OBJECTIVE SHEET

ON-GRADE CURB AND CURB-AND-GUTTER FORMS

3

INTRODUCTION

The construction of streets, curbs, and gutters are a part of nearly every construction project, large or small. On small projects you may be required to build the forms on site using wood, or, on larger jobs, you may use commercial, premanufactured metal units. Whatever type of form is used, careful preparation will be required to ensure that the forms are on grade and properly positioned. The ability to build or use a variety of curb and gutter forms is an important skill for the cement mason to have.

FOCUS ASSIGNMENTS

FOCUS ASSIGNMENTS

1. Watch the video *On Grade Curb Forms*.
2. Write a brief description of the steps to follow in establishing the line of a curb from an offset hub.

UNIT OBJECTIVE

After completing this unit, you will show the following competencies by mastering the activities on the Job Sheets and by scoring at least 85% on the Written Test.

SPECIFIC OBJECTIVES

1. Identify types of curbs and curbs and gutters.
2. Identify types of curb and curb-and-gutter forms.
3. Construct a straight curb form. (Job Sheet 1)
4. Set metal curb-and-gutter forms with a radius. (Job Sheet 2)
5. Identify types of median barrier forms.
6. Name methods of forming median barriers.
7. Describe the operation of a curb-and-gutter machine.

ON-GRADE CURB AND CURB-AND-GUTTER FORMS

OBJECTIVE 1

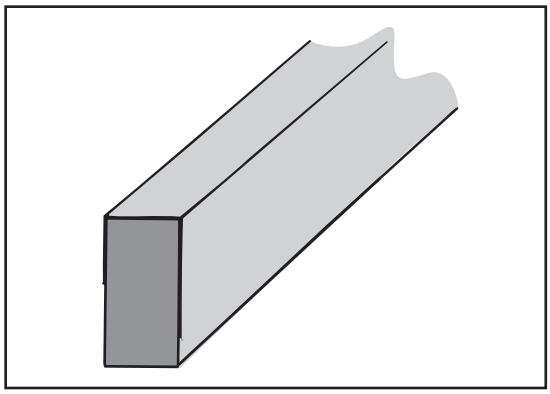
Optional Activities/ Resources in Instructor's Guide

Identify types of curbs and curbs and gutters.

WORDS YOU SHOULD KNOW	
battered	having a receding upward slope on the face of a curb

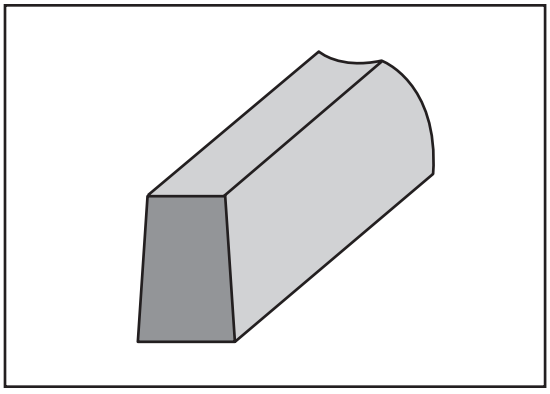
- Curbs
  - ❑ Straight (Figure 1)

FIGURE 1



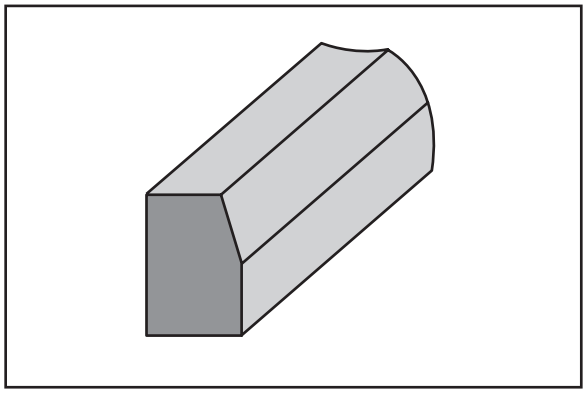
  - ❑ Full battered (Figure 2)

FIGURE 2



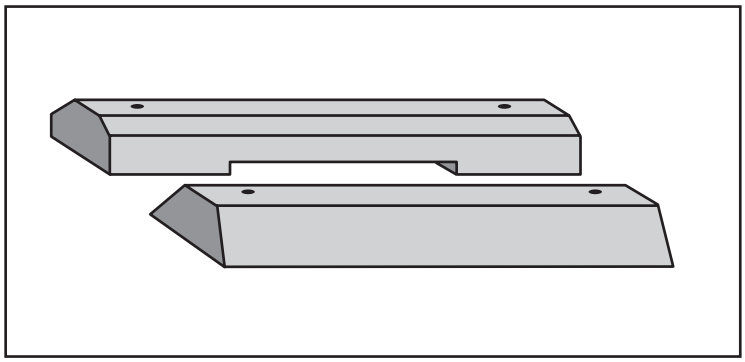
- ❏ Partially battered (Figure 3)

FIGURE 3



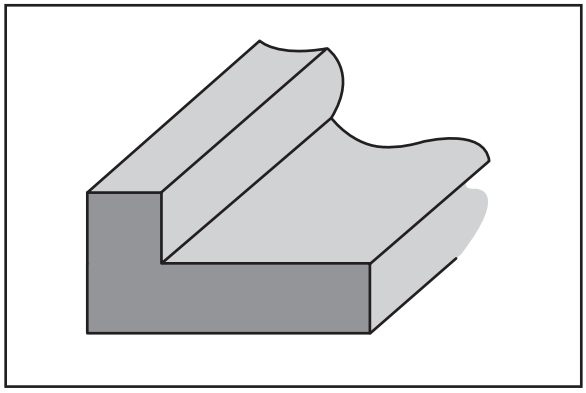
- ❏ Precast (Figure 4)

FIGURE 4



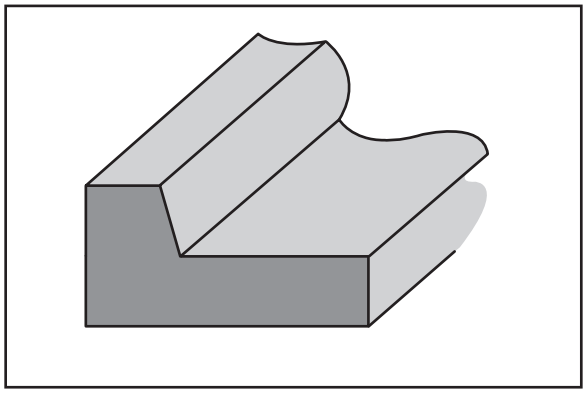
- Curbs and gutters
  - ❏ Straight face, vertical (Figure 5)

FIGURE 5



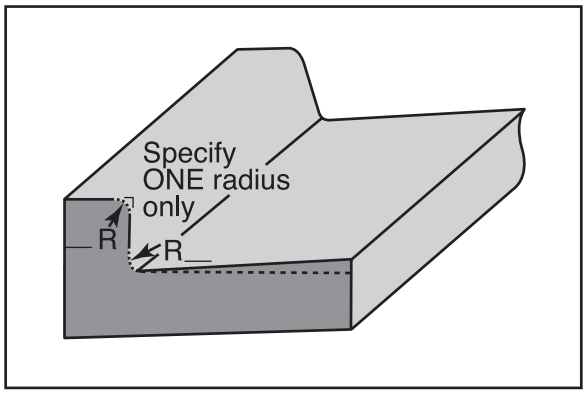
- ❏ Straight face, battered (Figure 6)

FIGURE 6



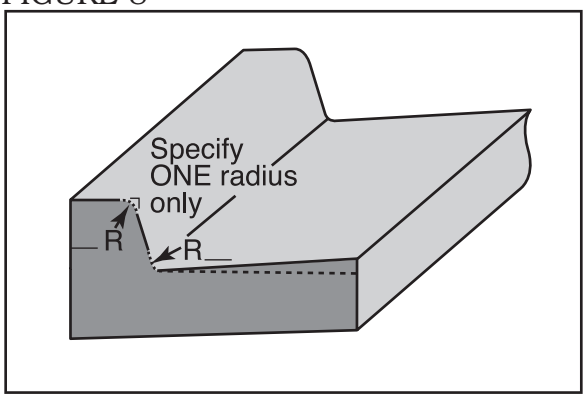
- ❏ Single radius, vertical (Figure 7)

FIGURE 7



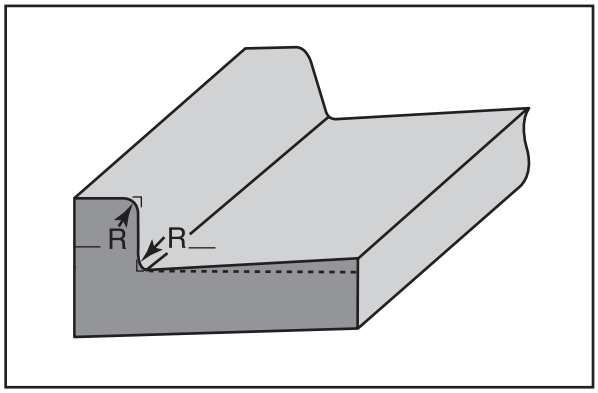
- ❏ Single radius, battered (Figure 8)

FIGURE 8



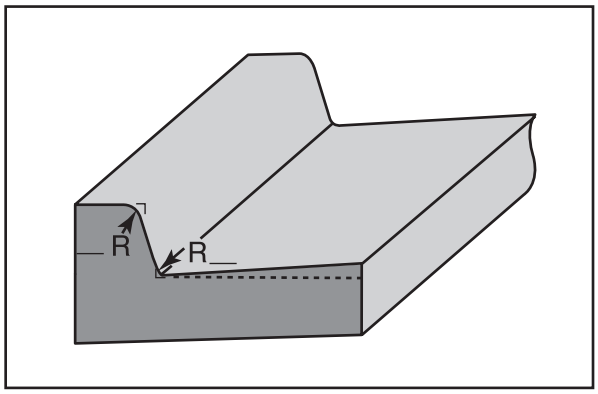
- ❏ Double radius, vertical (Figure 9)

FIGURE 9



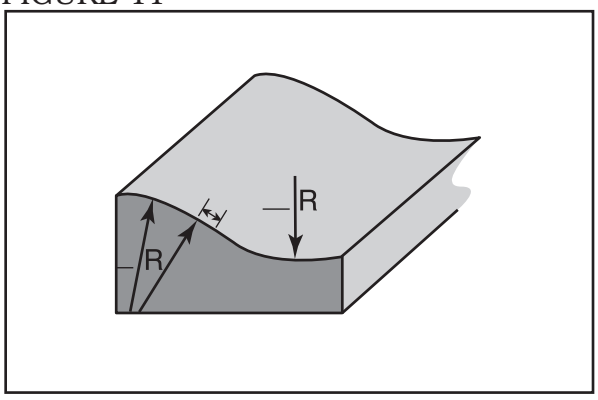
- ❏ Double radius, battered (Figure 10)

FIGURE 10



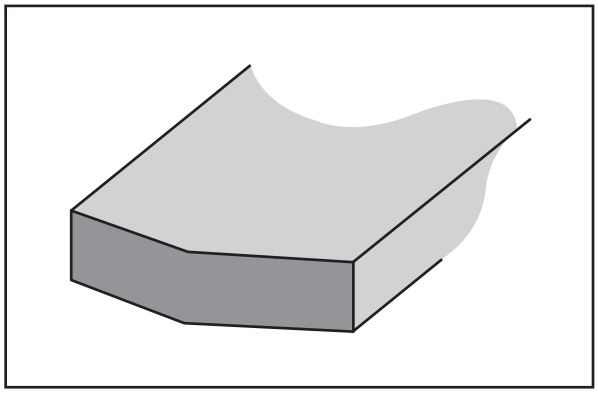
- ❏ Roll-type (Figure 11)

FIGURE 11



- ❏ Highway gutter (Figure 12)

FIGURE 12



OBJECTIVE 2

Identify types of curb and curb-and-gutter forms.

WORDS YOU SHOULD KNOW

mule	tool used to shape the profile of a curb and gutter

serpentine curb	curb having several lengthwise curves
subgrade	soil prepared and compacted to support a structure or pavement system

- Patented premanufactured metal units
  - ❏ Straight curb-and-gutter form (Figures 13 and 14)

FIGURE 13

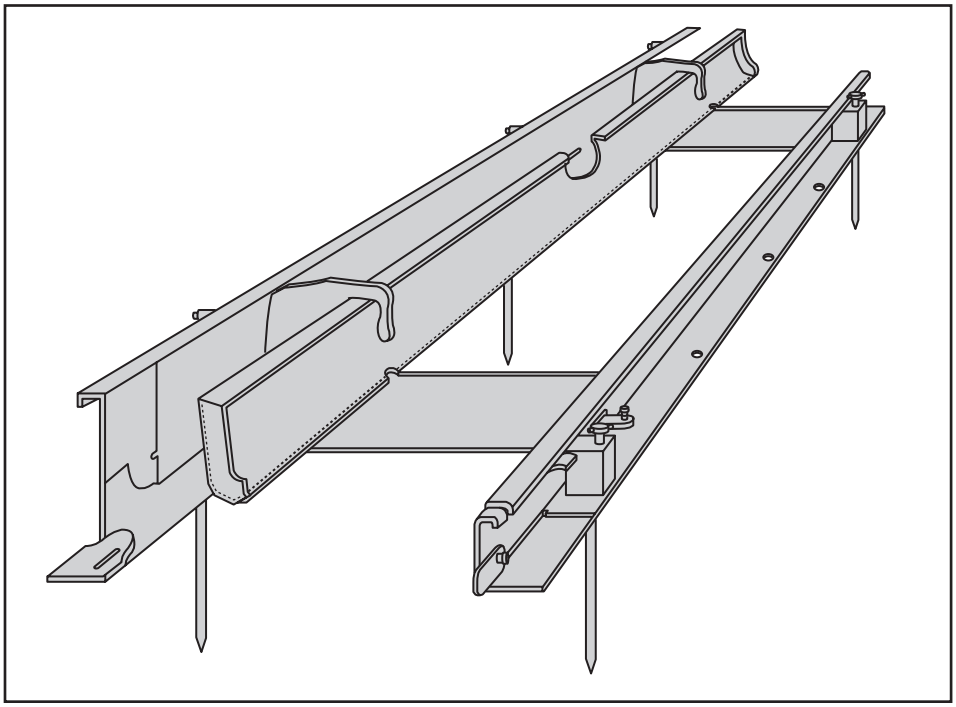
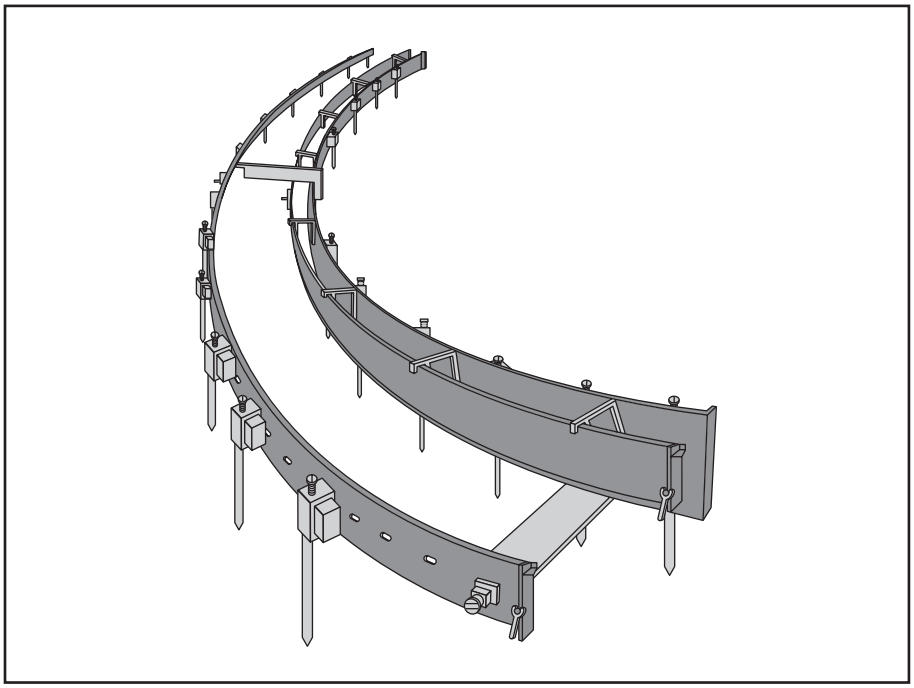


FIGURE 14

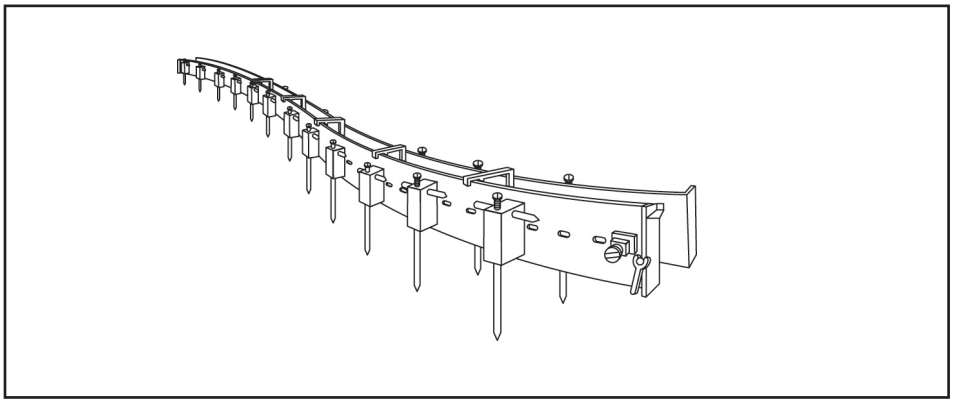
- Flexible-radius curb-and-gutter form (Figure 15)

FIGURE 15



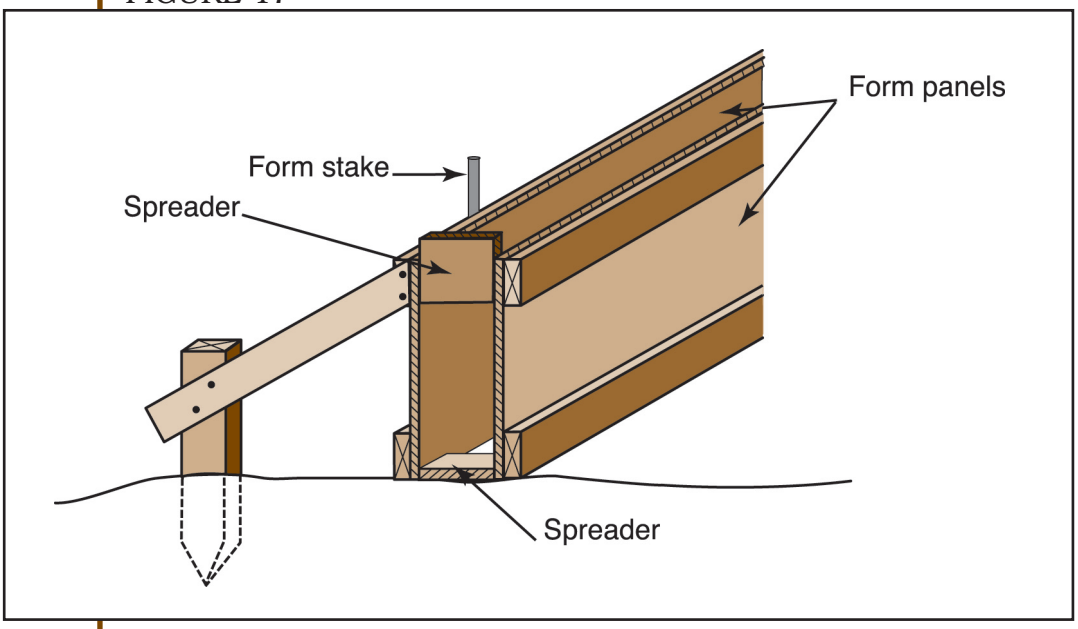
- Serpentine curb form (Figure 16)

FIGURE 16



- Wood forms constructed on site
  - ❑ Job-built curb form (Figure 17)

FIGURE 17



OBJECTIVE 3 **Complete Job Sheet 1.**

OBJECTIVE 4 **Complete Job Sheet 2.**

OBJECTIVE 5

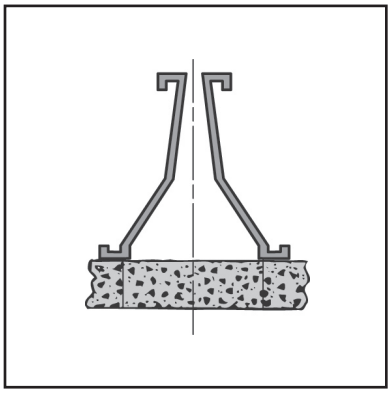
Identify types of median barrier forms.

WORDS YOU SHOULD KNOW	
median barrier	barrier dividing a highway into lanes according to direction of travel

- Set on slab (Figure 18)

  ✔ **NOTE:** A median barrier is set on a slab when the pavement is already in place.

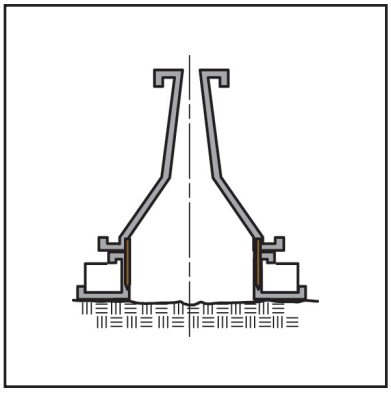
FIGURE 18



- Set on subgrade (Figure 19)

  ✔ **NOTE:** A median barrier is set on the subgrade when the barrier is placed first, then the pavement is laid up to the barrier.

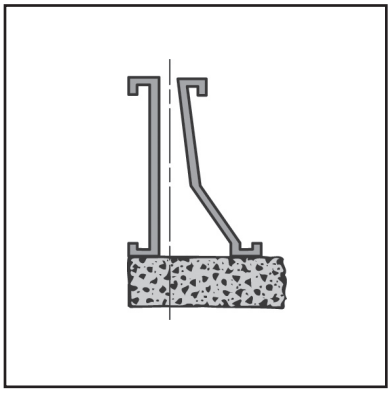
FIGURE 19



- One-sided (Figure 20)

  ✔ **NOTE:** A one-sided median barrier may be used to separate pedestrian and vehicular traffic, as on a bridge or in a tunnel.

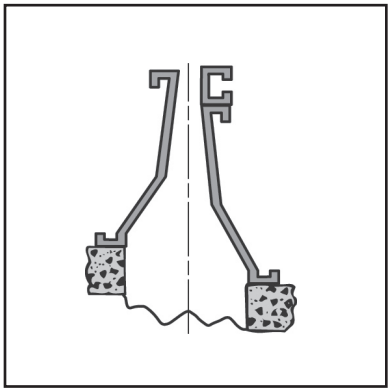
FIGURE 20



- Set on two elevations (Figure 21)

  ✔ **NOTE:** A median must be set on two elevations when the lanes of the highway are at different levels. An extension must be added at the top of the form on the lower side so that the finished barrier will have a level top.

FIGURE 21

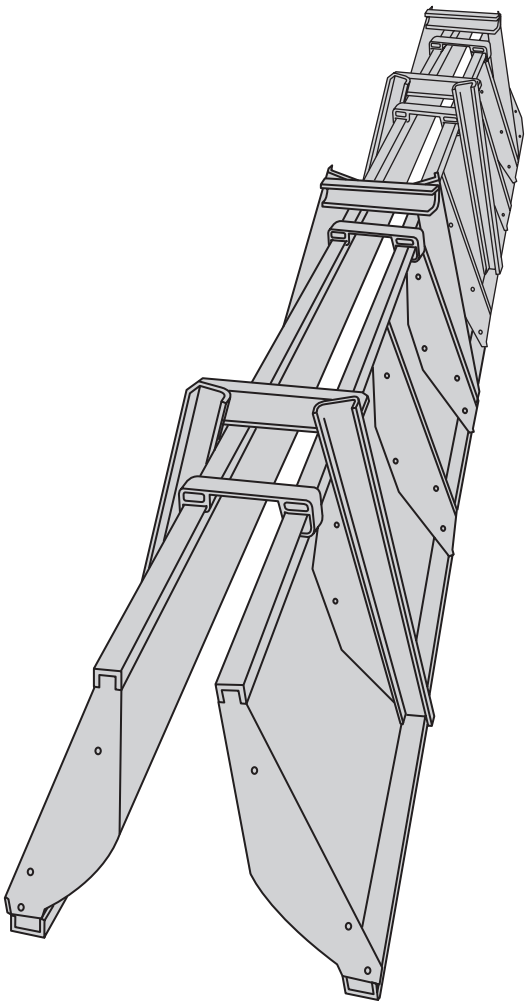


OBJECTIVE 6

Name methods of forming median barriers.

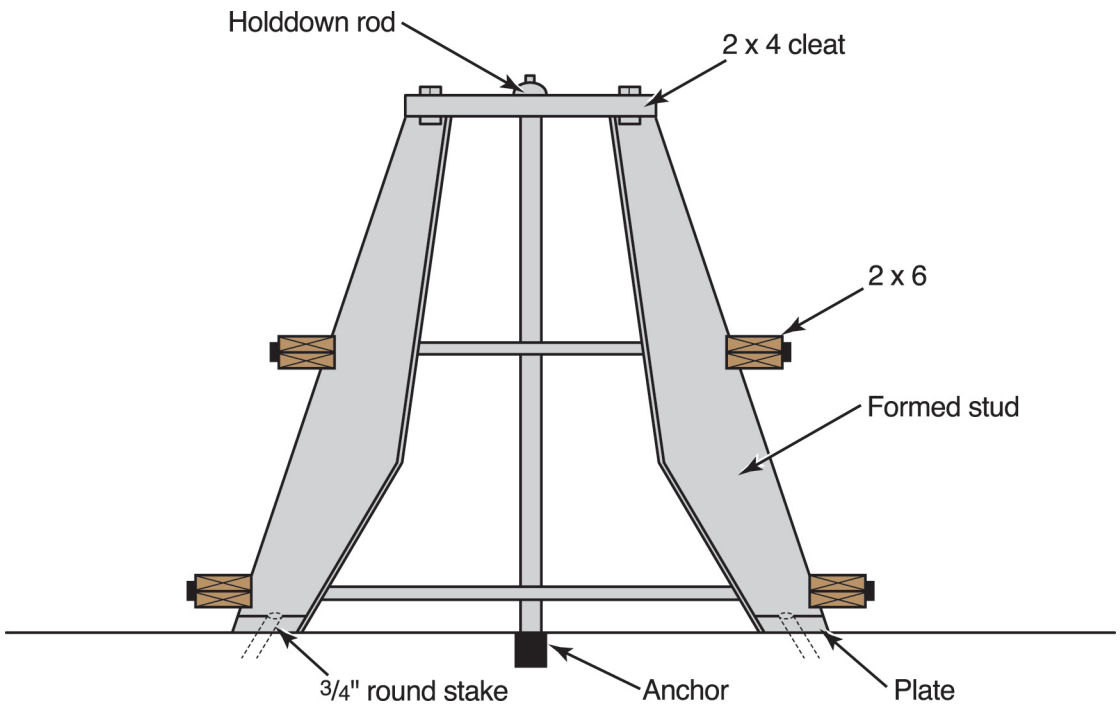
- Using patented premanufactured forms (Figure 22)

FIGURE 22



- Constructing wood forms on site (Figure 23)

FIGURE 23



OBJECTIVE 7

Describe the operation of a curb-and-gutter machine.

WORDS YOU SHOULD KNOW	
extrude	to be forced out through an opening or mold

✔ **NOTE:** Curb and gutter machines are widely used today because they are efficient and produce a consistent product. The cement mason's job is to ensure that the grade has been properly prepared and to set the string line that the machine will follow.

- Curb and gutter machines are self-propelled
- Curb and gutter machines can make very tight turns and can be used on large jobs or short pours
- Computers and electronic sensors on allow it to follow a preset stringline to very close tolerances

- A very thick, low-slump concrete mix is vibrated and extruded through a curb-shaped mold
- Most machines are also able to pour barriers, sidewalks, and bicycle paths
- A machine and crew of cement masons can pour up to 2000 to 4000 feet of curb and gutter per day
- Cutting joints and finishing are done by hand

FIGURE 24

JOB SHEET 1

ON-GRADE CURB AND CURB-AND-GUTTER FORMS

3

Name _____Score_____

OBJECTIVE 3

Construct a straight curb form.

BASIC SKILLS

Employability

EQUIPMENT AND SUPPLIES

- Sledge hammer
- Claw hammer
- Power handsaw and extension cord equiped with a ground-fault circuit interrupter

CAUTION: Wear eye protection when operating power handsaw.

- Handsaw
- 100-foot tape
- Engineer's rule or steel tape
- 4-foot hand level
- String line
- Builder's level and rod
- Curb clamps
- 36-inch steel form pins
- 12, 16, or 18 inch form panels
- 2 x 4 bracing or turnbuckles
- 8d and 16d duplex nails
- Color pencil
- Personal protective equipment.

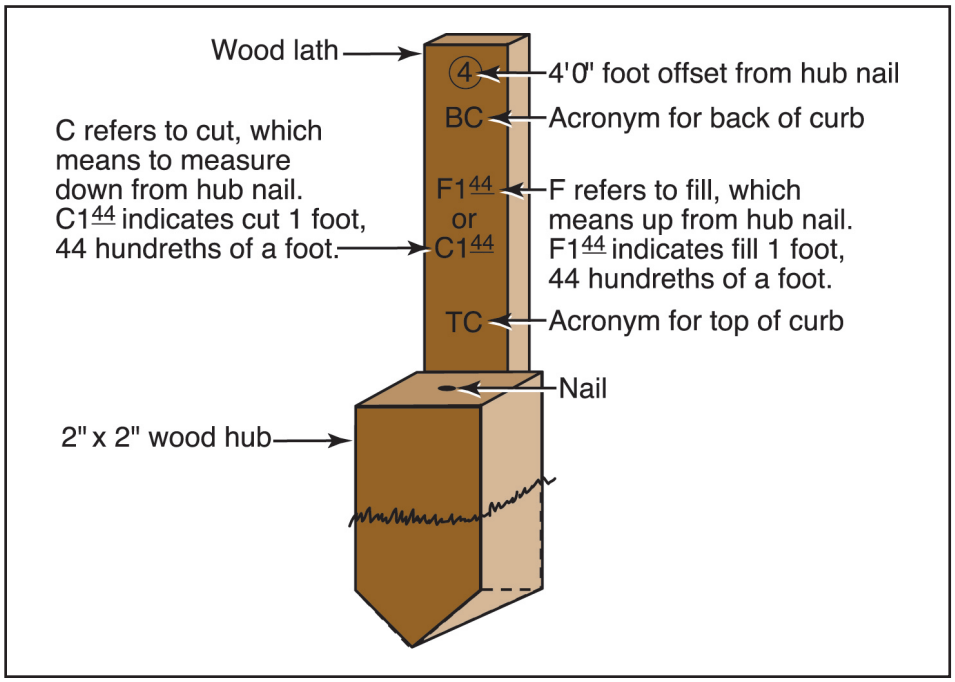
✔ **NOTE:** Refer to C.F.R. 1926.28 Sub Part C in regard to personal protective equipment.

PROCEDURE

Yes No

❑ ❑ 1. Establish the line of the curb. (Figure 1)

FIGURE 1



❑ ❑ 2. The grade stake states the offset is 4 feet from the hub nail to the back of the curb. Drive the stake 4 feet from the hub. This will place the stake inside the back of the curb. Do not include the stake width in the 4 foot measurement. (Figure 2) Use the level to determine the offset elevation on the form stake and mark it clearly (Figure 3). Using F 1 44 TC, use an engineer's ruler to measure up 1 foot .44 hundreths.

FIGURE 2

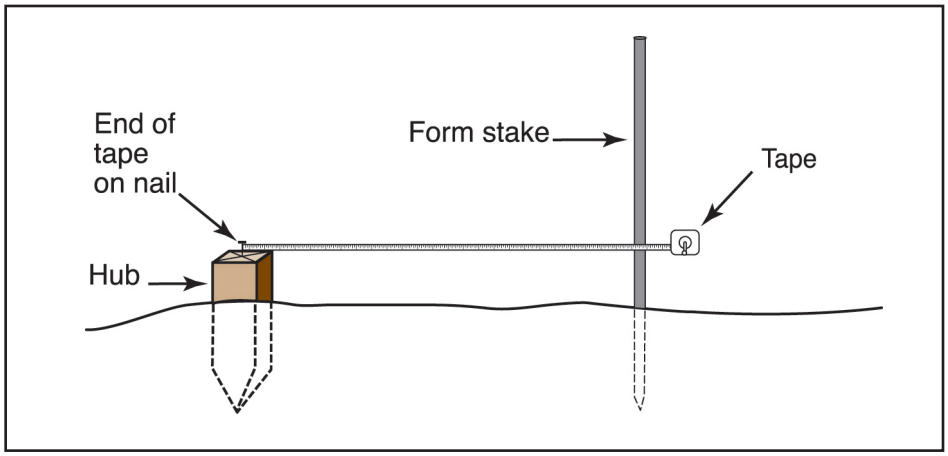
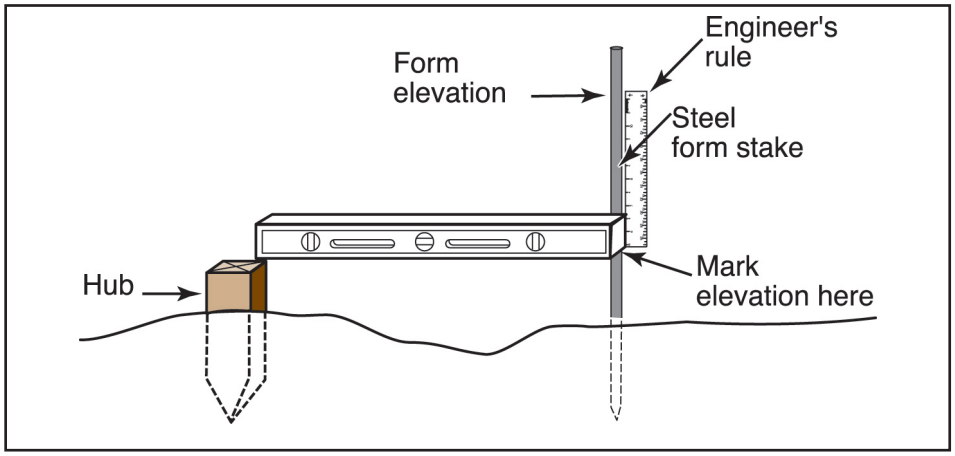


FIGURE 3



✔ **NOTE:** Some states use FC which is an acronym for face of curb. When this is used, the width of curb top must be subtracted from the offset distance for the back of the curb form.

Yes No

❑ ❑ 3. Measure and drive the stakes opposite each offset hub.

✔ **NOTE:** Offset hubs are usually set at twenty foot intervals.

❑ ❑ 4. Level over the form elevation on each offset hub to the form stake and mark the elevation on each form stake. Cut or fill using an engineer's ruler.

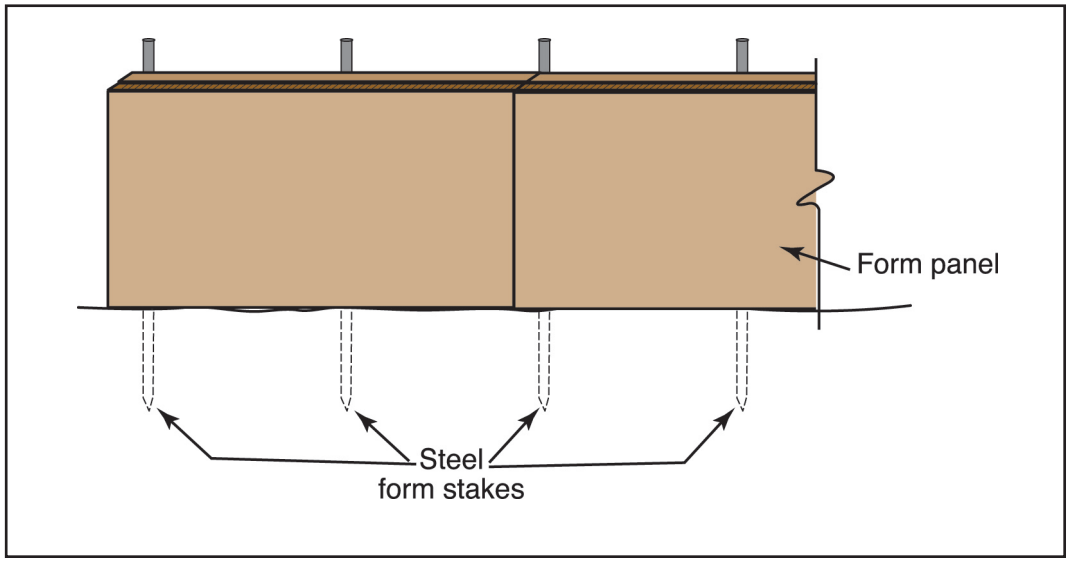
❑ ❑ 5. Attach and pull a nylon string to establish the back of curb. It is important to select the proper knot when tying a stringline to a steel stake. The hitch knot is used because it is simple to make and can be easily untied.

❑ ❑ 6. After the line is set, kneel and sight down the line. If the curb line does not flow smoothly, recheck the grades. The first back form should be set plumb to the line by the form setter.

❑ ❑ 7. The form setter can continue to set back forms making sure the forms are set to the stringline.

❑ ❑ 8. Drive intermediate stakes, spacing them approximately four feet apart, making sure there is a stake at every form panel joint and that they are plumb with the stringline. (Figure 4)

FIGURE 4

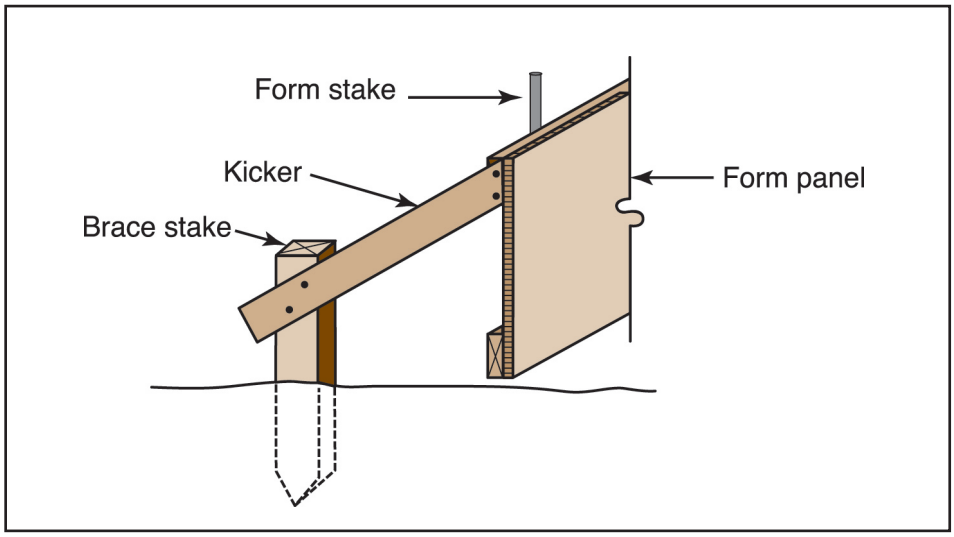


Yes No

❑ ❑ 9. Nail the form panels to the stakes so the tops of the panels are flush with the stringline.

❑ ❑ 10. Align the forms and brace if necessary. (Figure 5)

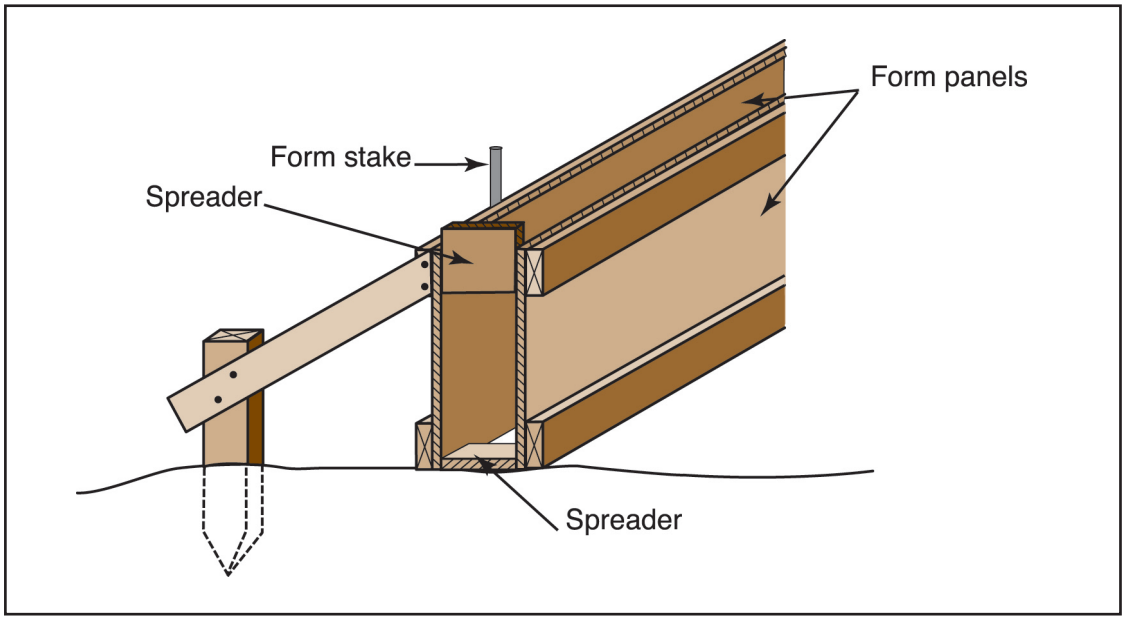
FIGURE 5



❑ ❑ 11. Cut spreader blocks to the width of the curb top.

❑ ❑ 12. Set the panel for the opposite side of the curb inserting spreaders between the two forms panels at the top, bottom, and opposite end of panel. (Figure 6) Stagger front form so the form joints do not align with the back forms.

FIGURE 6

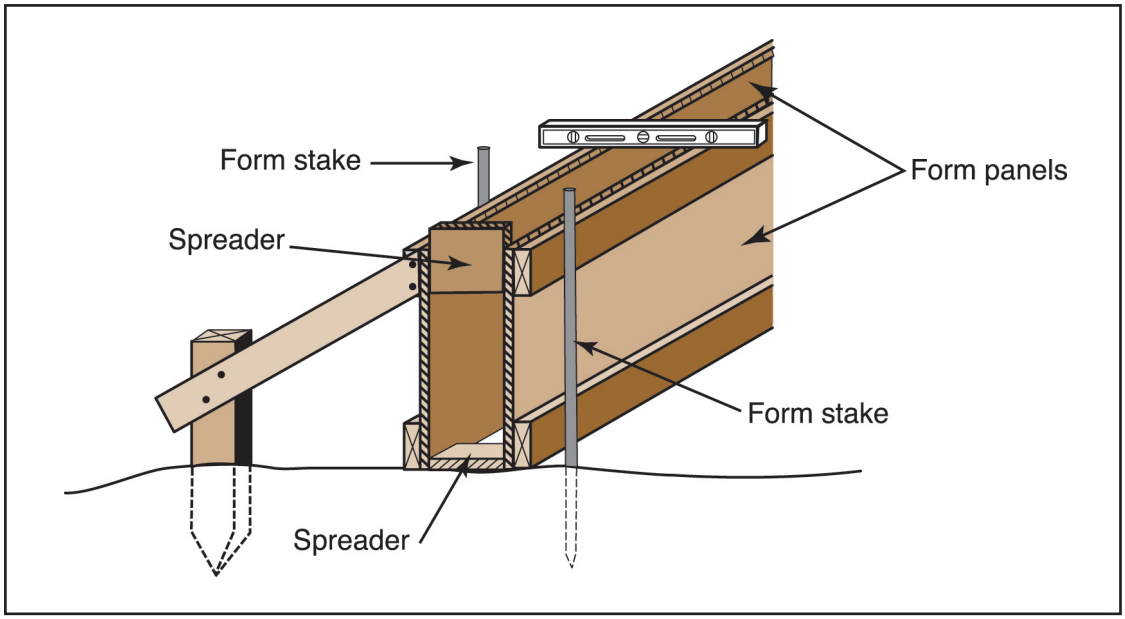


Yes No

❑ ❑ 13. Holding the panel and the spreaders in place, drive stakes snug against the panel with one across from each stake on the opposite panel. Drive the stakes straight down to keep from applying pressure against the opposite panel and forcing it out of alignment.

❑ ❑ 14. Nail panels to the stakes level with the opposite form. (Figure 7)

FIGURE 7



Yes No

❑ ❑ 15. Install curb clamps or cleats across the tops of the stakes to hold the form in alignment. (Figures 8 and 9) It is not usually necessary to use braces on both sides of the curbs. The bottom spreader may be removed after the cleats or clamps are installed. The top spreader will be removed as the curb is poured.

FIGURE 8

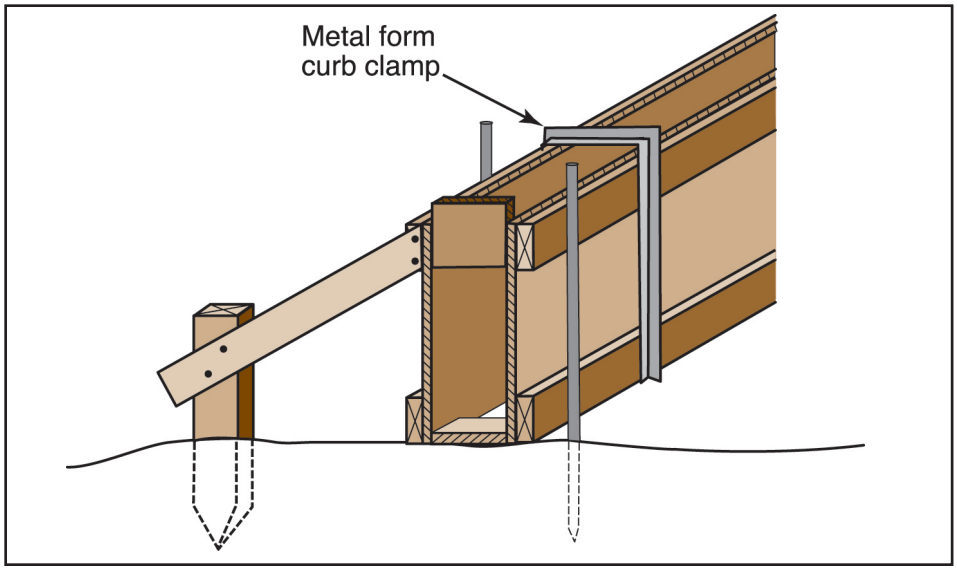
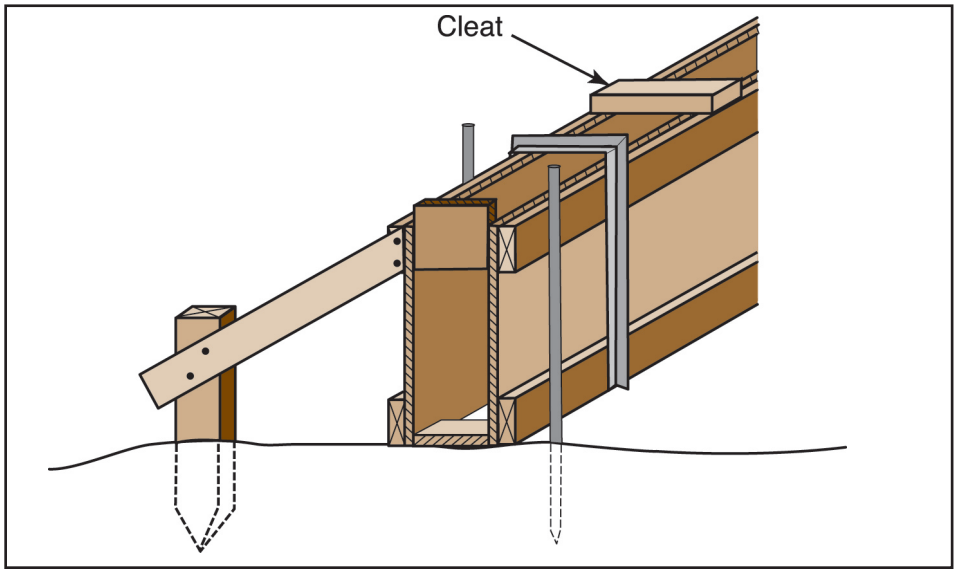


FIGURE 9



❑ ❑ 16. Check the alignment of the form and adjust as needed.

❑ ❑ 17. Have the instructor check your work.

❑ ❑ 18. Clean the work area and return tools and equipment to proper storage.

SKILL TEST RECORD

PRODUCT EVALUATION

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

Safety	4	3	2	1
Use of tools	4	3	2	1
General appearance	4	3	2	1
Overall performance	4	3	2	1

AVERAGE RATING

Evaluator note: To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

KEY

4 **Skilled** — Can perform job with no additional training
3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required
2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill
1 **Unskilled** — Is familiar with process, but is unable to perform job

EVALUATOR'S COMMENTS

JOB SHEET 2

ON-GRADE CURB AND CURB-AND-GUTTER FORMS

3

Name _____Score_____

OBJECTIVE 4

Set metal curb-and-gutter forms with a radius.

BASIC SKILLS

Employability

EQUIPMENT AND SUPPLIES

- Sledge hammer
- Claw hammer
- 100-foot tape
- Engineer's rule or steel tape
- 4-foot hand level
- String line
- Builder's level and rod
- Patented metal forms and accessories
- Metal form stakes
- Division plate
- Color pencil
- Personal protective equipment.

✔ **NOTE:** Refer to C.F.R. 1926.28 Sub Part C in regard to personal protective equipment.

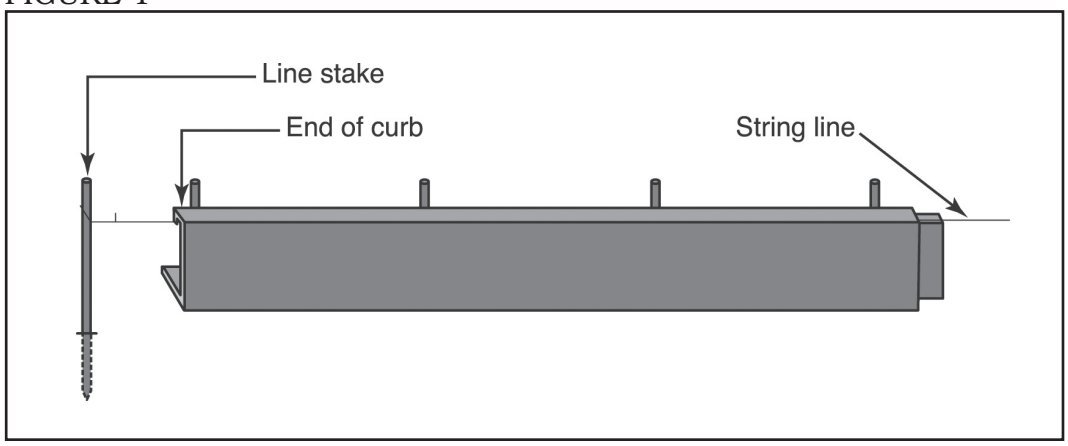
PROCEDURE

Yes No

❑ ❑ 1-6. Follow steps 1-6 on Job Sheet 1.

❑ ❑ 7. Set the first form so that the end is even with the starting point of the curb and the face of the form is aligned with the stringline. (Figure 1)

FIGURE 1

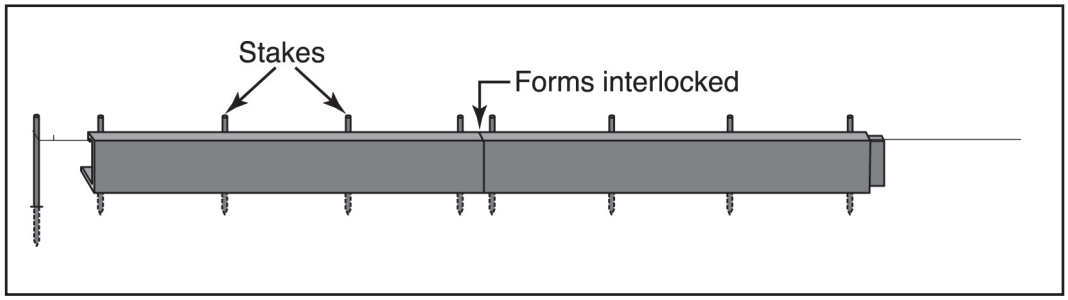


Yes No

❑ ❑ 8. Drive stakes through the first form, keeping the face of the form aligned with the stringline.

❑ ❑ 9. Butt the second form against the first form so that they interlock; align the face with the stringline and stake in place. (Figure 2) Raise or lower the form until the top edge is flush with the stringline. Block the male end of the form to elevation if the subgrade is cut too deep. While holding the form in this position, strike the stake lock with a hammer to hold the form at proper height.

FIGURE 2

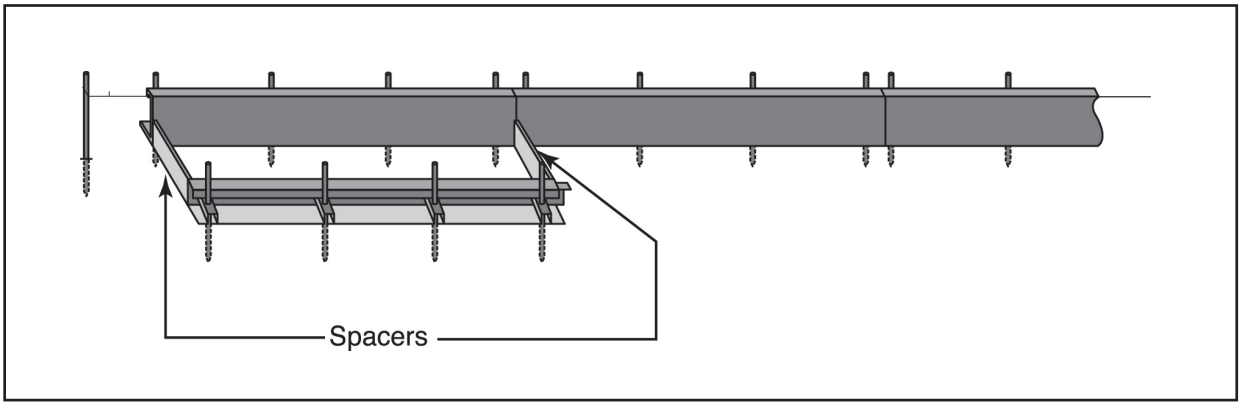


❑ ❑ 10. Repeat the procedures in step one until all the rear straight form sections are set and remove the stringline.

❑ ❑ 11. Lay out the front or toe forms end to end along the line of the curb.

❑ ❑ 12. Place the spacer or division plates against the rear form on each end of the section and set the front form against the other end of the spacer or division plate. (Figure 3)

FIGURE 3



Yes No

❑ ❑ 13. Drive the stakes through the form to hold it in place.

❑ ❑ 14. Remove the spacers or division plates and move to the next section of the form.

❑ ❑ 15. Butt the second section against the first so they interlock and the face is tight against the spacers or division plate; stake in place.

❑ ❑ 16. Repeat steps 14 and 15 until all the front straight forms are set.

❑ ❑ 17. Align the top of the front forms with the back forms for proper elevation. This may be done with a level and ruler, stringline, or builder's level. Raise or lower the form to proper elevation, strike the stake lock with a hammer to hold the form at proper height.

❑ ❑ 18. Set the division plates at the proper joint layout.

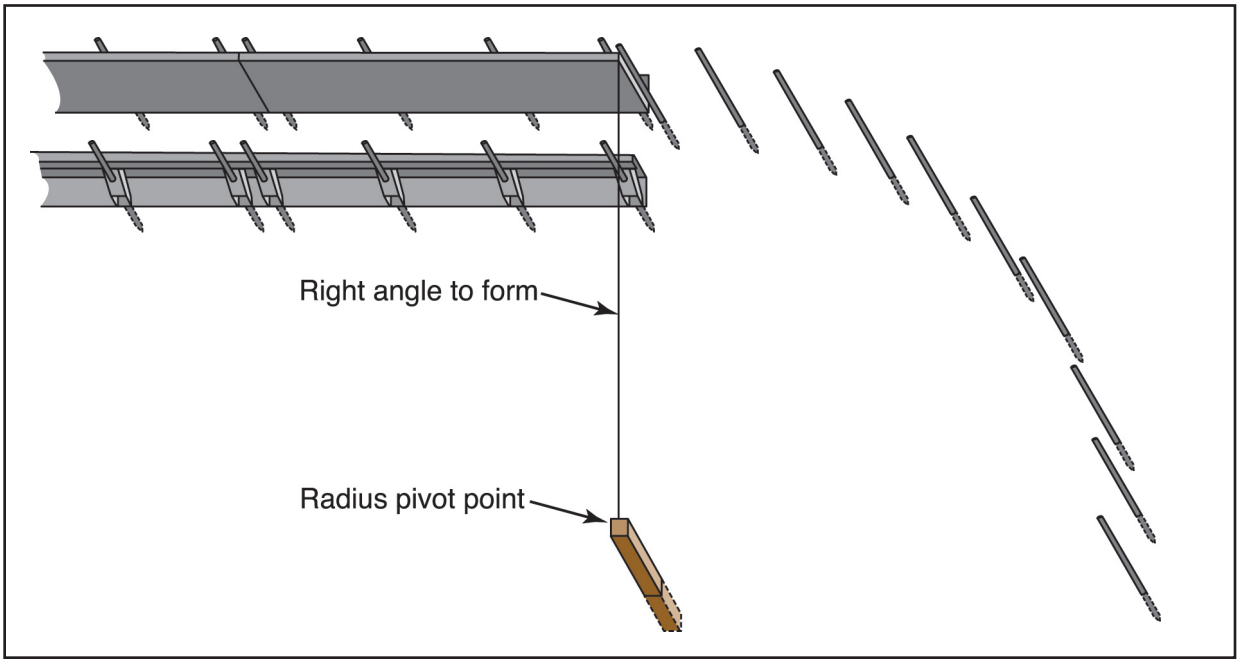
❑ ❑ 19. Set the curb face forms starting at one end and attach to the division plates.

✔ **NOTE:** Instead of setting the face form to the exact elevation, set the face form slightly higher (¼"). Then when floating the curb top, use the top of the back form for the grade, because the back form has been set to correct elevation.

❑ ❑ 20. Recheck the forms for alignment and adjust as needed.

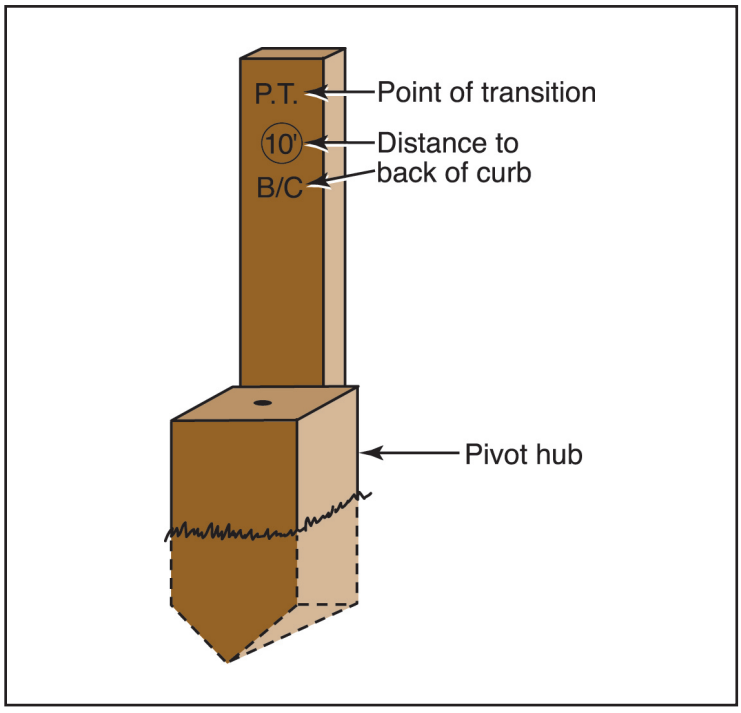
❑ ❑ 21. Determine the size of the radius and lay out of the radius stakes. (Figure 4)

FIGURE 4



A. Pivot hubs will read PT which means the point of transition or point of tangent. PT means there is a change in direction or elevation. If the formsetter has any questions, they can contact the engineer that placed these hubs. Hook the end of tape on nail in the pivot hub and stretch the tape to the form to check the measurement, for this example, 10-feet. (Figure 5)

FIGURE 5



Yes No

B. Pull the tape tight and at the 10-foot mark drive the stakes every 2 feet and plumb.

✔ **NOTE:** If using 1 x 12s for the back form, the width of form may have to be compensated when driving form stakes.

C. Attach the end of the radius form to the end of the straight form and bend it around the radius stakes. Elevation of the back form can be done with a builder's level or eyesite.

D. Using a spacer or division plate, the front or toe form can be set. Metal flex forms or 1 x 6s can be used.

E. Use a hand level and ruler or builder's level for proper elevation.

F. A flex radius curb face form can be used or in some areas low slump concrete is used to "free hand" the radius face.

❑ ❑ 22. Have the instructor check your work.

❑ ❑ 23. Clean the work area and return tools and equipment to proper storage.

SKILL TEST RECORD

PRODUCT EVALUATION

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Key below.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

Safety	4	3	2	1
Use of tools	4	3	2	1
General appearance	4	3	2	1
Overall performance	4	3	2	1

AVERAGE RATING

Evaluator note: To obtain an average rating for the Profile of Training Mastery, total the points in Product Evaluation and divide by the total number of criteria. Circle the rating on the Key.

KEY

4 **Skilled** — Can perform job with no additional training
3 **Moderately Skilled** — Has performed job during training program; limited additional training may be required
2 **Limited Skill** — Has performed job during training program; additional training is required to develop skill
1 **Unskilled** — Is familiar with process, but is unable to perform job

EVALUATOR'S COMMENTS