points | 3 Points | 4 Points  | Weight | Total |
|---------------------------|--|----------|---------|----------|----------|-----------|--------|-------|
| Fence Plan                | Fence is well suited for its intended use and posts are properly spaced                      | Failed   | Poor    | Fair     | Good     | Excellent | X 7.5  |       |
| Building and Zoning Codes | Fence complies with all relevant building and zoning codes                                   | Failed   | Poor    | Fair     | Good     | Excellent | X 6.25 |       |
| Bill of Materials         | Bill of materials includes all materials needed, their cost, and the total cost of the fence | Failed   | Poor    | Fair     | Good     | Excellent | X 6.25 |       |
| Presentation              | Plan is well drawn and to scale  | Failed   | Poor    | Fair     | Good     | Excellent | X 5    |       |
| <b>TOTAL</b>              |  |          |         |          |          |           |        |       |

◆ Page 7 ◆

Final Assessment Total \_\_\_\_\_/100 pts.

Comments:

