

## UNIT III - BUILDING CONSTRUCTION

### Lesson 4: Fasteners and Fastening Systems

**Competency/Objective:** Identify the uses of different fasteners and fastening systems.

#### **Study Questions**

1. What are the groups of fasteners and the uses of each group?
2. What are the factors to consider when selecting nails?
3. What are the types of screws and their uses in agricultural structures?
4. What are adhesives and their uses?
5. What are the types of construction anchors and their uses?
6. What are the types of framing anchors and their uses?

#### **References**

1. *Agricultural Structures (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1999, Unit III.
2. Transparency Masters
  - a) TM 4.1: Nails
  - b) TM 4.2: Nail Sizes
  - c) TM 4.3: Screws
  - d) TM 4.4: Sample Framing Anchors
3. Activity Sheet
  - a) AS 4.1: Identifying Fasteners



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#### Lesson 4: Fasteners and Fastening Systems

#### TEACHING PROCEDURES

##### B. **Review**

The previous lesson, Lesson 3, described some of the materials used in construction. The following lesson explores the different fasteners and fastening systems as well as some of their uses. Nails, screws, adhesives, and construction anchors are all types of fasteners.

##### C. **Motivation**

Show the class examples of different fasteners representing each of the groups discussed in this lesson.

##### D. **Assignment**

##### E. **Supervised Study**

##### F. **Discussion**

1. Ask students to list different kinds of fasteners. Discuss their uses.

#### **What are the groups of fasteners and the uses of each group?**

- a) Nails - attach pieces of wood together
  - b) Screws - attach pieces of wood as well as metals
  - c) Adhesives - can bond many types of materials
  - d) Construction anchors - devices used to attach walls to foundations
  - e) Framing anchors - attach framing members together
2. Ask students to list some different types of nails. Use TM 4.1 to illustrate the different types. Discuss how different sizes of nails are designated. Discuss the factors to consider when choosing nails for use in construction. TM 4.2 shows different nail sizes.

#### **What are the factors to consider when selecting proper nails?**

- a) Use
  - 1) Common nail - general purpose nails used anywhere a special purpose nail is not needed
  - 2) Box nail - have a thinner head and shank and are less likely to split wood and easier to cover with paint; often used in finish cabinet work
  - 3) Finish nail - useful for finishing because of their very small heads, which make them less noticeable; have less holding ability because of the small head
  - 4) Duplex-head nail - used when nails will have to be removed because the head extending above the surface makes their removal easier; commonly used for concrete forms
  - 5) Roofing nail - used for nailing shingles in place; have very wide, flat heads
  - 6) Ring-shank nail - used for applications where the nail will never be removed and the material needs to be held tightly; often used for stair treads
  - 7) Screw-shank nail - twisted shaft causes the nail to turn as it is driven in, making it difficult to remove; used where good holding ability is needed, such as on decks
  - 8) Staple - used mostly for wire, plastics, or vinyl
- b) Length

- 1) Designated by the term “penny” and the letter “d”
  - 2) Should be long enough to pass entirely through one board and at least half the thickness of the board to which it will be attached
  - c) Exposure to weathering - Should choose nails made of materials such as zinc or aluminum that will resist corrosion or staining
3. Screws have better holding ability than nails. They are also used in combination with glues for even greater bonds. Discuss the different types of screws. Use TM 4.3 to illustrate as needed.

**What are the types of screws and their uses in agricultural structures?**

- a) Head styles
    - 1) Round head
    - 2) Oval head
    - 3) Flat head
    - 4) Pan head
  - b) Slot types
    - 1) Straight-slot
    - 2) Phillips
    - 3) Special slot styles (square, Allen, or star)
  - c) Wood screw - used to attach wood
  - d) Self-tapping metal screw - used with sheet metal or building siding
  - e) Drywall screw - used to secure drywall to walls and ceilings
4. Adhesives are used today in all phases of construction, and they are expected to play an even greater role in the future. Discuss the different adhesives and their uses. Emphasize that all manufacturer’s recommendations should be followed carefully, because adhesives can be dangerous.

**What are adhesives and their uses?**

- a) Wood glue - for joining woods
    - 1) Polyvinyl (white wood glue) - for interior or furniture woodwork
    - 2) Urea formaldehyde (plastic resin glue) - for repairing wood splits or reinforcing joints in a defective truss
    - 3) Resorcinol resin - for wood where water exposure is likely
  - b) Epoxy - for extremely strong bonds; commonly used on fiberglass and plastics
  - c) Mastic - for materials with large surface areas, such as floor coverings; includes contact cements, which are used to attach laminates to counter tops or for vinyl floor coverings
5. Anchors include a wide range of devices, bolts, and cable systems. Discuss some of the different types of construction anchors that are used.

**What are the types of construction anchors and their uses?**

- a) Generally used to attach walls to foundations; help protect the structure against damage from high winds by adding more strength and stability
  - b) Anchor bolt - large bolts set into the foundation to serve as anchors by securing the bottom of the wall to the concrete
  - c) Other types of anchor systems
    - 1) Metal straps set in concrete and then attached to the wooden member in the wall
    - 2) Anchors screwed into the ground with metal cables attaching them to the structure
6. Another type of anchor is a group of specially built brackets designed to attach framing pieces together. Show students examples of framing anchors using TM 4.4. Hand out AS 4.1, and assign students different groups of fasteners to research. If possible, discuss their research in class.

**What are the types of framing anchors and their uses?**

- a) Differ from construction anchors in that they attach framing pieces together
  - 1) Setting joists in place
  - 2) Attaching the roof to the walls
  - 3) Attaching walls to each other
  - 4) Joining the parts of a truss
- b) Have specific shapes for a particular purpose

G. ***Other Activities***

Have students compare sample fasteners to determine where each fastener would work best and where it would not be a good choice. If possible, have students collect different types of fasteners and add them to the school's collection.

H. ***Conclusion***

Five main groups of fasteners--nails, screws, adhesives, construction anchors, and framing anchors--are discussed in this lesson. Nails are the most commonly used type of fastener, while screws generally are stronger fasteners. Adhesives are now being used more frequently to join a variety of building materials. Anchors increase the strength and stability of the structure. For heavy construction, obtaining professional recommendations about the best types of fasteners to use is valuable.

I. ***Answers to Activity Sheet***

J. ***Answers to Evaluation***

- 1. a
- 2. c
- 3. d
- 4. c
- 5. d
- 6. Self-tapping metal screws
- 7. To attach walls to foundations and help protect the structure against damage from high winds by adding more strength and stability
- 8. Use, length, and exposure to weathering
- 9. Answers may include any one of the following: attaching the roof to the walls, attaching walls to each other, and joining the parts of a truss together.



EVALUATION

**Circle the letter that corresponds to the best answer.**

1. A duplex-head nail is used for:
  - a. Easy removal.
  - b. Permanent installation.
  - c. Attaching wire.
  - d. Finishing.
  
2. White wood glue is a:
  - a. Contact cement.
  - b. Urea formaldehyde.
  - c. Polyvinyl.
  - d. Resorcinol resin.
  
3. The length of a nail is described by a number and the term:
  - a. Weight.
  - b. Inches.
  - c. Dimes.
  - d. Penny.
  
4. Which of the following nails has a twisted shaft that causes it to turn as it is driven?
  - a. Ring-shank nail
  - b. Finish nail
  - c. Screw-shank nail
  - d. Twister nail
  
5. Which of these adhesives is used for attaching vinyl floor coverings?
  - a. Epoxy
  - b. Urea formaldehyde
  - c. Resorcinol resin
  - d. Contact cement

**Complete the following short answer questions.**

6. What type of screw is used to attach sheet metal or metal siding?
  
  
  
  
  
  
  
  
  
  
7. What is the purpose of construction anchors?

8. What are three factors that affect the selection of nails?

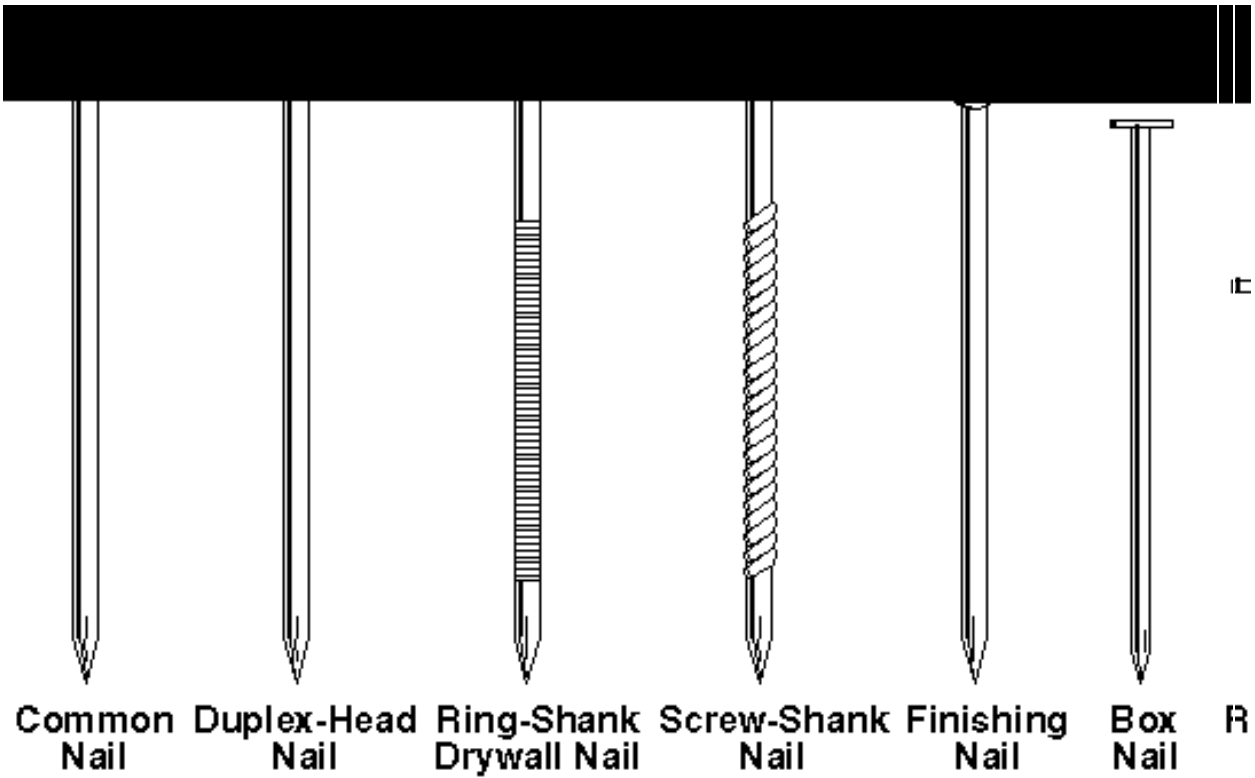
a.

b.

c.

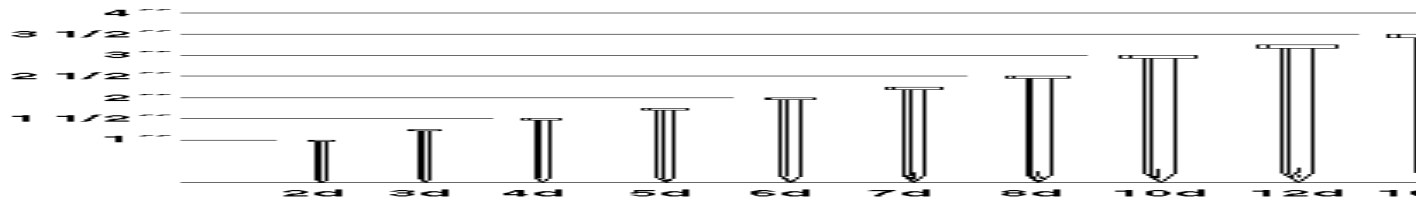
9. What is one use of framing anchors?



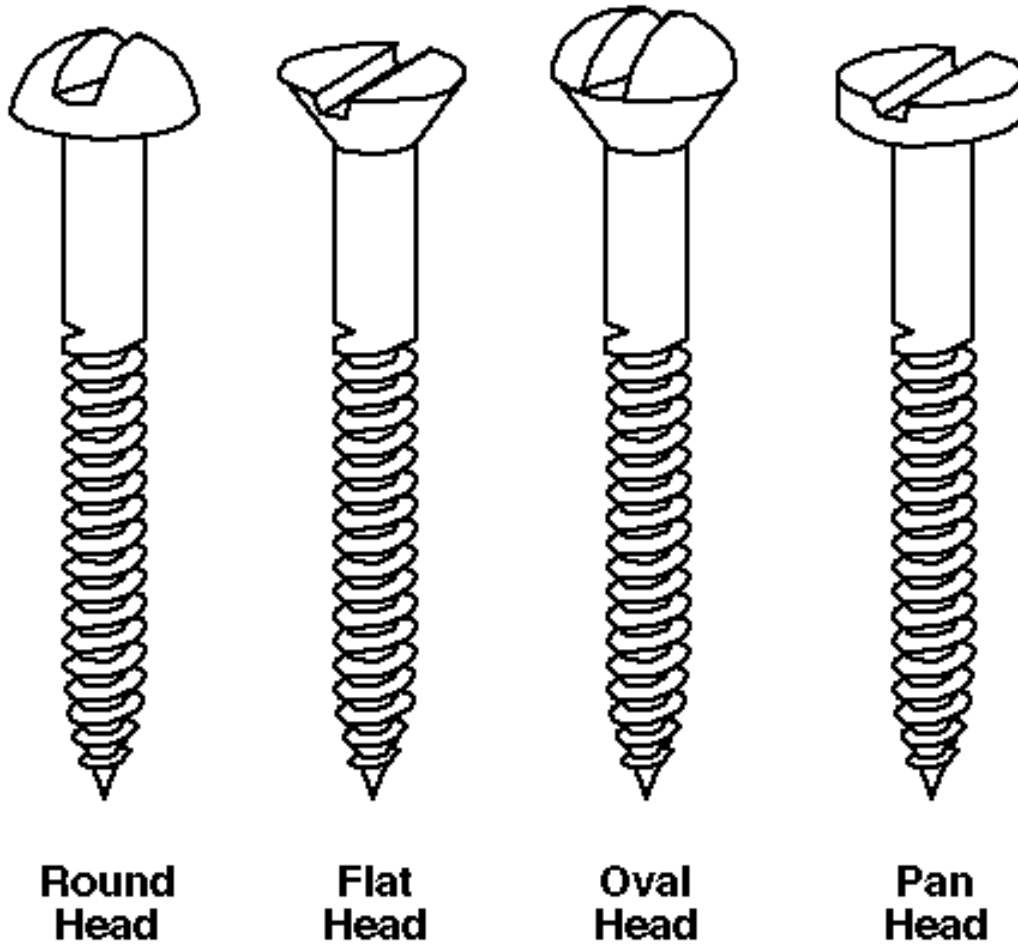




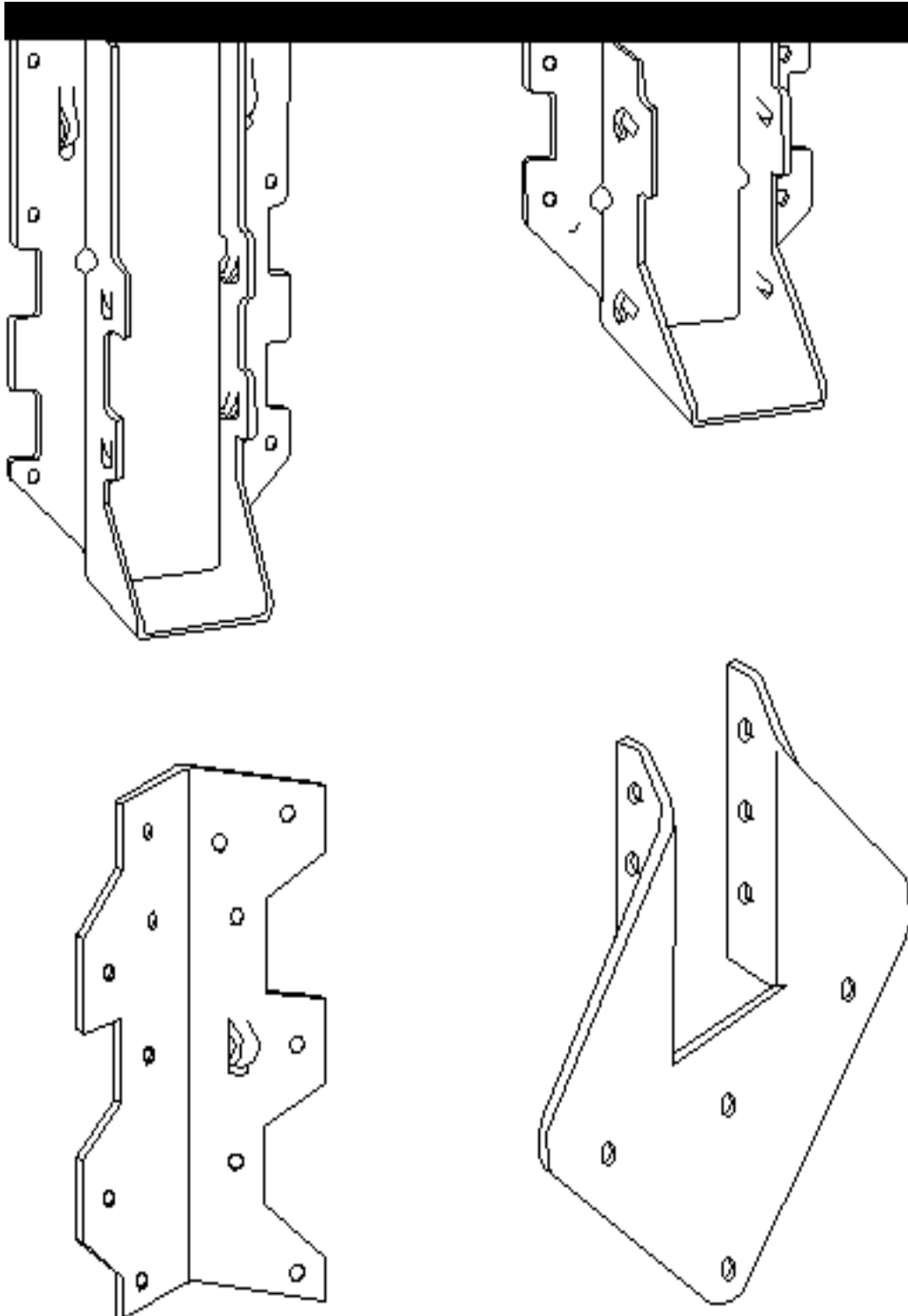
## TM 4.2







## Sample Framing Anchors





Lesson 4: Fasteners and Fastening Systems

Name \_\_\_\_\_

**Identifying Fasteners**

**Objective:** Identify the uses of different fasteners and fastening systems.

**Research the group of fasteners assigned by your instructor then answer the questions below. Be prepared to discuss the information with the class.**

1. What are five products available in the category selected?

2. How and when can each of them be used?

3. What are the advantages and disadvantages of each?



