

# 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.

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### **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.

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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 \_\_\_\_\_

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- 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.	

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### 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>



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## Unit IV—Concrete Scoring Guide

Name \_\_\_\_\_

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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:

