

INTRODUCTION

Working with concrete often requires repetitive motions with special tools. This repetition can cause injuries, resulting in conditions such as carpal tunnel syndrome. Many hand tool manufacturers are now modifying tool designs to be ergonomic, fitting the shape of the body with minimal discomfort and fatigue.

FOCUS ASSIGNMENTS

FOCUS ASSIGNMENTS

1. Using health-related textbooks or online resources, read about carpal tunnel syndrome.
2. Prepare and present a demonstration of exercises you can do to alleviate pain or prevent this repetitive motion injury.



Reading



Writing



Oral Communication



Technology

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. State guidelines for care and safe use of hand tools.
2. State specific uses of hand tools used for placing and finishing fresh concrete.
3. Identify hand tools used for placing and finishing fresh concrete.
4. Label hand tools used for patching and mixing concrete.
5. Label hand tools used for working with hardened concrete.
6. Label miscellaneous hand tools and equipment.
7. Use a bull float. (Job Sheet 1)
8. Use a hand float and a finishing trowel. (Job Sheet 2)
9. Use an edger. (Job Sheet 3)





OBJECTIVE 1

Optional Activities/
Resources in Instructor's
Guide

State guidelines for care and safe use of hand tools.

- Use the correct tool for the job.
- Maintain tools properly.
- Keep tools clean.
- Inspect tools frequently to be sure they are in good condition.
- Repair broken or damaged tools promptly.
- Dispose of broken or damaged tools that cannot be repaired.
- Store tools properly when not in use.

EXAMPLES: *Do not* carry tools in your pockets; *do not* leave tools lying around; protect edges of tools; store tools in dry place.

- Wear personal protective equipment (PPE) when necessary.

EXAMPLES: When rubbing; when applying dry shake to a slab; when using a ceiling grinder

- Stay alert when using tools.

EXAMPLES: Keep fingers away from cutting edges; work away from your body when using cutting tools; use tools with insulated or wooden handles when working around sources of electricity; be sure everyone is clear when using long-handled tools such as bull floats.

- *Do not* throw tools.



OBJECTIVE 2

Optional Activities/
Resources in Instructor's
Guide

State specific uses of hand tools used for placing and finishing fresh concrete.

WORDS YOU SHOULD KNOW

float	to finish fresh-concrete surface by use of a float; precedes troweling when that is to be final finish
honeycomb	void or cavity left in concrete due to ineffective consolidation
low-slump concrete	concrete with a stiff consistency
placing	process of distributing concrete
void	empty space, gap

- Bull floats — Used on large concrete surfaces to eliminate any high or low spots or ridges left after rodding process
- Combination tools — Used to do at least two jobs at the same time

EXAMPLE: Edger/jointer

- Darbies — Used to darby concrete surface to eliminate any high or low spots or ridges left after rodding process
- Edgers — Used to form a radius at concrete-slab edges to improve appearance and reduce risk of damage to edges
- Finish brooms — Available in various sizes and textures to produce a desired finish
- Hand floats — Used to float concrete around hard-to-reach places and to prepare concrete surface for troweling
- Jointers (groovers) — Used to cut joints (grooves) partly through fresh concrete to act as controls to predetermine location of possible cracks and to improve appearance

✓ **NOTE:** Control joints do not extend completely through the slab but are cut to a depth one-fourth the thickness of the slab.

- Shovels — Used to place and puddle concrete alongside edge forms to prevent voids and honeycombing



OBJECTIVE 3

Optional Activities/
Resources in Instructor's
Guide

- Straightedges — Used to rod concrete surface to a given grade
- Tampers (jitterbug/tamper) — Used on low-slump (1 inch or less) concrete to embed coarse aggregate just below concrete surface and to consolidate concrete surface
- Trowels — Used to give concrete surface a dense, smooth finish

Identify hand tools used for placing and finishing fresh concrete.

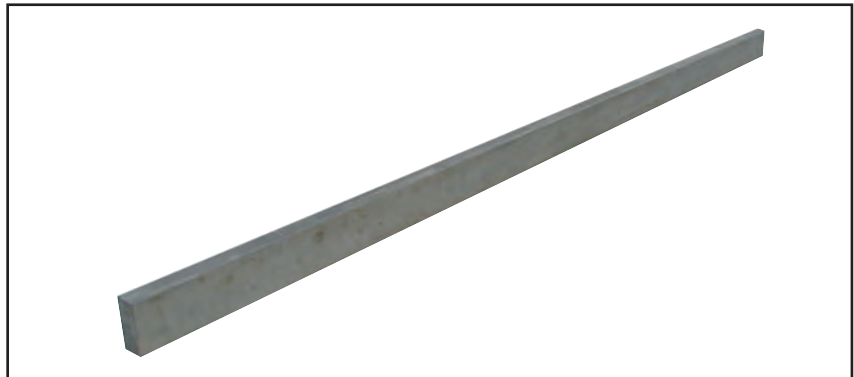
WORDS YOU SHOULD KNOW

cove	concave or radius at bottom section of curb, step, or base
finishing	process of working concrete to desired texture
rod	to level concrete to a specific grade

- Types of straightedges
 - Magnesium straightedge (Figure 1)

✓ **NOTE:** The common wood or magnesium straightedge is used to rod concrete after it has been placed. The common wood straightedge is generally made of 1¼-inch stock. The common magnesium straightedge is usually 1 inch thick and 4½ inches wide. Straightedges come in lengths ranging from 3 to 16 feet, the length used depending on the distance between the edge forms. Both wood and magnesium straightedges can be used on the same types of jobs, but magnesium straightedges work better on some toppings, prevent drag, and are preferred as a guide when cutting joints.

FIGURE 1



- ❑ Paver's (highway) straightedge (Figure 2)

✓ **NOTE:** The paver's straightedge has a stationary head and a long handle. It is used to check pavement levelness, to cut off high places, and to fill voids.

FIGURE 2



- ❑ Long-handled, 12-foot, adjustable-head straightedge

✓ **NOTE:** The long-handled, 12-foot, adjustable-head straightedge is a heavy straightedge used at right angles to the rodding process to strike-off slabs to create super-flat floors.

- Types of darbies

✓ **NOTE:** Darbies are long, flat, rectangular pieces of wood or magnesium that have handles and come in lengths of from 2½ to 6½ feet and widths of from 3 to 4 inches. Magnesium and wood darbies can be used on the same types of jobs (roof slabs, pavement, sidewalks), but magnesium darbies are more durable, prevent drag, and are preferred on some types of topping and on air-entrained concrete.

- ❑ Wood darby (Figure 3)

FIGURE 3



- ❑ Small magnesium darby (Figure 4)

FIGURE 4



- Types of bull floats

✓ **NOTE:** Bull floats serve the same general function as darbies, but they are more commonly used in locations where there is enough room to accommodate their 4- to 18-foot handle. The tool itself is a large, flat, rectangular piece of wood or metal (aluminum or magnesium) that is usually 8 inches wide and ranges in length from 3½ to 5 feet. Both wood and metal bull floats can be used to bull float floor slabs, pavement, and sidewalks made with normal types of concrete, but metal bull floats prevent drag, are much lighter than wood bull floats, and are preferred on some toppings, low-slump concrete, and air-entrained concrete.

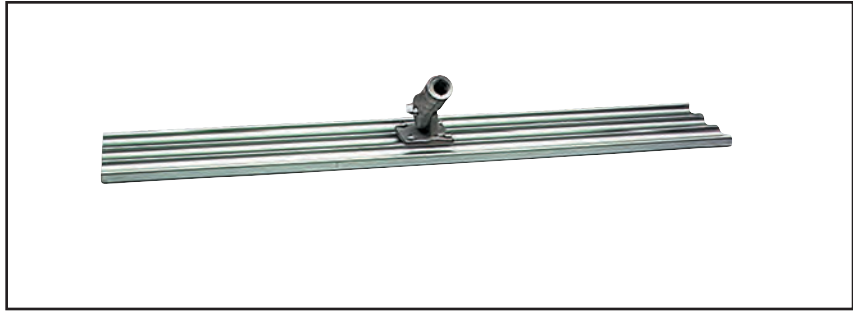
- ❑ Wood bull float (Figure 5)

FIGURE 5



- ❑ Metal (magnesium or aluminum) bull float (Figure 6)

FIGURE 6



- Types of tampers (tamps)

✓ **NOTE:** There are three basic types of tampers; the small, flat, hand-held type; the larger 3- to 4-foot jitterbug; and the largest 3- to 6-foot rollerbug. The size of the job determines the size of the tamper used, but all types are used *only* on low-slump (i inch or less) concrete.

- ❑ Hand tamper (Figure 7)

FIGURE 7



- ❑ Jitterbug (Figure 8)

FIGURE 8



- ❑ Rollerbug (Figure 9)

FIGURE 9



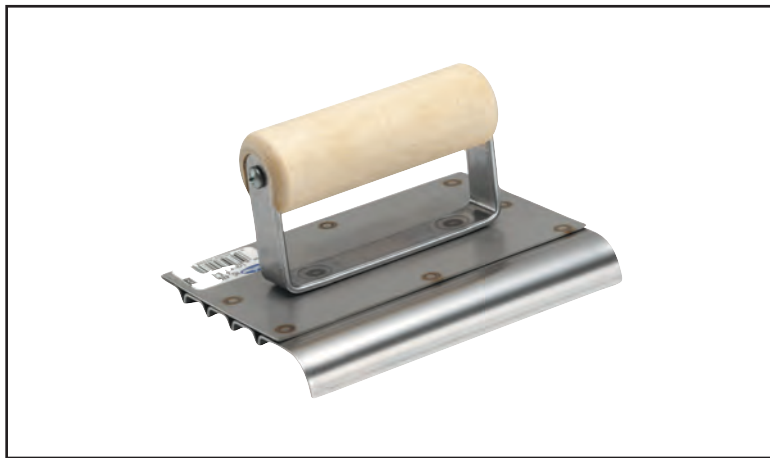
- Types of edgers

✓ **NOTE:** Edgers are made of steel, stainless steel, bronze, or malleable iron. They are available in many sizes, but the most common sizes are those from 6 to 10 inches long, from 1½ to 4 inches wide, and with a lip that is from ⅛ to ⅝ inch and a radius from ⅛ to 1½ inch. Edgers are used to edge sidewalks, floor slabs, driveway approaches, and pavement. Some edgers have a long handle so that they can be used while the mason is standing.

- Safety edger (Figure 10)

✓ **NOTE:** Safety edgers have safety grooves to produce a non-skid surface.

FIGURE 10



- ½ inch sidewalk edger (Figure 11)

FIGURE 11



- ❑ Curb edger (Figure 12)

FIGURE 12



- ❑ Radius edger (Figure 13)

FIGURE 13



- ❑ Long-handled walking-type edger (Figure 14)

FIGURE 14



- Types of jointers (groovers)

✓ **NOTE:** Jointers are made of stainless steel, bronze, or malleable iron. Common jointers are 6 inches long; vary in width from 2 to 4½ inches; and have shallow, medium, or deep bits (cutting edges) ranging from ⅜ to 1 inch depth. Some jointers also have a long handle so that they can be used while the cement mason is standing. Jointers are used to make joints in sidewalks, pavement, patios, and floor slabs.

- Deep-bit hand-type jointer (Figure 15)

FIGURE 15



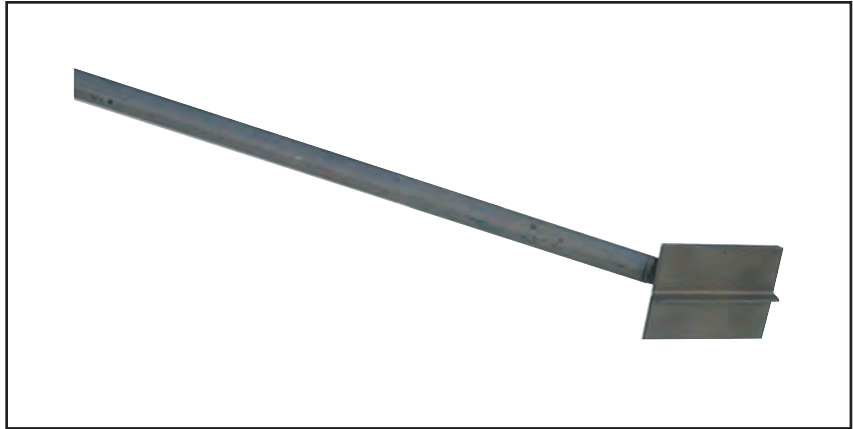
- Small-bit hand-type jointer (Figure 16)

FIGURE 16



- ❑ Long-handled walking-type jointer (Figure 17)

FIGURE 17



- Types of hand floats

✓ **NOTE:** Common hand floats are made of wood or metal (steel, aluminum, magnesium, or fiberglass). Metal floats are usually 3½ inches wide, but come in one of two lengths: 12 or 16 inches. Wood floats are available in 12-, 15-, or 18-inch lengths and in 3½- or 4½-inch widths. Both metal and wood hand floats can be used to float normal types of concrete; however, metal floats prevent drag, are lighter than wood floats, and are preferred on some types of toppings, and on air-entrained concrete. Special types of hand floats made of cork, rubber/sponge, or carpet are used to create textured finishes on rubbed concrete.

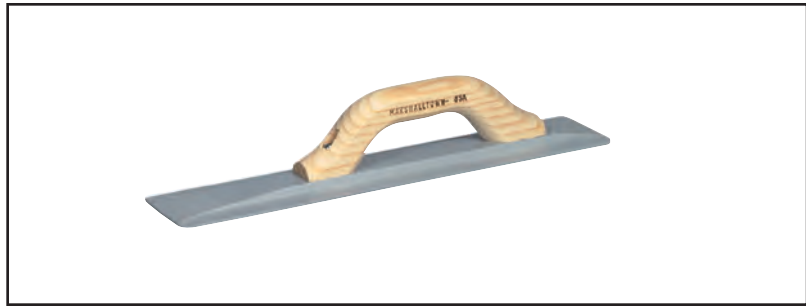
- ❑ Common wood or metal float
 - Wood float (Figure 18)

FIGURE 18



► Magnesium float (Figure 19)

FIGURE 19



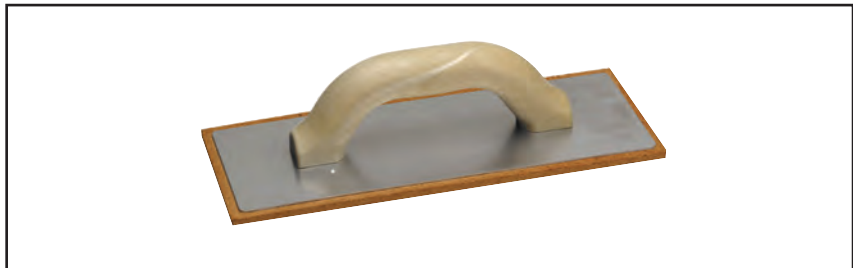
❑ Fiberglass float (Figure 20)

FIGURE 20



❑ Special cork float (Figure 21)

FIGURE 21



❑ Special rubber/sponge float (Figure 22)

FIGURE 23

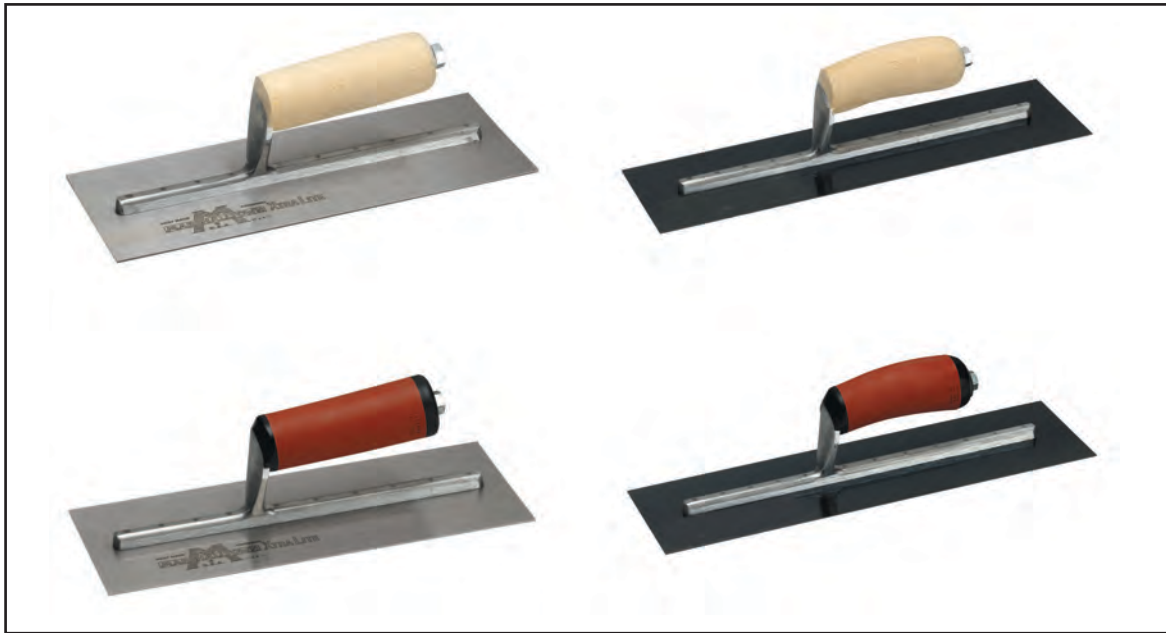


- Types of trowels

✓ **NOTE:** Hand trowels are made of either high-carbon tempered steel or special long-wearing stainless steel, and generally come in a variety of sizes ranging from 10 to 20 inches long and from 3 to 5 inches wide. The size chosen depends on the job to be done. For example, a trowel (16 to 20 inches) is usually used for the first troweling process, while a smaller trowel (14 to 16 inches) is used for the final troweling. Also, fresno trowels fitted with long handles are used when the cement mason must stand to trowel the concrete surface.

- Finishing trowel (Figure 23)

FIGURE 23



- Small trowel (Figure 24)

FIGURE 24



- ❑ Fresno trowel (Figure 25)

FIGURE 25



- Types of combination tools

✓ **NOTE:** Combination tools are tools designed to do the special jobs their names suggest: edge and joint, curb and gutter, etc. In the past, all of these tools were made of metal, but some are now being made from new plastics that have been developed.

- ❑ Edger/jointer (Figure 26)

FIGURE 26



- ❑ Curb-and-gutter tool (Figure 27)

FIGURE 27



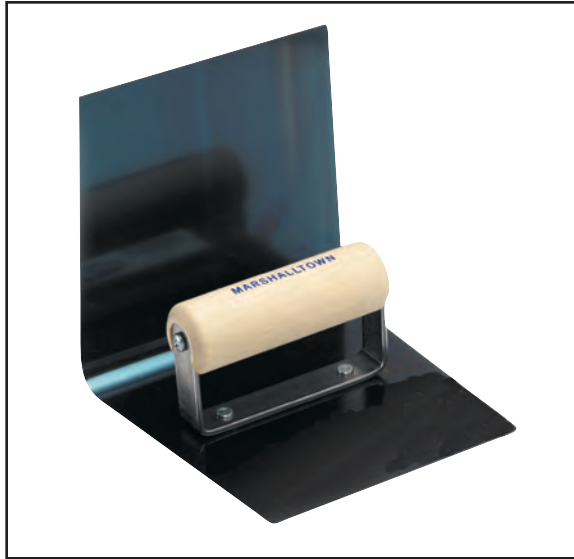
- ❑ Step tool (Figure 28)

FIGURE 28



- ❑ Cove-and-base tool (Figure 29)

FIGURE 29



OBJECTIVE 4

Optional Activities/
Resources in Instructor's
Guide

Label hand tools used for patching and mixing concrete.

WORDS YOU SHOULD KNOW

base	bottom section of a wall
patching	process of filling form-tie holes, honeycombs, or any other defects in concrete

- Margin trowel (Figure 30)

✓ **NOTE:** The margin trowel is used primarily to mix mud, patch holes, and grout machine bases; however, it can also be used to finish patches and small, difficult-to-reach areas. It comes in various lengths.

FIGURE 30



- Pointing trowel (Figure 31)

FIGURE 31



OBJECTIVE 5

Optional Activities/
Resources in Instructor's
Guide

Label hand tools used for working with hardened concrete.

- Types of concrete hammers

✓ **NOTE:** There are two types of hammers used by masons to work with hardened concrete: the chipping hammer and the bush hammer. Chipping hammers are used to cut off projections and high places on hardened concrete, and bush hammers are used to cut off humps of hardened concrete and to fracture aggregate to present a rough, colorful finish.



CAUTION: Wear eye protection whenever using a concrete hammer.

- Chipping hammer (Figure 32)

FIGURE 32



- ❑ Bush hammer (Figure 33)

FIGURE 33



- Types of Carborundum rubbing stones

✓ **NOTE:** Rubbing stones are tools used for dressing down hardened concrete. Common rubbing stones come in a variety of sizes. Grit sizes range from #24 (coarse) to #150 (fine).

- ❑ Small rubbing stones (Figure 34)

FIGURE 34



- ❑ Medium-sized, fluted rubbing stone (Figure 35)

FIGURE 35



- ❑ Large-sized, fluted, 8"-x-3½"-x-1½" rubbing stone (Figure 36)

FIGURE 36



OBJECTIVE 6

Optional Activities/
Resources in Instructor's
Guide

Label miscellaneous hand tools and equipment.

- Finishing broom (Figure 37)

✓ **NOTE:** Finishing brooms are used to finish fresh concrete.



FIGURE 37



- Brush (Figure 38)

✓ **NOTE:** Brushes are used in finishing and rubbing operations and to clean other tools.

FIGURE 38



- Chisel (Figure 39)

✓ **NOTE:** Chisels of various sizes and shapes are used to cut off projections and to chip off loose or scaled concrete.



CAUTION: Always wear eye protection when using a chisel.

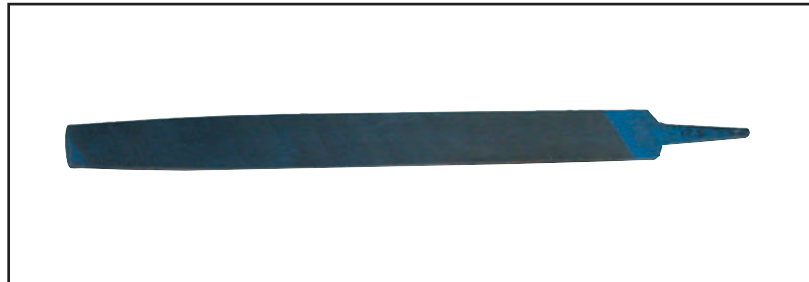
FIGURE 39



- Flat file (Figure 40)

✓ **NOTE:** Flat files are used to dress edges of trowels and to file off burrs on other tools.

FIGURE 40



- Concrete protection
 - Sliders (Figure 41)

✓ **NOTE:** Sliders are stainless steel or fiberglass knee boards.

FIGURE 41



- Knee boards (Figure 42)

✓ **NOTE:** Knee boards are wooden boards used to disperse the weight of the cement mason on fresh concrete.

FIGURE 42



- Knee pads (Figure 43)

✓ **NOTE:** Knee pads may be leather, plastic, or rubber, and are used to protect the cement mason's knees.

FIGURE 43

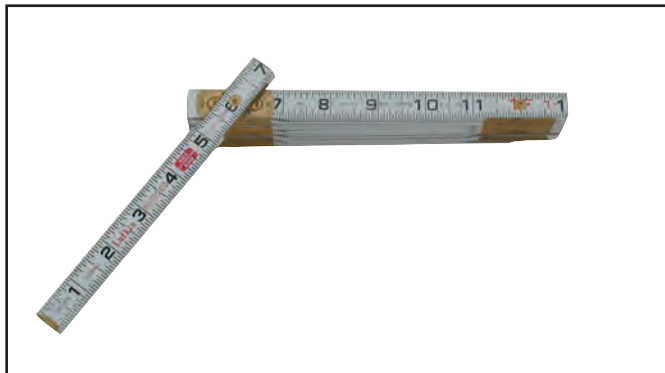


- Measuring tools

✓ **NOTE:** Folding rules and steel tapes are used to measure lumber and to lay out work.

- Folding rule (Figure 44)

FIGURE 44



- ❑ Steel tape
 - 6-foot tape (Figure 45)

FIGURE 45



- 100-foot tape (Figure 46)

FIGURE 46



OBJECTIVE 7

Complete Job Sheet 1.

OBJECTIVE 8

Complete Job Sheet 2.

OBJECTIVE 9

Complete Job Sheet 3.

OBJECTIVE 10

Complete Job Sheet 4.



Name _____ Score _____

OBJECTIVE 7

Use a bull float.

BASIC SKILLS



EQUIPMENT AND SUPPLIES

- Bull float
- Concrete or sand pad
- Personal protective equipment

✓ **NOTE:** Refer to C.F.R. 1926 Sub Part E in regard to personal protective equipment.

PROCEDURE

✓ **NOTE:** Bull floating is done immediately after the concrete has been straightedged. When possible, bull float in a direction that is perpendicular to the direction of the straightedging process.

Yes No

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. Adjust the bull-float handle to your reach (so the bull float will be comfortable for you to use). |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Make the first pass. |
| <input type="checkbox"/> | <input type="checkbox"/> | a. Set the bull-float blade 5-6 inches from the edge of the concrete. |
| <input type="checkbox"/> | <input type="checkbox"/> | b. Position the bull-float handle low enough so the leading edge of the blade is raised slightly. (Figure 1) |



FIGURE 1



Yes No

- c. Begin the forward stroke by pushing and sliding the bull float across the slab while keeping low enough to maintain a slightly raised edge of the blade.
- d. As you end the forward stroke, raise the bull-float handle to flatten the blade against the concrete surface.
- e. When you reach the end of forward stroke, raise the handle slightly and without hesitating start the return stroke, keeping the leading edge of the blade raised *very* slightly (almost flat) to the concrete surface. (Figure 2)

FIGURE 2



Yes No

- f. If necessary, make another forward stroke, keeping the blade as flat as possible while preventing the blade edges from digging into the concrete surface.
- 3. Make the second pass.
- a. Place the bull float so the blade will overlap the first pass by at least 6 inches. (Figure 3)

FIGURE 3



- b. Repeat procedures in Step 2, b through f.
- 4. Continue until the slab has been completely bull floated, overlapping passes by at least 6 inches and following procedures in Step 2, b through f.

✓ **NOTE:** To improve flatness of the slab, it is sometimes necessary to bull float crosswise to first bull-floating process. If this is necessary, follow Steps 1 through 4 to complete second bull-floating process.

- 5. Clean work area and tools, and properly store tools and equipment.



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 appearance	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



Name _____ Score _____

OBJECTIVE 8

Use a hand float and a finishing trowel.

BASIC SKILLS



EQUIPMENT AND SUPPLIES

- Hand float
- Large finishing trowel
- Knee pads
- Concrete or sand pad
- Personal protective equipment

✓ **NOTE:** Refer to C.F.R. 1926 Sub Part E in regard to personal protective equipment.

PROCEDURE

✓ **NOTE:** Through experience, you will eventually know when it is appropriate to begin the floating process. However, for now, check with your instructor before performing this job sheet.

Yes No

1. While holding the hand float in your dominant hand and the trowel in the other hand, position yourself on your knees near the edge of the forms.

✓ **NOTE:** Your dominant hand is the hand you use most effectively.

2. Lean out over the edge of the concrete, supporting yourself on the trowel. (Figure 1)

✓ **NOTE:** This position allows you to reach further out.



FIGURE 1



Yes No

- 3. Make the first pass with the hand float.
 - a. Hold the float flat on the concrete surface.
 - b. Move the float in a wide, semicircular motion.
 - c. Level any high spots or imperfections by using a forward-and-backward sawing motion of the float.
- 4. Maintain position and make a second pass with the hand float.
 - a. Move the float back (toward you), while overlapping the first pass.
 - b. Follow procedures in Step 3 for completing the pass.
- 5. Maintain position and continue floating, following procedures in Steps 3 and 4, until all of area you can reach has been floated except the area along the form.
- 6. Reposition yourself and float the area along the edge of the forms, moving the float at a right angle to the form.



FIGURE 2



Yes No

7. Reposition yourself as in Steps 1 and 2, but place the trowel in your dominant hand and the float or trowel in the other hand. (Figures 2 and 3)
8. Make the first trowel pass.
- a. Hold the trowel flat on the concrete surface.
- b. Move the trowel in a wide, semicircular motion.

FIGURE 3



Yes No

9. Maintain position and a make second pass with trowel.
- a. Move the trowel back (toward you), while overlapping the first pass.
- b. Follow procedures in Step 8 for completing pass.
10. Maintain position and continue troweling, following procedures in Steps 8 and 9, until all of the area you can reach has been troweled except the area along the form edge.
11. Reposition yourself as in Step 6, and trowel the area along the edge of the forms, moving the trowel at right angle to form. (Figure 4)

FIGURE 4



12. Continue positioning yourself along the form edge and following Steps 1 through 11 to float and trowel until all edges have been floated and troweled.

✓ **NOTE:** As concrete hardens and moisture evaporates, the concrete may have to be troweled another time or two (sometimes even more). On each successive troweling, you should use a smaller trowel and tilt the blade a little more. You will find that as the concrete hardens you will need to increase pressure placed on the trowel in order to remove imperfections as you trowel.



Yes No

13. Clean work area and tools, and properly store tools and equipment.

PRODUCT EVALUATION

SKILL TEST RECORD

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Use of tools 4 3 2 1

General appearance 4 3 2 1

Overall appearance 4 3 2 1

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EVALUATOR'S COMMENTS





Name _____ Score _____

OBJECTIVE 9

Use an edger.

BASIC SKILLS



EQUIPMENT AND SUPPLIES

- Margin trowel
- Edger
- Knee pads
- Concrete pad
- Personal protective equipment

✓ **NOTE:** Refer to C.F.R. 1926 Sub Part E in regard to personal protective equipment.

PROCEDURE

Yes No

- 1. Float and trowel the slab edges. (See Job Sheet 2)
- 2. Position yourself on your knees near the edge forms.
- 3. Make an arm's length pass with the margin trowel to cut along the inside of the form.

✓ **NOTE:** Making a pass with the margin trowel helps to force the aggregate away from the form and makes it easier to use the edger.

- 4. Make an arm's length pass with the edger.
- a. Hold the edger with the leading edge raised just enough to keep the edger from digging into the concrete and with the rear edge pressed down lightly. (Figure 1)



FIGURE 1



Yes No



- b. Begin the forward stroke by gliding the edger across the top of the concrete until your arm is nearly fully extended. (Figure 2)

✓ **NOTE:** Do not press too hard on the edger; the edger should make hardly any indentation on the top surface of the concrete. The edger must be run flat.

FIGURE 2



Yes No

- c. At the end of the forward stroke (when your arm is fully extended), lift the edger from the concrete while the edger is still in forward motion.
- ✓ **NOTE:** If the edger is not in motion when it is removed from the concrete, the concrete surface may be pulled up with the edger.
- d. With your arm still extended, begin the return stroke, drawing the edger backward (toward you) with the leading edge tilted up slightly.
- e. At the end of the return stroke, lift the edger from the concrete surface while the edger is still in motion.
5. Continue repositioning yourself and edging, following the procedures in Steps 3 and 4, until slab has been completely edged.
6. Clean work area and tools, and properly store tools and equipment.

SKILL TEST RECORD

PRODUCT EVALUATION

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**EVALUATOR'S
COMMENTS**

