Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Describe advances in the design and use of agricultural structures and farm electrification.
2. Describe the reason for building codes, and explain the different types of building codes.
3. Describe how state and local governments utilize building codes.
4. Identify safety precautions to implement during the construction process.
5. Identify careers related to agricultural construction.

Resources. The following resources may be useful in teaching this lesson:

- E-unit(s) corresponding to this lesson plan. CAERT, Inc. [http://www.mycaert.com](http://www.mycaert.com).
Equipment, Tools, Supplies, and Facilities

- Overhead or PowerPoint projector
- Visual(s) from accompanying master(s)
- Copies of sample test, lab sheet(s), and/or other items designed for duplication
- Materials listed on duplicated items
- Computers with printers and Internet access
- Classroom resource and reference materials

Key Terms. The following terms are presented in this lesson (shown in bold italics):

- building codes
- International Fire Code
- National Electrical Code
- National Fuel Gas Code
- Uniform Mechanical Code
- Uniform Plumbing Code

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Use the Internet to find examples of farm buildings from the colonial period, industrial revolution, and present time. Post pictures on the board to initiate a classroom discussion. Ask students to explain how and why buildings of each period were built differently.

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Describe advances in the design and use of agricultural structures and farm electrification.

Anticipated Problem: What are some advances in the design and use of agricultural structures and farm electrification?

I. Advances in agricultural structures and farm electrification

A. Colonial farms
   1. Farm structures were simple and small.
   2. Farm houses and buildings were large enough for what was needed.
3. Most buildings housed small numbers of animals and animal-drawn equipment.
4. The American landscape glowed at night from candles and lanterns, as electricity was still a mystery with which scientists were only experimenting.

B. Farms during the industrial revolution

1. As the country became more mechanized, farms transitioned from animal-drawn equipment to equipment powered by steam and internal-combustion engines.
2. As farms increased in size, so did the farm buildings.
3. The great American barn characterized the countryside landscape as farms raised more animals.
4. Machine sheds replaced tool sheds and grew in size as more farm implements became available.
5. Toward the end of the industrial revolution, cities and towns were beginning to see electrical distribution systems built to power light and appliances in homes and businesses, while windmills were used on farms.
   a. Windmills were mostly used for pumping water from wells.
   b. Windmills were also used to power generators that operated electric motors on equipment such as cotton gins.

C. Modern farms

1. Today’s farms are larger than ever before. As a result, the great American barn is now a symbol of times past. Large machine sheds and cattle barns house today’s equipment and animals.
2. In 1935, only about 10 percent of farms received electrical service, because for most farms, it was either unavailable or unaffordable.
3. President Franklin Roosevelt created the Rural Electric Administration (REA) by executive order in 1935.
   a. The REA was created to bring electricity to rural areas.
   b. The goal of the REA was to provide farms with inexpensive electric power.
   c. The REA provided loans to rural cooperatives that wanted to build their own electrical distribution systems.
4. Today, the infrastructure from the REA-based rural cooperatives is in place, and the American farm sits on the cutting edge of technological advancement.
5. Buildings are often constructed with the latest technology.
   a. Computerized ventilation and production systems regulate the environment and nutritional needs for animal production.
   b. Farm machine buildings are often constructed for efficiency and employ geothermal heating and cooling systems.

**Teaching Strategy:** Show students examples of farm structures in VM–A and VM–B. Lead a field trip to a local historic farm and a modern farm.
Objective 2: Describe the reason for building codes, and explain the different types of building codes.

Anticipated Problem: Why are building codes developed, and what are the different types of building codes?

II. Building codes

A. According to the Federal Emergency Management Agency (FEMA), “building codes are sets of regulations governing the design, construction, alteration and maintenance of structures. They specify the minimum requirements to adequately safeguard the health, safety and welfare of building occupants” ([https://www.fema.gov/building-codes](https://www.fema.gov/building-codes)).

1. There is no way for state and local governments to ensure the expertise of a builder. Therefore, many local governments require an inspection by a certified building inspector once each phase of a construction project is complete to make sure building codes and standards were followed.

2. International Code Council
   a. Many state and local governments adopt the building codes developed by the International Code Council (ICC) rather than creating or updating their own codes.
   b. The ICC develops and maintains three types of codes.
      (1) The International Building Code (IBC) directs how most new buildings should be constructed.
      (2) The International Residential Code (IRC) directs how new one- and two-family homes should be constructed. The IRC is for homes of three stories or less.
      (3) The International Existing Building Code (IEBC) directs how to make additions, alterations, or repairs to existing structures.
   c. The ICC releases new editions of the International Codes with updated requirements every three years.

B. Types of building codes

1. The National Electrical Code, standards for the safe installation of electrical wiring and its related hardware and equipment, is published by the National Fire Protection Association.
   a. All 50 states have adopted the code.
   b. Although the electrical code itself is not a law, a state or local government will often require adherence to the code through laws.

2. The International Fire Code, a set of fire safety requirements for buildings, is published by the International Code Council.
   b. A new edition is published every three years.
3. The **Uniform Plumbing Code**, a set of requirements and standards for the installation, repair, and change of plumbing systems, is published by the International Association of Plumbing and Mechanical Officials.
   a. The Uniform Plumbing Code covers work done on drinking water, sewer, and toilet systems in homes, commercial buildings, schools, and all other types of buildings.
   b. The code is updated every three years.

4. The **Uniform Mechanical Code**, a set of requirements and standards for heating, ventilating, air-conditioning, and refrigeration (HVAC/R) systems, is published by the International Association of Plumbing and Mechanical Officials.
   a. The Uniform Mechanical Code addresses the design, construction, installation, operation, and maintenance of HVAC/R equipment.
   b. The code is updated every three years.

5. The **National Fuel Gas Code**, a set of minimum safety requirements for fuel gas piping systems in homes and other buildings, as well as for items that contain or operate on natural gas or propane, is published by the National Fire Protection Association.
   a. The code sets standards for installing and operating fuel gas systems, appliances, and equipment.
   b. The code is updated as needed, usually every three to five years.

**Teaching Strategy:** Use VM–C during instruction. Students can refer to the suggested resources to aid in understanding the content of the objective.

**Objective 3:** Describe how state and local governments utilize building codes.

**Anticipated Problem:** How do state and local governments utilize building codes?

III. State and local building codes

A. State building codes
   1. If municipalities do not have building codes, they will adopt the state building codes for compliance.
   2. Often, state codes are meant for commercial buildings, as most municipalities adopt codes for residential buildings.

B. Local building codes
   1. Local governments usually adopt and enforce the International Residential Building Code.
   2. Local governments may not always adapt to the latest version of the international code. They may find the changes irrelevant or controversial and stay with an older version.
   3. Local governments may enforce other codes as well.
4. Cities, towns, and counties will often have accessible links to the enforced codes on their websites.

**Teaching Strategy:** Use VM–D during instruction. Have students identify what local building codes are enforced. Show students where to access local codes via a website.

**Objective 4:** Identify safety precautions to implement during the construction process.

**Anticipated Problem:** What safety precautions should be implemented during the construction process?

IV. Safety precautions

A. A culture of safety should be promoted.
   1. Each person should adopt a safety mind-set.
   2. One person on a project should be designated as the “go-to person” for potential safety risks. Once a safety risk has been identified, someone should be assigned to take the steps needed to remove the risk.

B. Potential safety hazards should be identified before the construction project begins.

C. The job site should be reviewed regularly, and input obtained from workers on the project to identify potential safety hazards.

D. Every person involved in the project should get safety training.

**Teaching Strategy:** Use VM–E during instruction. Assign LS–A to supplement instruction.

**Objective 5:** Identify careers related to agricultural construction.

**Anticipated Problem:** What are some careers related to agricultural construction?

V. Careers in agricultural construction.

A. Common agricultural construction careers within the skilled trades
   1. Agricultural construction worker
   2. Agricultural HVAC/R technician
   3. Agricultural plumber
   4. Construction equipment salesperson
   5. Land surveyor
   6. Landscape contractor
   7. Welder

B. Common agricultural construction careers in engineering and architecture
   1. Agricultural construction engineer
2. Agricultural construction project manager
3. Landscape architect

**Teaching Strategy:** Use VM–F during instruction. Supplement instruction content with a careers activity through Career Explorer from the National FFA website.

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may also be included in the Review/Summary.

**Application.** Use the included visual masters and lab sheet to apply the information presented in the lesson. Invite a local building inspector to speak with students on the importance of building codes.

**Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

**Answers to Sample Test:**

**Part One: Matching**

1. b
2. d
3. c
4. a
5. f
6. e

**Part Two: Completion**

1. irrelevant or controversial
2. a. safety  
   b. before  
   c. job site, input  
   d. training

**Part Three: Short Answer**

Many local governments require an inspection by a certified building inspector once each phase of a construction project is complete to make sure building codes and standards were followed.
Construction Codes

Part One: Matching

Instructions: Match the term with the correct definition.

b. International Fire Code  e. Uniform Mechanical Code

1. A set of fire safety requirements for buildings
2. A set of minimum safety requirements for fuel gas piping systems in homes and other buildings, as well as for items that contain or operate on natural gas or propane
3. Standards for the safe installation of electrical wiring and its related hardware and equipment
4. Sets of regulations governing the design, construction, alteration and maintenance of structures and specifying the minimum requirements to adequately safeguard the health, safety and welfare of building occupants
5. A set of requirements and standards for the installation, repair, and change of plumbing systems
6. A set of requirements and standards for heating, ventilating, air-conditioning, and refrigeration (HVAC/R) systems

Part Two: Completion

Instructions: Provide the word or words to complete the following statements.

1. Local governments may not always adapt to the latest version of the International Residential Building Code. They may find the changes _________________________ and stay with an older version.
2. During the construction process:
   a. Promote a culture of _________________________.
   b. Identify potential safety hazards ________________________ the construction project begins.
   c. Review the ________________________ regularly, and obtain ________________________ from workers on the project to identify potential safety hazards.
   d. Get safety ________________________ for every person involved in the project.

Part Three: Short Answer

Instructions: Answer the following.

How are building codes enforced?
Colonial Agriculture Structures

Agricultural Structure of the Industrial Revolution
ADVANCES IN AGRICULTURAL STRUCTURES

Modern Agricultural Structures
COMMON BUILDING CODES

♦ International Fire Code
♦ National Electrical Code
♦ National Fuel Gas Code
♦ Uniform Mechanical Code
♦ Uniform Plumbing Code
Local governments usually adopt and enforce the International Residential Building Code.

Local governments may not always adapt to the latest version of the international code.

Local governments may enforce other codes as well.

Cities, towns, and counties will often have accessible links to the enforced codes on their websites.
CONSTRUCTION SAFETY

♦ Promote a culture of safety.

♦ Identify potential safety hazards before the construction project begins.

♦ Review the job site regularly, and obtain input from workers on the project to identify potential safety hazards.

♦ Get safety training for every person involved in the project.
COMMON CAREERS IN AGRICULTURAL CONSTRUCTION

- Agricultural construction engineer
- Agricultural construction project manager
- Agricultural construction worker
- Agricultural HVAC/R technician
- Agricultural plumber
- Construction equipment salesperson
- Land surveyor
- Landscape architect
- Landscape contractor
- Welder
Agricultural Construction Safety

Purpose
The purpose of this activity is to identify common safety precautions in construction.

Objective
Identify the proper use and requirements for common safety in construction.

Materials
Computer with printer and Internet access

Procedure
Imagine you are the safety coordinator for a volunteer community construction project. As the coordinator, you need to identify the areas of safety that each volunteer needs to be informed about.

1. Identify OSHA’s minimum requirements for a basic first-aid kit.
2. Identify the common PPE that construction workers use on the job.
3. Explain the safe use of a ladder.
4. Identify occasions when safety harnesses should be used.
5. Identify four safety precautions when setting up a scaffold.