

UNIT VII - FENCING

Lesson 2: Setting and Bracing Posts

Competency/Objective: Describe how to set and brace wood and steel posts.

Study Questions

1. What are the materials and tools needed for installing wood posts and braces?
2. Where are wood and steel anchor-and-brace assemblies located?
3. How are assemblies and brace wire installed?
4. How are the wood line posts installed?
5. What tools are needed for installing steel posts and braces?
6. How are steel post-and-brace assemblies installed?
7. How are steel line posts installed?
8. What are the factors to consider when installing a gate?

References

1. *Agricultural Structures (Student Reference)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1999, Unit VII.
2. Transparency Masters
 - a) TM 2.1: Anchor-and-Brace Assemblies
 - b) TM 2.2: H-Brace
 - c) TM 2.3: Metal Corner Post and Braces
3. Activity Sheet
 - a) AS 2.1: Constructing Model Brace Assemblies

UNIT VII - FENCING

Lesson 2: Setting and Bracing Posts

TEACHING PROCEDURES

B. *Review*

Lesson 1 discussed the tools used to build fences and how to build them safely. Building fences is a labor intensive process. Constructing a fence correctly is better than doing a poor job and having to perform excessive maintenance and repairs. This lesson describes how to install anchor-and-brace assemblies and line posts for wood and steel posts.

C. *Motivation*

Ask students whether the fences they are familiar with use wood or steel posts or some combination of the two. Ask students why they think the different kinds of posts are used for those fences.

D. *Assignment*

E. *Supervised Study*

F. *Discussion*

1. Ask students to describe the tools needed to install braces and wood posts. Discuss the different tools. If possible, show students a sample wood post and brace.

What are the materials and tools needed for installing wood posts and braces?

a) Materials

- 1) Wood corner posts
 - (a) Chemically treated to resist rotting
 - (b) 6 or more inches in diameter
 - (c) 8 feet or more in length
- 2) Wood line posts
 - (a) Chemically treated
 - (b) 2½ inches to 6 inches in diameter, with a diameter of 5 inches preferred
 - (c) 5½ to 8 feet in length
- 3) Wood brace poles
- 4) Large nails, such as 16d tempered ring shank pole barn nails
- 5) 12½ gauge high tensile smooth wire for wire braces
- 6) Staples

b) Tools

- 1) Axe
- 2) Wheelbarrow
- 3) Chain saw
- 4) Heavy equipment
- 5) Post hole digger
- 6) Shovel
- 7) Hoe
- 8) Tape measure 100 feet or more in length
- 9) Level

2. Discuss where anchor-and-brace assemblies are located along the fence line.

Where are wood and steel anchor-and-brace assemblies located?

- a) Fence corners
 - b) At points along the fence line to compensate for the effect of stresses exerted on the fence
 - 1) Type of fence
 - 2) Topography of the ground
 - 3) Type of ground
 - 4) Length of the fence run
 - 5) Bends in the fence line
3. Describe the process for installing the most common type of assembly, the H-brace. TM 2.1 can be used to illustrate other types of assemblies. TM 2.2 shows a finished H-brace. Hand out AS 2.1.

How are assemblies and brace wire installed?

- a) Set the posts in place.
 - 1) Place the end or corner post first.
 - 2) Put the second brace post in place in line with the first at the desired distance.
 - (a) A longer brace pole will provide more structural strength.
 - (b) The industry standard is 8 feet in length, but when a single H-brace is needed, using a 10- to 12-foot brace is preferable.
 - b) Form a notch for the brace pole in each post.
 - 1) The notches should be perpendicular to the fence line.
 - 2) A good height for the bottom edge of the brace pole is 36 to 42 inches.
 - 3) The height should be determined by the spacing of the fence wires, so the brace does not interfere with wire placement.
 - c) Install the twist wire.
 - 1) Wrap the wire twice completely around each of the posts.
 - 2) The direction of the fence pull will determine the placement of the twist wire.
 - 3) Loosely staple the twist wire low on the brace post farthest from the longer stretch of fence and just above the brace on the post next to the length of fence being braced.
 - 4) Remove as much slack as possible from the twist wire by pulling on both ends.
 - 5) Splice the wires together.
 - d) Nail the ends of the brace pole to the posts using the 16d nails ring shank nails; four nails are used at each end, one on top, one on each side, and one on the bottom.
 - e) Insert a twist stick between the wires.
 - 1) The stick may be a 1-inch wood dowel, fiberglass rod, or a short section of 2" × 4" or 2" × 2".
 - 2) It should be a minimum of 20 inches in length.
 - f) Twist the wires so that when the assembly is finished the stick will be pulled against the brace pole on the opposite side from where the wire is attached.
 - 1) The structure should begin to move in the opposite direction from the pull of the fence.
 - 2) A good rule of thumb is to move the end post approximately ½ to ¾ of an inch out of plumb away from the direction of pull.
 - g) Attach the twist stick to the brace pole by drilling a ¼-inch hole through the twist stick in line with the brace and then driving a 16d galvanized nail through the stick and into the pole.
4. Discuss the procedures used to install wood line posts.

How are wood line posts installed?

- a) Lay out the fence line.
 - 1) One person stands behind a corner post and another person moves down the fence line toward the next corner post holding a movable post, or sighting pole.
 - 2) The person at the corner post directs him or her to a position that lines up the corner post, the post being held, and the next reference point.
 - 3) The spot is marked for reference in aligning the posts.
 - b) Measure off the line post spacing.
 - 1) The placement is determined by the type of fence, the amount of pressure that will be placed on the fence by livestock, dips and rises in the ground, and whether steel, fiberglass, or other types of posts are also placed in the fence line.
 - 2) For field fencing, line posts are commonly 14 to 20 feet apart, while 8 to 16 feet is typical for more confined lots.
 - 3) A tape measure may be used to measure out the exact spot for each post, or the distance between them may simply be estimated by pacing out the distance.
 - c) Mark the ground line on the posts; line posts are usually set 30 inches into the ground.
 - d) Dig the holes to the proper depth and set the posts in packed dirt.
 - e) A level may be used to check the posts' plumbness.
 - f) An alternative method of placing wood posts is sharpening and driving them into the ground with a post maul or a hydraulic post driver mounted on a tractor.
 - g) Special considerations for setting any line posts are topography and ground conditions.
 - 1) Wet areas will typically require a longer post driven deeper into the ground to provide stability for the fence.
 - 2) Posts set in low areas may need special bracing to keep them from lifting out of the ground.
5. Ask students to list the tools needed to install steel posts and braces.

What tools are needed for installing steel posts and braces?

- a) Chain saw
 - b) Ax
 - c) Heavy equipment
 - d) Metal post driver
 - e) Set of wrenches or a socket set for bolts
 - f) Portable arc welder
 - g) Fencing pliers or special tool for fasteners
 - h) Portable cement mixer or a wheelbarrow
 - i) Shovel
 - j) Buckets or a hose to supply water for concrete
6. Discuss how to install steel post-and-brace assemblies at a corner or along a fence line. Use TM 2.3 to illustrate the installation of a corner post.

How are steel post-and-brace assemblies installed?

- a) Dig the anchor post hole.
 - 1) Should be 3 feet deep
 - 2) Provides more stability if it is approximately 20 inches in diameter at the bottom and 18 inches in diameter at the top
- b) Mark the ground line on the post.
- c) Bolt or weld the braces to the anchor post.
- d) Dig holes where the braces touch the ground.
 - 1) Must extend 6 inches below the frost line
 - 2) Should be a minimum of 18 inches deep and preferably deeper, usually 2 to 3 feet
- e) Place the concrete around the post and braces.
- f) Mold the top of the concrete to slope away from them.

- g) Use a level to make sure the post is plumb.
7. Discuss the procedures for installing a steel line post.

How are steel line posts installed?

- a) Measure the line post spacing and align the posts.
 - b) Mark the ground line on the posts, which are set 2 to 3 feet deep.
 - c) Drive the posts to the proper depth using a steel post driver.
8. Collecting some pictures of gates and displaying them will help stimulate interest in this topic. Discuss the following factors with the class.

What are the factors to consider when installing a gate?

- a) A heavy gate will provide a counter force to the pull of the fence, so the weight of the gate should be taken into account when tensioning the brace structure.
- b) Gates should not be hung from lone posts.
- c) A larger post, 7 inches in diameter or more, should be used for the gate post.
- d) Gates should be hung in line with the fence structure, providing maximum support.
- e) If double gates are hung, a brace assembly must be installed on both sides of the opening.

G. ***Other Activities***

- 1. Examine fences around the school or community to investigate methods of bracing.
- 2. Ask a local fencing contractor to speak to the class about new types of fencing and fence bracing.

H. ***Conclusion***

Installing wood or steel posts is the first step in building a fence. Careful installation of both anchor-and-brace assemblies and line posts is necessary to construct a sturdy fence. Gates should also be installed with care, because their size and weight can have an effect on the fence.

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

- 1. They add strength to the fence, keep wires tight, and allow line wires to be tightened.
- 2. The fence would have little overall strength, and all wires would become very loose.
- 3. The twist wire pulls the posts toward each other.

J. ***Answers to Evaluation***

- 1. d
- 2. c
- 3. c
- 4. b
- 5. d
- 6. a
- 7. Twist stick

8. Answers may include any two of the following: type of fence, topography of the ground, type of ground, length of the fence run, and bends in the fence line.
9. They must be driven deeper into the ground.
10. Answers may include any two of the following: a set of wrenches or a socket set for bolts, a portable arc welder, and fencing pliers or a special tool for fasteners.

EVALUATION

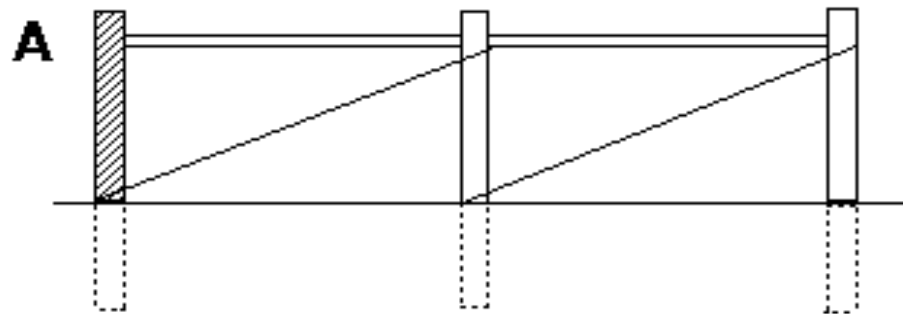
Circle the letter that corresponds to the best answer.

1. The recommended size for wood line posts is:
 - a. 2 inches in diameter.
 - b. 3½ inches in diameter.
 - c. 4½ inches in diameter.
 - d. 5 inches in diameter.
2. How deep are steel line posts generally set?
 - a. 1 to 2 feet deep
 - b. 1½ to 2½ feet deep
 - c. 2 to 3 feet deep
 - d. 2½ to 3½ feet deep
3. How deep are wood line posts usually set?
 - a. At least 10 inches
 - b. At least 20 inches
 - c. At least 30 inches
 - d. At least 40 inches
4. What is the first step in installing steel post-and-brace assemblies?
 - a. Mark the ground line on the post.
 - b. Dig the anchor post hole.
 - c. Bolt the braces to the post.
 - d. Dig holes for the braces.
5. How large should a gate post be?
 - a. At least 4 inches in diameter
 - b. At least 5 inches in diameter
 - c. At least 6 inches in diameter
 - d. At least 7 inches in diameter
6. What type of wire is preferred for wire braces?
 - a. 12½ gauge high tensile smooth wire
 - b. 12 gauge barbed wire
 - c. 10½ gauge smooth wire
 - d. 10 gauge high tensile smooth wire

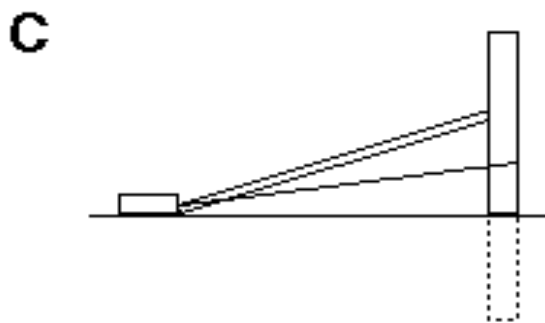
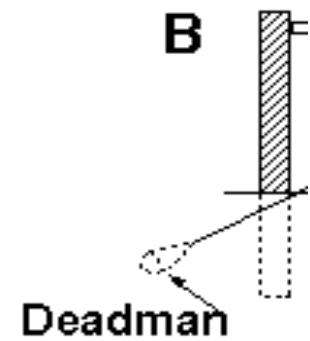
Complete the following short answer questions.

7. What is used to tighten a brace wire?
8. What are two factors that may affect the placement of an anchor-and-brace assembly along a fence line?
 - a.
 - b.
9. What must be done to provide more stability for line posts set in wet areas?
10. What are two tools used to attach braces to steel posts?
 - a.
 - b.

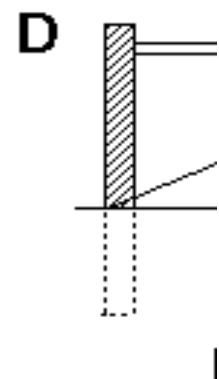
Anchor-and-Brace Assemblies



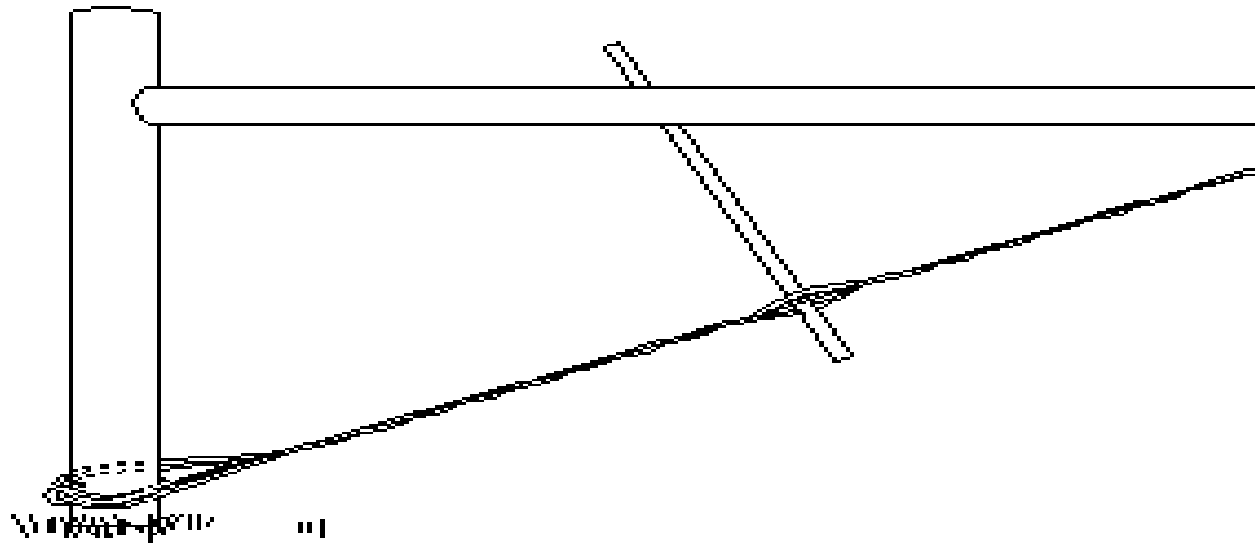
Double H



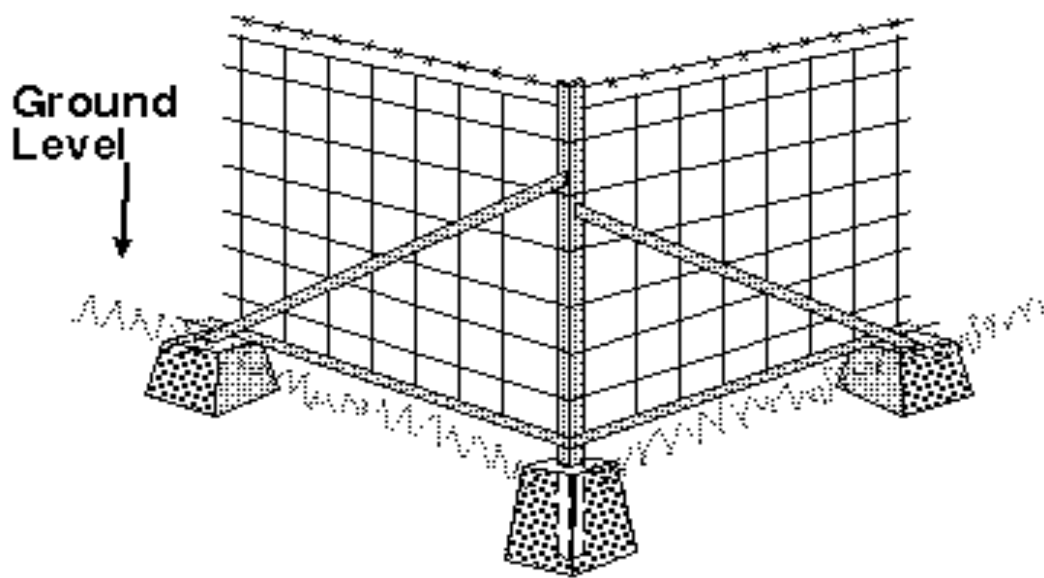
Angle Brace



H-Brace



Metal Corner Post and Braces

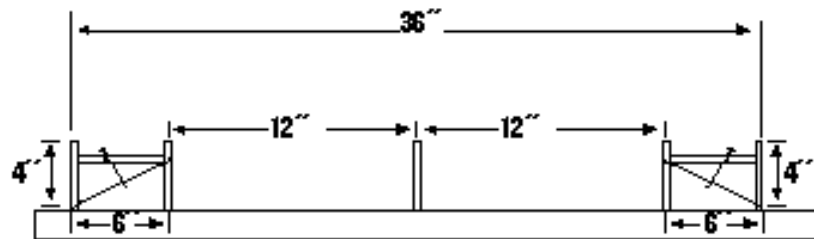


Lesson 2: Setting and Bracing Posts

Name _____

Constructing Model Brace Assemblies**Objective:** Construct model brace assemblies similar to those used in fencing.**Materials and Equipment:**

1 8-foot 2" × 4"
 1 4-foot ½" dowel
 Hacksaw
 ½-inch drill bit
 Drill
 Wood glue
 Wood chisel
 1 12d nail
 2 feet of thin wire (.035 MIG wire)

**Procedure:**

In this activity, you will construct a model (Figure 1.1) of a wood post fence that is 36 feet long, including the corner bracing. The model will be on the scale of 1" = 1'.

1. On your 2" × 4", mark on the board where the end posts will be placed. Drill holes 1 inch in depth into the board for the dowel posts.
2. At each end of the fence, brace posts will be placed 6 inches from the end post. Mark their location on the board and drill these holes.
3. The line posts in the middle will be 12 inches from the brace posts, with 12 inches between them. Mark their location and drill the holes.
4. Cut the dowel in 6-inch lengths to make six fence posts.
5. Before inserting any dowels into the holes, notch the brace posts for the brace pole. The top of the brace will be placed 4 inches above the surface. Mark the position on four of the posts, and cut a notch into the post that is ½ inch in diameter and only about ¼ inch into the post. Using the wood chisel, chip out the material between the cuts where the brace will be inserted.
6. Place a small amount of glue in the brace assembly holes at each end of the fence. Insert the four posts in the base so that the notches in the end and brace posts face each other.
7. Once these posts are in place, measure and cut the braces to the correct length.
8. Using wood glue, insert the brace in the notches of the brace assembly at one end of the model.
9. Wrap the wire around the posts forming the brace assembly. The wire should wrap around the bottom of the end post and the top of the other post.
10. Pull the wire as tight as possible. Tie the ends together tightly.
11. Insert a nail between the two wires in the middle of the brace span and begin twisting. Twist until the wire is tight and begins to cut into the dowel.
12. When the wire is tight, let the nail rest against the brace.

13. Wrap more wire around the nail and brace to hold the nail in place.
14. Repeat steps 8-13 for the brace assembly at the other end of the board.
15. Using a small amount of glue, insert the other two posts.
16. Optional - Using more of the wire, finish the model as if it were a 4-wire barbed wire fence. Fasten your wire to the posts using a hand staple gun.

Key Questions:

1. Why are fences braced in this manner?
2. How would the strength of the fence be affected if the brace assemblies broke?
3. What does the twist wire do?