OBJECTIVE SHEET

SURFACE DEFECTS AND TREATMENTS 13

INTRODUCTION

Grinding, rubbing, and sacking are just a few of the ways concrete masons correct defects in concrete walls, floors, and ceilings. Concrete repairs are inevitably necessary in nearly every concrete structure. This unit offers hands-on experience in surface defects and treatments.

FOCUS ASSIGNMENTS

FOCUS ASSIGNMENTS

1. Browse the Publications section of the International Concrete Repair Institute web site at <www.icri.org>.

2. Do a search for the following terms and note the publications available on these topics:

   - rubbing
   - sacking
   - grinding


Reading


Writing


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. Arrange in order the steps to take when preparing concrete for grinding/rubbing or sacking.
2. Select from a list methods used to rub concrete.
3. Name reasons for rubbing or sacking walls.
4. Discuss briefly the proper time to rub and sack concrete.
5. Rub a wall. (Job Sheet 1)
6. Sack a wall. (Job Sheet 2)
7. Select from a list results of premature grinding.
8. Name reasons for grinding a floor.

9. Label types of equipment used for grinding floors.
10. Name reasons for grinding ceilings.
11. Label types of equipment used for grinding ceilings.
12. Name reasons for patching concrete.
13. Name characteristics of a satisfactory concrete repair.
14. Name factors that control the method and/or extent of repairs.
15. Arrange in order steps to take before patching form-tie holes.
16. Select from a list materials used to bond new concrete to old.
17. Name methods used to repair concrete.
18. Name guidelines for matching patch material to original concrete.
19. Patch a deep hole in a wall. (Job Sheet 3)
20. Patch a hole in a wall where water pressure exists. (Job Sheet 4)
21. Select from a list types of concrete surface defects.
22. State causes of surface defects.
23. List recommended guidelines for preventing surface defects.
24. State methods of repairing surface defects.
25. Patch a feature strip. (Job Sheet 5)
26. Patch a champher. (Job Sheet 6)
27. Repair a spall in a finished floor. (Job Sheet 7)

OBJECTIVE 1

Optional Activities/ Resources in Instructor's Guide

Arrange in order the steps to take when preparing concrete for rubbing or sacking.

WORDS YOU SHOULD KNOW	
fin	concrete that has oozed out between form board joints and hardened
form mark	impression or projection formed by knothole or wood grain on form boards
honeycomb	voids or cavities left in concrete due to ineffective consolidation
sacking	process of finishing concrete surfaces by rubbing with coarse fabric such as burlap

1. Break off form ties.
2. Chip off heavy fins.
3. Remove cone inserts.
4. Grind the concrete to remove any form marks, fins, nails, and other projections.
5. Chip the honeycombed areas back to secure the substrate.
6. Fill form-tie holes, cone insert holes, honeycomb, and any other defects.

OBJECTIVE 2

Optional Activities/ Resources in Instructor's Guide

Select from a list methods used to rub concrete.

CAUTION: Use proper personal protective equipment when rubbing concrete.

WORDS YOU SHOULD KNOW	
wet grinding	process of grinding while keeping concrete wet ✔ **NOTE:** This is the preferred practice to control silica dust.

- Wet grinding with hand stone
- Wet grinding with power grinder

OBJECTIVE 3

Optional Activities/ Resources in Instructor's Guide

Name reasons for rubbing or sacking walls.

- To improve appearance
- To seal surface from exposure
- To fill voids in preparation for final finish

OBJECTIVE 4

Optional Activities/ Resources in Instructor's Guide

Discuss briefly the proper time to rub and sack concrete.

- After forms have been removed and concrete is hard enough to dry-grind without loosening or pulling out aggregates

OBJECTIVE 5

Complete Job Sheet 1.

OBJECTIVE 6

Complete Job Sheet 2.

OBJECTIVE 7

Optional Activities/ Resources in Instructor's Guide

Select from a list results of premature grinding.

- Too much surface fines taken off
- Large aggregate loosened
- Large aggregate pulled out

OBJECTIVE 8

Optional Activities/ Resources in Instructor's Guide

Name reasons for grinding a floor.

- To repair surface damage caused by rain
- To repair surface damage caused by freezing
- To resurface an old floor
- To remove high spots on the floor

OBJECTIVE 9

Optional Activities/ Resources in Instructor's Guide

Label types of equipment used for grinding floors.

- Commercial floor grinder (Figure 1)

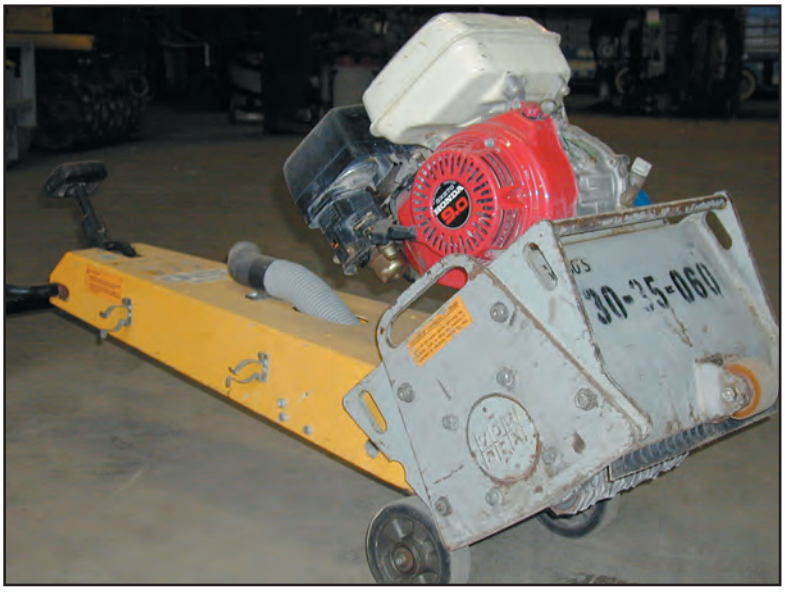
FIGURE 1

- Shot blaster (Figure 2)

FIGURE 2

- Scarifier (Figure 3)

FIGURE 3



OBJECTIVE 10

Optional Activities/ Resources in Instructor's Guide

Name reasons for grinding ceilings.

- To prepare the ceiling for rubbing operations
- To prepare the ceiling for painting
- To prepare the ceiling for tile or other finish

OBJECTIVE 11

Optional Activities/ Resources in Instructor's Guide

Label types of equipment used for grinding ceilings.

WORDS YOU SHOULD KNOW	
burlap	coarse, plain woven fabric usually of jute or hemp
dust	sand and cement mixture proportioned about half and half

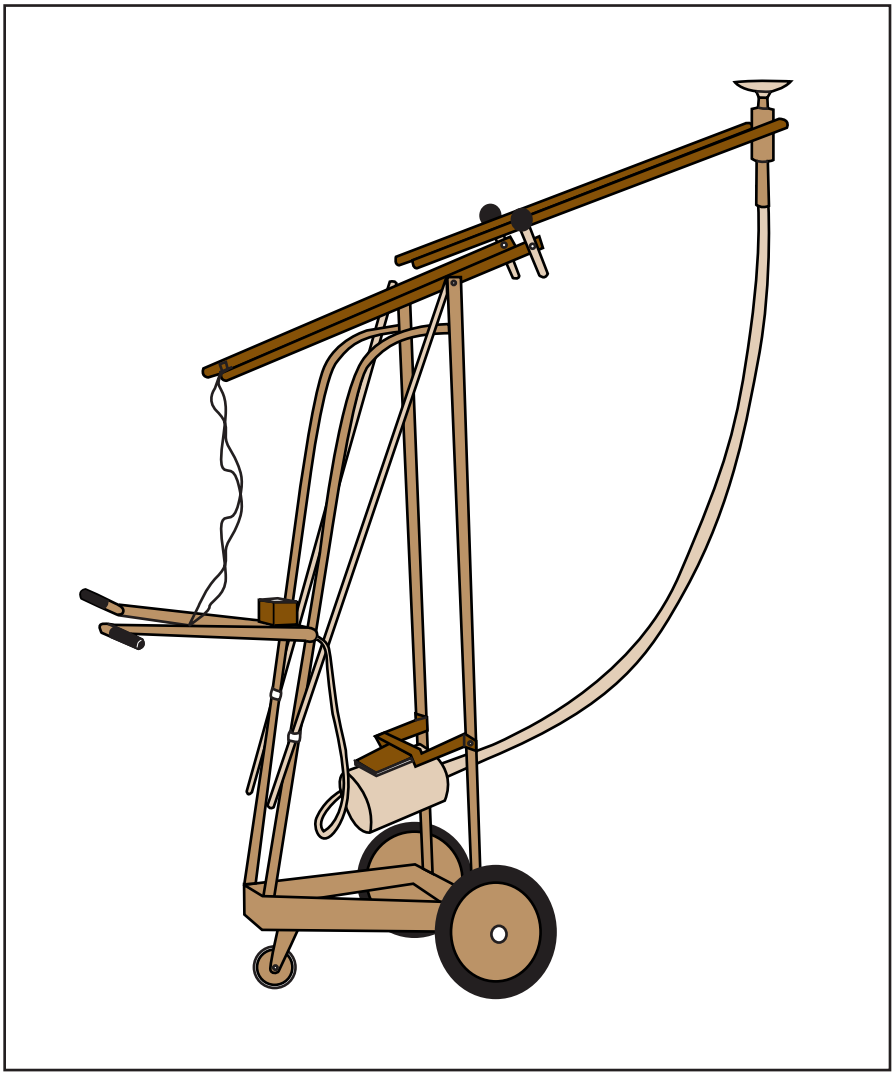
- Portable electric hand grinder (Figure 4)

FIGURE 4

- Chipping hammer and hand stone

- Ceiling grinder (Figure 5)

FIGURE 5



OBJECTIVE 12

Optional Activities/ Resources in Instructor's Guide

Name reasons for patching concrete.

✔ **NOTE:** Defects in concrete, such as tie-rod holes, cone holes, and honeycomb, detract from the strength as well as the appearance of the concrete (Figures 6 and 7)

FIGURE 6

FIGURE 7

- To improve the appearance of concrete
- To improve the serviceability of old concrete

- To improve the structural soundness of damaged concrete
- To seal concrete against moisture

OBJECTIVE 13

Name characteristics of a satisfactory concrete repair.

Optional Activities/ Resources in Instructor's Guide

WORDS YOU SHOULD KNOW	
bond	to cause to adhere firmly

- Bonded to the damaged concrete
- Durable and impermeable
- Crack- and shrink-resistant
- Aesthetically appealing
- Capable of withstanding applied loads
- Similar to the coefficient of the expansion and contraction of existing concrete

OBJECTIVE 14

Name factors that control the method and/or extent of repairs.

Optional Activities/ Resources in Instructor's Guide

✔ **NOTE:** Some repairs will necessitate a full depth patch where others will only require a thin overlay.

- Type of structure
- Exposure to environmental conditions
- Costs of repairs
- Ease of application
- Extent of interruption to traffic

OBJECTIVE 15

Optional Activities/ Resources in Instructor's Guide

Arrange in order steps to take before patching form-tie holes.

WORDS YOU SHOULD KNOW	
cone insert	plastic or wood device on form ties that assures proper setback and acts as positive spreader for forms

1. Break off or remove form ties.
2. Remove form-tie cone inserts from concrete.
3. Remove all oil, grease, and stains from the area.
4. Thoroughly clean the area with air or a brush.
5. Apply specified bonding material.

OBJECTIVE 16

Optional Activities/ Resources in Instructor's Guide

Select from a list materials used to bond new concrete to old.

WORDS YOU SHOULD KNOW	
bonding agent	material used to adhere fresh concrete to hard concrete or to another surface
epoxy	chemical bonding system used in the preparation of special concrete coatings, polymer or epoxy-based
neat cement grout	mixture of pure cement and water

✔ **NOTE:** There are many types of bonding agents on the market. Use the type specified and be sure to follow manufacturer's instructions or recommendations.

- Neat cement grout
- Cement and sand grout
- Epoxy

OBJECTIVE 17

Optional Activities/ Resources in Instructor's Guide

Name methods used to repair concrete.

WORDS YOU SHOULD KNOW	
dry pack	very stiff mortar mixture
mortar	mixture of cement, sand, and water

- Dry-pack mortar method

  ✔ **NOTE:** Dry packing is the process of placing very stiff mortar or concrete by ramming or packing it into the repair area.

- Pre-packed concrete method

  ✔ **NOTE:** Pre-packed concrete is produced by placing coarse aggregate in a form or void and pumping or injecting it with a cement/sand grout to fill the voids.

- Conventional concrete method

  ✔ **NOTE:** The conventional concrete method uses a low slump normal concrete to the full depth of the adjoining concrete.

- Pneumatic mortar method (Gunite or Shotcrete)

  ✔ **NOTE:** The pneumatic mortar method involves applying a mortar mix at high velocity onto a surface.

- Epoxy mortar or concrete method

  ✔ **NOTE:** The epoxy method utilizes plastic material comprised of two liquid phase components of epoxy resin mixed together in a predetermined ratio which, through a chemical reaction, are converted into a tough plastic solid.

- Surface overlay replacement method

  ✔ **NOTE:** A surface overlay is a thin surface patch accomplished by bonding the repair area with a cement/sand grout mixture, then placing a topping material over the area before the grout material dries.

- Latex modified cement mortar or concrete method

  ✔ **NOTE:** The latex modified method creates a surface overlay which can be feather-edged and is accomplished by using latex in the mortar mix, bonding the repair area with a latex/cement/sand grout, then placing the latex modified concrete or mortar mix over the grout.

OBJECTIVE 18

Name guidelines for matching patch material to original concrete.

Optional Activities/ Resources in Instructor's Guide

✔ **NOTE:** Be sure to match the original concrete as closely as possible, especially when patching colored concrete. Commercial bonds tend to bleed through the mix and cause distortion of color and shade.

- Use neat cement grout to bond the area.
- Use the same ingredients as used in the original mix when possible.
- Blend the colors to match.
- Make samples.

OBJECTIVE 19

Complete Job Sheet 3.

OBJECTIVE 20

Complete Job Sheet 4.

OBJECTIVE 21

Select from a list types of concrete surface defects.

Optional Activities/ Resources in Instructor's Guide

- Honeycomb — voids or cavities left in concrete due to ineffective consolidation
- Air pocket — voids in concrete formed by air bubbles
- Rock pocket — porous, mortar-deficient portion of hardened concrete consisting primarily of coarse aggregate and open voids
- Laitance — residue of weak, nondurable material consisting of cement and fines from aggregates, brought to the surface of overly wet concrete by the bleed water
- Blemish — imperfection in color or finish on the surface of hardened concrete
- Dusting — development of a powder on the surface of hardened concrete

- Popout — breaking away of a small portion of concrete surface due to internal pressure caused by freezing of water in soft, porous aggregate or by a chemical reaction between alkalies in the cement and alkali-reactive aggregate
- Scaling — flaking or breaking away of a hardened concrete surface
- Spalling — detachment of a flake-shaped fragment from a larger mass by a blow, by pressure, or by expansion from within the mass
- Crazing — developing fine random cracks or fissures in the surface of concrete due to surface shrinkage
- Blistering — irregular raising of a thin layer at the surface of placed concrete during or soon after the finishing operations
- Sand and gravel streaks
- Tearing of the surface
- Plastic shrinkage cracking
- Drying shrinkage cracking

OBJECTIVE 22

Optional Activities/ Resources in Instructor's Guide

State causes of surface defects.

- Use of poor quality materials
- Improper mix design
- Improper placing
- Improper or inadequate curing
- Poor workmanship
- Improper consolidation
- Improper or excessive use of form oil
- Use of improper forms or improper form setting
- Excessive bleeding on the concrete surface
- Rust caused by steel being exposed to wet weather or inadequately covered with concrete
- Premature finishing procedures and overuse of placing and finishing tools
- Presence of carbon monoxide

- Using dry cement on fresh concrete to absorb moisture
- Surface freezing
- Use of salts, such as sodium chloride or calcium chloride on concrete
- Lack of cleaning
- Use of calcium chloride or high alkali cement
- Excessively rapid evaporation of surface water
- Weather conditions

  EXAMPLES: Wind velocity, relative humidity, temperature, rain and snow

OBJECTIVE 23

Optional Activities/ Resources in Instructor's Guide

List recommended guidelines for preventing surface defects.

WORDS YOU SHOULD KNOW	
efflorescence	crystalline deposits of soluble salts that form on the surface of concrete as moisture evaporates
curing compound	liquid coating applied to newly placed concrete to maintain a satisfactory moisture content and temperature in concrete during the early stages so that desired properties may develop

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

CAUTION: When working with chemicals such as curing compounds, always consult construction standards found in C.F.R. 1926, all federal and state regulations, and the appropriate MSDS.

✔ **NOTE:** Since repair work is never as good as the original, every effort should be made to avoid use of materials or construction practices that can cause defects.

- Use good quality materials and good construction practices.
- Use a properly designed mix to improve workability.
- Use the proper slump concrete.

- Use proper methods to consolidate concrete.
- Use proper placing and finishing procedures.
- Use air-entrained concrete on exterior work.
- Use good grade form material and properly set forms.
- Be sure the reinforcement is firmly fixed and adequately covered with concrete.
- Do not finish concrete prematurely.
- Provide proper ventilation.
- Do not use dry cement to absorb moisture from concrete.
- Use proper curing compounds and methods.
- Prevent concrete from freezing.
- Do not use salts, such as sodium chloride or calcium chloride for snow and ice removal.
- Use materials with low potential efflorescing salt content.
- Use recommended protective sealant coatings on concrete.
- Avoid the use of calcium chloride in concrete when possible.
- Lower the temperature of concrete in hot weather.
- Raise the temperature of concrete in cold weather, but avoid overheating.
- Provide windbreaks, sun shades, and coverings to protect concrete when necessary.
- Avoid using concrete from different sources.

OBJECTIVE 24

Optional Activities/ Resources in Instructor's Guide

State methods of repairing surface defects.

WORDS YOU SHOULD KNOW	
poultice	paste formed with various ingredients, used for removing stains from masonry
underlayment	concrete mixture, usually of two components, used to resurface and patch concrete

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

CAUTION: It is always important to use safe work practices for silica dust when grinding or mixing dry material.

- Remove defective concrete, thoroughly clean area, secure a good bond, replace mortar or concrete by hand or pneumatically.
- Use a dry-pack mortar mix, tightly compacted to fill deep holes.
- Use a pressure gun to apply mortar to holes that extend through the concrete.

  EXAMPLES: Tie-rod holes, bolt holes
- Grind and refinish the surface.
- Resurface the damaged area with underlayment or topping.
- Thaw frozen concrete slowly, then use a curing agent.
- Use effective stain-removal agents and/or poultices for removal of common stains.

  EXAMPLES: Metal stains, oil stains, paint stains, asphalt stains, ink stains, tobacco stains, coffee stains, fire and smoke stains

OBJECTIVE 25

Complete Job Sheet 5.

OBJECTIVE 26

Complete Job Sheet 6.

OBJECTIVE 27

Complete Job Sheet 7.

JOB SHEET 1

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 5

Rub a wall.

WORDS YOU SHOULD KNOW	
hawk	flat tool with handle centered and fixed to the underside; used to hold and carry mortar
paste	composition of fine material and water
rubbing	hand finishing concrete with a hand stone

BASIC SKILLS


Reading


Science


Employability

EQUIPMENT AND SUPPLIES

- Portable hand grinder and extension cord
- Chipping hammer
- Cork or rubber float
- Margin trowel
- Brush
- Sprayer
- Hand stone
- Safety goggles
- Respirator
- Hard hat
- Mortar
- Water
- Bonding agent
- Personal protective equipment

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

CAUTION: It is always important to use safe work practices for silica dust when grinding or mixing dry material.

PROCEDURE

Yes No

✔ **NOTE:** These procedures may be regional.

CAUTION: Follow safety precautions pertaining to power tools, chipping, and grinding.

❑ ❑ 1. Put on safety equipment.

❑ ❑ 2. Chip off heavy fins and projections.

❑ ❑ 3. Grind the wall, leaving it free of projections and form marks.

❑ ❑ 4. Apply a bonding agent to all deep holes and form-tie cone holes. (Figure 1)

FIGURE 1

❑ ❑ 5. Use a margin trowel to apply very stiff mortar to all deep holes and form-tie cone holes; use the float as a hawk. (Figure 2)

✔ **NOTE:** Mortar is applied only if the wall is too hard to work up a paste on the surface.

FIGURE 2

Yes No

❑ ❑ 6. Dampen the wall with a brush. (Figure 3)

FIGURE 3

❑ ❑ 7. Apply mortar with a float or brush. (Figure 4)

✔ **NOTE:** It may be necessary to add water to the mortar for easier application. Apply only enough mortar to form a paste after rubbing.

FIGURE 4

Yes No

❑ ❑ 8. If necessary, apply with a fine paste, working the paste up until the holes are filled. (Figure 5)

FIGURE 5

❑ ❑ 9. Using the float in a semicircular motion, work all pinholes full of paste to leave surface with a fine stone-like texture.

✔ **NOTE:** It may be necessary to sprinkle wall slightly with water to float out section that has been rubbed.

Yes No

- ❑ ❑ 10. Rub the second section and follow up by floating.
- ❑ ❑ 11. Continue this procedure until the entire wall has been finished.
- ❑ ❑ 12. Allow the wall to dry sufficiently.
- ❑ ❑ 13. Use the margin trowel, brush, and water to clean tools and equipment.
- ❑ ❑ 14. 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

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 6

Sack a wall.

WORDS YOU SHOULD KNOW	
patching	process of filling form-tie holes, spalls, honeycomb, and other defects in concrete

BASIC SKILLS


Reading


Science


Employability

EQUIPMENT AND SUPPLIES

- Portable hand grinder and extension cord
- Chipping hammer
- Rubber float
- Burner trowel
- Margin trowel
- Brush
- Burlap
- Sprayer
- Hand stone
- Safety goggles
- Respirator
- Hard hat
- Mortar
- Water
- Bonding agent
- Dryer (dry sand and portland cement)
- Personal protective equipment

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

PROCEDURE

Yes No

✔ **NOTE:** These procedures may be regional.

CAUTION: Follow safety precautions pertaining to power tools, chipping, and grinding.

❑ ❑ 1. Put on safety equipment.

❑ ❑ 2. Chip off heavy fins and projections.

❑ ❑ 3. Grind the wall, leaving it free of projections and form marks.

❑ ❑ 4. Apply the bonding agent to all deep holes and form-tie cone holes.

❑ ❑ 5. Use a margin trowel to apply very stiff mortar, packing all deep holes and form-tie cone holes; use the float as a hawk.

✔ **NOTE:** Packing of all deep holes and form-tie cone holes should be completed at least 24 hours prior to sacking.

❑ ❑ 6. Dampen the surface of the wall with a brush.

❑ ❑ 7. Apply mortar with the float, working the mortar into all holes and uneven places. (Figure 1)

FIGURE 1

Yes No

❑ ❑ 8. Using a burner trowel, scrape off excess mortar. (Figure 2)

FIGURE 2

❑ ❑ 9. Place a handful of dryer on a piece of burlap and work this over the surface. (Figure 3)

✔ **NOTE:** The dryer will dry deep holes and keep them from shrinking and will aid in securing a proper finish.

FIGURE 3

Yes No

❑ ❑ 10. Use another piece of burlap to wipe all excess from the surface of the wall. (Figure 4)

FIGURE 4

❑ ❑ 11. Again lightly apply dryer to the wall, using burlap.

❑ ❑ 12. Allow the wall to dry slightly.

❑ ❑ 13. Wipe all excess dryer from the wall with a piece of burlap.

✔ **NOTE:** The wall will be left with a fine, smooth surface.

❑ ❑ 14. Let the wall dry sufficiently.

❑ ❑ 15. Use the margin trowel, brush, and water to clean tools and equipment.

❑ ❑ 16. Return tools and equipment to proper storage.

SKILL TEST RECORD

PRODUCT EVALUATION

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EVALUATOR'S COMMENTS

JOB SHEET 3

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 19

Patch a deep hole in a wall.

BASIC SKILLS

Reading Science Employability

EQUIPMENT AND SUPPLIES

- Chipping hammer
- Block of wood
- Margin trowel
- Cork or rubber float
- Brush
- Safety goggles
- Respirator
- Bucket of dry pack
- Bucket of water
- Bonding material
- Personal protective equipment

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

PROCEDURE

Yes	No	
❑	❑	1. Put on safety equipment.
❑	❑	2. Chip out loose material. (Figure 1)

FIGURE 1

Yes No

❑ ❑ 3. Free the hole of dust and debris using safe work practices for dryer control.

❑ ❑ 4. Dampen the area with a brush. (Figure 2)

✔ **NOTE:** Keep the area damp for at least two hours before proceeding.

FIGURE 2

❑ ❑ 5. Apply bonding material to the hole. (Figure 3)

FIGURE 3

Yes No

❑ ❑ 6. Apply dry pack to the hole. (Figure 4)

FIGURE 4

A. Use a margin trowel to fill the hole with dry pack, using a float as a hawk.

B. Use a hammer and block of wood to tamp the material tightly by laying the block of wood against the dry pack and striking it with the hammer. (Figure 5)

FIGURE 5

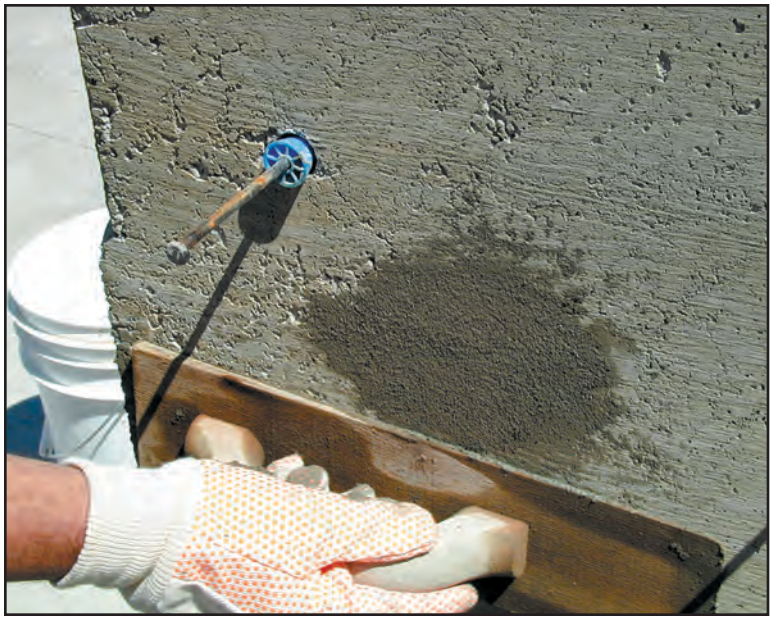
Yes No

C. Continue applying dry pack and tamping until the hole is filled flush with the surface.

❑ ❑ 7. Use a brush to lightly dampen the surface of the patch.

❑ ❑ 8. Float out the patch until it is smooth and resembles the original concrete finish. (Figure 6)

FIGURE 6



❑ ❑ 9. Use a margin trowel, brush, and water to clean the tools and equipment.

❑ ❑ 10. Return tools and equipment to proper storage.

SKILL TEST RECORD

PRODUCT EVALUATION

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EVALUATOR'S COMMENTS

JOB SHEET 4

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 20

Patch a hole in a wall where water pressure exists.

WORDS YOU SHOULD KNOW

expansive cement	cement which, when mixed with water, tends to increase in volume to a significantly greater degree than portland cement
fast-setting cement	commercial patching material manufactured by many different companies
hydraulic cement	cement that is capable of setting and hardening under water due to a chemical interaction between water and the composition of the cement

BASIC SKILLS

EQUIPMENT AND SUPPLIES

- Chipping hammer
- Block of wood
- Margin trowel
- Cork or rubber float
- Brush
- Safety goggles
- Respirator
- Bucket of dry pack
- Bucket of water
- Bonding material
- Commercial fast-setting, expansive, or hydraulic cement
- Mortar
- Curing agent
- Piece of ½" or ¾" pipe
- Personal protective equipment

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

PROCEDURE

Yes	No		
❑	❑	1.	Put on safety equipment.
❑	❑	2.	Chip out loose material.
❑	❑	3.	Dampen the area with a brush, if specified.

✔ **NOTE:** Keep area damp for at least two hours before proceeding.

❑	❑	4.	Apply bonding material to the hole.

✔ **NOTE: When using commercial bonding agents, follow manufacturer's specifications.**

❑	❑	5.	Insert a piece of one-half-inch or three-quarter-inch pipe in the hole so that water will run through the pipe.
❑	❑	6.	Hold the pipe in place and make the first application of fast-setting, expansive, or hydraulic cement.

✔ **NOTE:** There are many types of commercial fast-setting, expansive, and hydraulic cements. Be sure to follow manufacturer's instructions.

❑	❑	7.	Use the block of wood to tamp material tightly into the hole and around the pipe.
❑	❑	8.	Continue applying material and tamping until the hole is filled to about one-half to three-eighths inch from the face of the wall.
❑	❑	9.	Hold some of the fast-setting, expansive or hydraulic cement in one hand until it begins to set; press it tightly into the end of the pipe and hold firmly until it sets hard.
❑	❑	10.	Use premixed mortar and apply it over the entire patch.
❑	❑	11.	Use a float and work out the patch to resemble the original concrete.
❑	❑	12.	Apply a curing agent as soon as the patch is hard enough.

✔ **NOTE:** Be sure to use the curing agent that is specified.

❑	❑	13.	Use a margin trowel, brush, and water to clean tools and equipment.
❑	❑	14.	Return tools and equipment to proper storage.

SKILL TEST RECORD

PRODUCT EVALUATION

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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 5

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 25

Patch a feature strip.

BASIC SKILLS


Reading


Science


Employability

EQUIPMENT AND SUPPLIES

- Chipping hammer
- Margin trowel
- Float
- Brush
- Bucket of dry pack
- Bucket of water
- Bonding agent
- Cure
- Personal protective equipment

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

PROCEDURE

Yes	No	
❑	❑	1. Put on protective equipment.
❑	❑	2. Prep the patch area: Chip out unsound concrete and square off edges with a saw or chisel, as required. (Figure 1)

FIGURE 1

Yes No

❑ ❑ 3. Use a water brush to flush out loose sand and debris, and to dampen substrate. (Figure 2)

FIGURE 2

❑ ❑ 4. Apply a bonding agent to the area to be patched. Try to be neat. (Follow manufacturer's directions.) (Figure 3)

FIGURE 3

Yes No

❑ ❑ 5. Apply dry pack to the hole. Press a handful of material at the center of the hole, pushing it firmly to the edge. (This will layer the dry pack.) (Figure 4)

FIGURE 4

❑ ❑ 6. Pack it firmly into the substrate, around all aggregate and into voids. (Figure 5)

FIGURE 5

Yes No

❑ ❑ 7. Repeat this process until the hole is tightly packed, and slightly above grade.

❑ ❑ 8. Using a trowel, shave the patch to grade or slightly higher in the center. (Figure 6)

FIGURE 6

❑ ❑ 9. Float the patch. Dip the float in water, floating it toward your edge. Floats have a tendency to leave edges low.

Yes No

❑ ❑ 10. Using a piece of feature strip or straight edge, trace the outline of the feature strip with a margin trowel. (Figure 7)

FIGURE 7

❑ ❑ 11. Shave the general shape of the feature strip with the margin trowel.

❑ ❑ 12. Using a feature strip float or strip with two nails, float the shaved-out area. (Dampen your strip tool.)

❑ ❑ 13. Using a regular float, fine-tune the patch. (Figure 8)

FIGURE 8

Yes No

❑ ❑ 14. Lightly trowel the patch, making sure to scrape excess material off the edges. (Dampen the trowel, if necessary, to avoid burnishing.) (Figure 9)

FIGURE 9

❑ ❑ 15. If sacking for color, wait until the patch has dried slightly to avoid lumpiness. Shake excess sand out of the bag to avoid scratching.

❑ ❑ 16. Cure the patch, if the weather is warm. Taping visquine is best for color and paint compatibility. Do not cure if it is 40°F or cooler.

❑ ❑ 17. 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

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EVALUATOR'S COMMENTS

JOB SHEET 6

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 26

Patch a champher.

BASIC SKILLS


Reading


Science


Employability

EQUIPMENT AND SUPPLIES

- Chipping hammer
- Margin trowel
- 12" trowel or small trowel
- Float (cork, shingle, etc)
- Champher float (optional)
- Bucket of dry pack
- Bucket of water
- Bonding agent
- Method of cure
- Bucket of drier (dry sand and cement)
- Piece of burlap
- Personal protective equipment

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

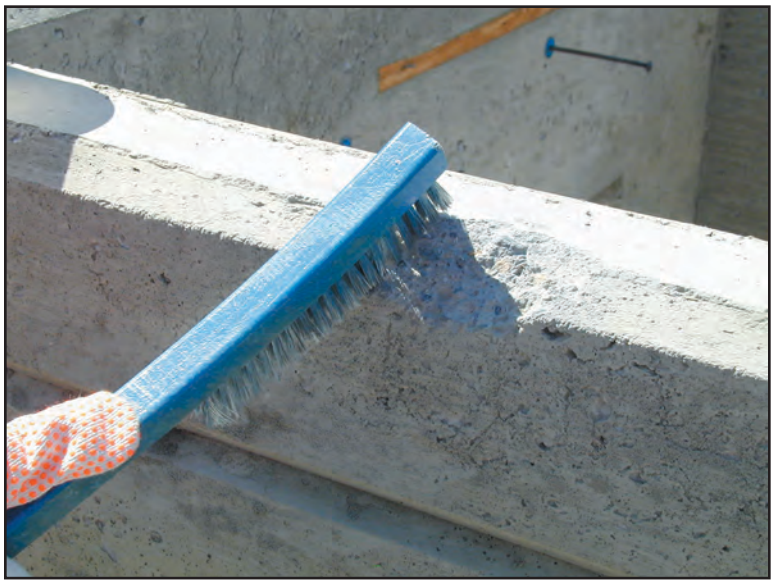
PROCEDURE

Yes No

❑ ❑ 1. Put on protective equipment.

❑ ❑ 2. Prepare the patch by chipping or brushing out unsound concrete. (Figure 1)

FIGURE 1



Yes No

❑ ❑ 3. Use a water brush to flush out dust and loose fines. (Figure 2)

FIGURE 2

❑ ❑ 4. Apply a bonding agent according to manufacturer's specifications. (Figure 3)

FIGURE 3

Yes No

❑ ❑ 5. Apply the dry pack. Rub the dry pack *firmly* into the bond line, making sure it surrounds the aggregate. Pack it with your hand or beanbag. (Figure 4)

FIGURE 4

❑ ❑ 6. Use your float to form one side. (Figure 5)

FIGURE 5

Yes No

❑ ❑ 7. Press and pack open the side full of dry pack, being careful to hold the float solidly against the wall so you don't shear the bond.

❑ ❑ 8. Continuing to hold flat and securely against the opposing side, shave off the dry pack, cutting towards the wall, using it as a guide. (Never use a stroke toward the edge of the patch; it will break off your edges.) (Figure 6)

FIGURE 6

Yes No

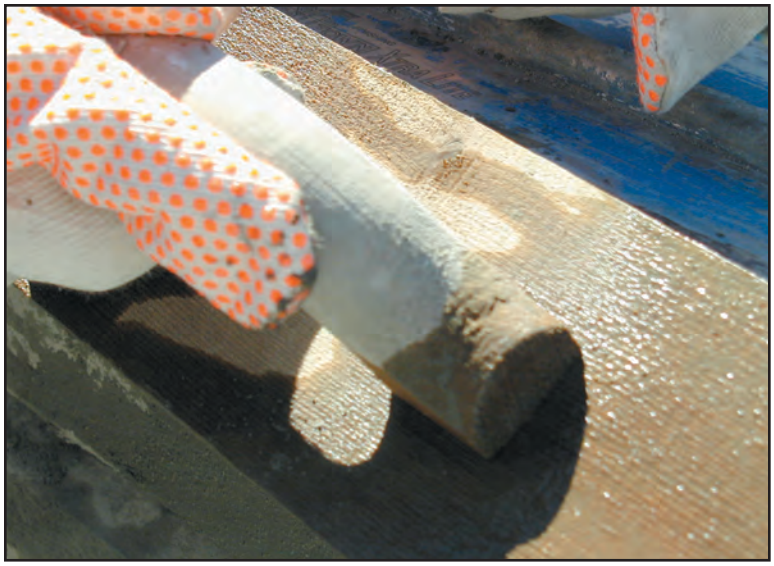
❑ ❑ 9. Move the float to the area you just cut off, pack in the opposing side, and cut it off. (Figure 7)

FIGURE 7

❑ ❑ 10. You should now have a square edge. Carefully shave the square edge to approximate champher width; stay on the narrow side of the width. You will float it to the exact size.

❑ ❑ 11. Dip your float in water. (Do not throw water with the brush—the dry pack will peel.) Float the champher to the proper width. Some people use a champher float. (Figure 8)

FIGURE 8



Yes No

❑ ❑ 12. Place a trowel on one side of the patch. Float the opposing side, first taking excess material from the champher floating toward the edge of the patch. (Remember to dampen the float)

❑ ❑ 13. If the edge of the patch is slightly low, add a small amount of material. Wet your float, and pick up a small amount of dry pack off the side of the bucket. This will moisten it enough to make it easy to work in.

❑ ❑ 14. Repeat the process on the other side.

❑ ❑ 15. Trim material off the existing wall to the edge of the patch.

❑ ❑ 16. Dampen your trowel so you don't darken the patch, and lightly smooth the patch. A circular motion away from the edge works well. (Figure 9)

FIGURE 9

❑ ❑ 17. You may want to come back after the patch has set for a while and sack it for color.

❑ ❑ 18. In warm weather, cure by taping visquine over the patch. Do not cure in cold weather.

❑ ❑ 19. 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

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EVALUATOR'S COMMENTS

JOB SHEET 7

SURFACE DEFECTS AND TREATMENTS 13

Name _____Score_____

OBJECTIVE 27

Repair a spall in a finished floor.

BASIC SKILLS


Reading


Science


Employability

EQUIPMENT AND SUPPLIES

- Chipping hammer or hammer and chisel
- Stiff broom
- Straightedge
- Float
- Margin trowel
- 60-80 grit patching stone
- Bonding agent
- Dry pack
- Bucket of water
- Waterbrush
- Personal protective equipment

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

PROCEDURE

Yes No

❑ ❑ 1. Put on safety equipment.

❑ ❑ 2. Chip out loose material. (Figure 1)

FIGURE 1

Yes No

❑ ❑ 3. Use a brush to clean the area. (Figure 2)

FIGURE 2

❑ ❑ 4. Dampen the area with a brush. (Figure 3)

FIGURE 3

Yes No

❑ ❑ 5. Apply bonding agent to the area to be repaired. (Figure 4)

✔ **NOTE:** Follow manufacturer's recommendations.

FIGURE 4

❑ ❑ 6. Place dry pack into the area to be patched. (Figure 5)

FIGURE 5

Yes No

❑ ❑ 7. Beat in the dry pack. (Figure 6)

FIGURE 6

❑ ❑ 8. Cut the dry pack close to grade with a margin trowel (leave grade a little high). (Figure 7)

FIGURE 7

Yes No

❑ ❑ 9. Use a stone to smooth off the surface of patch. (Figure 8)

✔ **NOTE:** With a smaller spall, the stone will grind patch to grade.

FIGURE 8

❑ ❑ 10. Trowel to color match if the floor is hard trowel or burnish. (Figure 9)

FIGURE 9

❑ ❑ 11. Cure.

✔ **NOTE:** Be sure the patch is level with the area around it and the edges have been filled sufficiently but scraped clean to the edge of the repair.

❑ ❑ 12. Return tools and equipment to the proper storage area.

SKILL TEST RECORD

PRODUCT EVALUATION

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Criteria:

Safety	4	3	2	1
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General appearance	4	3	2	1
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EVALUATOR'S COMMENTS