

PROPERTIES OF CONCRETE, PART TWO

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Describe the properties of different admixtures and other materials used in concrete.
2. Identify anticipated changes in set time, workability, and finishing for various types of admixtures and mix designs.
3. Determine how the ingredients of concrete influence mix, placement, finishing, durability, and performance.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment

Materials

Trainee Task Module
Transparencies
Paper and pencils
Markers/chalk
Module Examination

HOW TO USE THIS INSTRUCTOR'S GUIDE

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- Introduction/Overview
- Classroom, and/or Demonstration, and/or Laboratory
- Class Break
- Classroom, and/or Demonstration, and/or Laboratory
- Summary

Suggested time periods for classroom sessions are included throughout this Instructor's Guide. These time periods should be adapted to meet local conditions and training requirements.

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Demonstration: Instructors will demonstrate all procedures before trainees attempt them. Instructors should make sure that trainees can point out all safety procedures during demonstrations to be assured of the proper use of equipment by trainees.

Laboratory: Instructors will facilitate all laboratory activities, coach trainees as they practice the procedures, monitor trainee progress, and provide feedback. The instructor will make sure that safety rules are followed at all times and that protective equipment is worn.

NCCER Standardized Craft Training Programs

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the properties of cementitious materials and admixtures and their effects on concrete.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

Core Curricula; Concrete Finishing Level One

Safety Considerations

Ensure that the trainees are equipped with Appropriate Personal Protective Equipment.

Teaching Time for This Module

Approximately 10 hours or four sessions of training time are suggested to cover *Properties of Concrete, Part Two*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence—Four 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Other Types of Admixtures	1.0.0 – 2.2.7
2	Mineral Admixtures – Finishing Lightweight Concrete	2.3.0 – 3.3.0
3	Flowable Fill – Heavyweight Concrete	4.0.0 – 5.5.0
4	Laboratory/Field Trip Module Examination	

Note: For Session 4, you will need to arrange a field trip to a concrete batch plant and testing laboratory. Make sure sufficient transportation is available.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Chemical Admixtures for Concrete, ACI 212.3R-91, American Concrete Institute, Farmington Hills, MI, 1991.

Concrete Fundamentals, Concrete Craftsman Series, American Concrete Institute, Farmington Hills, MI, 1993.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1988.

Mineral Admixtures, American Concrete Institute, Farmington Hills, MI, 1993.

ESTIMATING CONCRETE QUANTITIES

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Describe U.S. Customary and SI metric units of measure.
2. Read residential blueprints and identify concrete construction requirements.
3. Estimate the required quantities of materials for different structural members.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Appropriate Personal Protective Equipment
Overhead projector and screen
Whiteboard/chalkboard
Tape measures
Architect's scale
Water or sand containers
Four-function calculators
Straightedges
Scissors
Compasses
Concrete molds or other cylinder molds

Materials

Trainee Task Module
Transparencies
Pencils and paper
Tagboard, cardboard or construction paper
Cellophane tape
Water
Sand
Estimating worksheets
Construction drawings
Colored pencils
Module Examination
Performance Profile Sheets

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Laboratory: Instructors will facilitate all laboratory activities, coach trainees as they practice the procedures, monitor trainee progress, and provide feedback. The instructor will make sure that safety rules are followed at all times and that protective equipment is worn.

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MODULE OVERVIEW

This module provides an overview of the methods and procedures used for estimating concrete quantities. It introduces the Concrete Finishing trainee to the formulas for calculating volumes of structural elements, the layout and format of construction drawings, and the tabulation of concrete quantities.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

Core Curricula; Concrete Finishing Level One;
Concrete Finishing Level Two, Module 23201

Safety Considerations

Ensure that the trainees are equipped with Appropriate Personal Protective Equipment.

Teaching Time for This Module

Approximately 10 hours or four sessions of training time are suggested to cover *Estimating Concrete Quantities*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Four 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Solid Figures And Volumes Demonstration/Laboratory	1.0.0 – 2.4.0
2	Drawings – Looking At The Drawings	3.0.0 – 3.2.7
3	Estimating Quantities – Columns Demonstration/Laboratory	4.0.0 - 4.3.7
4	Module Examination Performance Profile Testing	

Note: A guest speaker should be invited for the demonstration portion of Session 3. This should be a person in a local construction company who prepares bids and estimates for concrete construction. The speaker should be prepared to describe and demonstrate take off procedures and estimating methods for concrete items of different types and shapes.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Construction and Estimating, Craftsman Book Company, Carlsbad, CA, 1991.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie IL, 1988.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

The Contractor's Guide to Quality Construction, American Concrete Institute, Farmington Hills, MI, 1997.

TRANSPARENCY 2

TASK MODULE 23202, ESTIMATING CONCRETE QUANTITIES

PERFORMANCE PROFILE TASKS

- 1. Calculate the volume of a concrete test cylinder mold in cubic feet and cubic meters.**
- 2. Calculate the volume and weight of concrete required to fill the mold.**
- 3. Estimate the quantity of concrete required for the slab under the floor of the house in the drawings in Appendix B.**

FORMING

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Identify different types of forming materials and explain how they are used.
2. Erect on-grade forms for different types of construction.
3. Erect low wall and foundation wall forms.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Hammers
Builder's levels
Spirit levels
Saws
Planes
Hand drills
Wall clamps
Level rods

Materials

Trainee Task Module
Transparencies
Paper and pencils
String
Marking pencils or keel
Nails
Construction stakes
Dimensional lumber
Plywood sheets
Chamfer strips
Form ties
Prefabricated form sections
Premanufactured column forms
Manufacturer's forms brochures
Construction drawings
(foundation or floor plan)
Prefabricated edge forms with hardware
Module Examination
Performance Profile Sheets

HOW TO USE THIS INSTRUCTOR'S GUIDE

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Introduction/Overview
Classroom, and/or Demonstration, and/or Laboratory
Class Break
Classroom, and/or Demonstration, and/or Laboratory
Summary

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MODULE OVERVIEW

This module provides instruction and information to the Concrete Finishing trainee on techniques and procedures used in building forms. It includes types of forms, forming materials, use of release agents, form accessories, placement of anchors, and embedment and form removal.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

- Core Curricula; Concrete Finishing Level One;
- Concrete Finishing Level Two, Modules 23201 and 23202

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 20 hours or eight sessions of training time are suggested to cover *Forming*. The training class session is a suggested 2½-hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Eight 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Safety Concerns And Reshoring	1.0.0 – 2.8.0
2	Form Siting And Checking – Placing Embedded Objects	3.0.0 – 4.2.3
3	Establishing Line And Grade Demonstration/Laboratory	3.2.3
4	Low Wall And Foundation Wall Forms – Construction Techniques Demonstration/Laboratory	5.0.0 – 5.2.1
5	Wall Openings – Joints Demonstration/Laboratory	5.2.2 – 5.4.0
6	Form Construction Demonstration/Laboratory	5.2.0 – 5.2.2
7	Performance Profile Testing	
8	Module Examination Performance Profile Testing	

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Cast-In-Place Walls, ACI Craftsman Series, American Concrete Institute, Farmington Hills, MI, 1984.

Concrete Construction and Estimating, Craftsman Book Company, Carlsbad, CA, 1991.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Form Builder's Manual, National Association of Home Builders, Washington, D.C., 1979.

Formwork For Concrete, 6th Edition, American Concrete Institute, Farmington Hills, MI, 1984.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

The Contractor's Guide to Quality Construction, American Concrete Institute, Farmington Hills, MI, 1997.

TRANSPARENCY 2
TASK MODULE 23203, FORMING

PERFORMANCE PROFILE TASKS

- 1. Set batter boards at a given location on building corners.**
- 2. Set building layout from plans using string lines and stakes. Tie onto batter boards.**
- 3. Build a 2 × 2-foot footer form on grade with overlapping corners.**
- 4. Construct wood job-built formwork for a wall 4 feet high, 1 foot thick, and 8 feet long. Use through-wall ties and bracing.**
- 5. Set, level, and brace a premanufactured column form.**

SITE CONCRETE

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Lay out, place, and finish curb and gutter.
2. Lay out, place, and finish site-built stairs.
3. Lay out, place, and finish small slabs for sidewalks, patios, and driveways.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Hammers
Builder's levels
Level rods
Spirit levels
Saws
Hammers
Shovels
Four-function calculators
Wheelbarrows
Small mechanical vibrators
Straightedges
Floats
Edgers
Margin trowels
Brushes
Steel measuring tapes
Water containers
Brooms

Materials

Trainee Task Module
Markers/chalk
Transparencies
Paper and pencils
Construction stakes
String
Nails
Dimensional lumber
Keel or marking pencils
Ready-mix concrete
Water
Form release agent
Metal curb and gutter forms and accessories
Wire mesh reinforcing (optional)
Manufacturers' literature on slipform pavers
Photos or brochures on special finishes
Module Examination
Performance Profile Sheets

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the techniques and procedures used in constructing formwork and placing and finishing site concrete.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

Core Curricula; Concrete Finishing Level One;
Concrete Finishing Level Two, Modules 23201 through 23203

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 30 hours or twelve sessions of training time are suggested to cover *Site Concrete*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Twelve 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Removing Forms	1.0.0 – 2.7.0
2	Form Curb and Gutter Demonstration/Laboratory	2.3.0 – 2.4.0
3	Finish Curb and Gutter Demonstration/Laboratory	
4	Stairs – Placing and Finishing	3.0.0 – 3.3.2
5	Form Stairs Demonstration/Laboratory	
6	Finish Stairs Laboratory	
7	Sidewalks, Driveways, and Patios – Form Removal	4.0.0 – 4.8.0
8	Layout Radius for Rounded Corner Demonstration/Laboratory	4.1.2
9	Other Site Work Structures – Curing Module Examination	5.0.0 – 6.4.0
10	Performance Profile Testing	
11	Performance Profile Testing	
12	Performance Profile Testing	

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Construction and Estimating, Craftsman Book Company, Carlsbad, CA, 1991.

Concrete Manual, International Conference of Building Officials, Whittier, CA, 1992.

Concrete Parking Lots: Eight Steps to Quality Construction, Videotape 18:28 minutes, Portland Cement Association, Skokie, IL.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1988.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

Guide to Residential Cast-In-Place Concrete Construction, ACI 332R-98, American Concrete Institute, Farmington Hills, MI, 1998.

The Contractor's Guide to Quality Construction, American Concrete Institute, Farmington Hills, MI, 1997.

PERFORMANCE PROFILE TASKS

- 1. Lay out prefabricated forms for a section of barrier curb and gutter. Align forms and set to grade.**
- 2. Estimate the amount of concrete needed to fill the formwork. Place and finish the concrete.**
- 3. Lay out a 4-foot radius outside curve. Set construction stakes for formwork.**
- 4. Given the total rise and run of a set of stairs, calculate the tread and riser dimensions.**
- 5. Build wood formwork for a 3-step set of stairs on grade with a top landing.**
- 6. Place and finish concrete for a 3-step set of stairs with a top landing.**

ARCHITECTURAL FINISHES

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Identify the four types of architectural concrete.
2. Identify various types of architectural finishes and surface treatments.
3. Apply various types of architectural finishes and surface treatments to concrete.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Concrete mixer
Water containers
Measures
Shovels
Floats
Hand pump sprayers
Commercial or other pattern stamps
Screed boards
Water brooms or brooms
Bushhammer face tools
Hoses
Trowels

Materials

Trainee Task Module
Transparencies
Markers/chalk
Pencils and paper
Module Examinations
Performance Profile Sheets
Dimensional lumber for 4' x 4' forms
Freshly prepared fly ash mixture
(Fly ash, sand, water)
Samples of large and small aggregate
Cardboard for templates
Surface retarder
Polyethylene sheeting
Two color shake hardeners
Photographs of architectural finishes
Samples of various colored cements
Samples of portland cement paint
Form liner
Two shake hardener containers per trainee

HOW TO USE THIS INSTRUCTOR'S GUIDE

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- Introduction/Overview
- Classroom, and/or Demonstration, and/or Laboratory
- Class Break
- Classroom, and/or Demonstration, and/or Laboratory
- Summary

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the surface classes of architectural concrete, and the treatments commonly specified to make them attractive, including special surface treatments, special forms, and form liners.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

- Core Curricula; Concrete Finishing Level One;
- Concrete Finishing Level Two, Modules 23201 through 23204

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 20 hours or eight sessions of training time are suggested to cover *Architectural Finishes*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Eight 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Portland Cement Paint	1.0.0 – 3.4.3
2	Applying Color Shake Demonstration/Laboratory	3.4.2
3	Exposed Aggregate Treatments – Repairing Exposed Aggregate Surfaces	4.0.0 – 4.5.0
4	Preparing Exposed Aggregate Surface Demonstration/Laboratory	4.3.0
5	Broom And Wash Exposed Aggregate Demonstration/Laboratory	4.4.1
6	Blasting – Job-Made Patterns Demonstration	5.0.0 – 7.2.2
7	Laboratory/Site Visit	
8	Module Examination Performance Profile Testing	

Note: (1) For Sessions 2, 6, and 8, you will need to prepare several 4' × 4' slabs to use with the demonstrations and laboratories. These slabs can be made by constructing a 4' × 4' box using 2" × 4" lumber as the forming material. Fill the box with a mixture of sand, fly ash, and water to simulate fresh concrete. Make sure there are enough slabs for the number of trainees.

(2) For Session 7, you will need to arrange a site visit well in advance. Make sure sufficient transportation is available.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

A Guide To Finishing And Related Problems, The Aberdeen Group, Addison, IL, 1996.

Concrete Construction Handbook, Fourth Edition, McGraw-Hill, Inc., New York, NY, 1998.

Concrete Manual, International Conference of Building Officials, Whittier, CA, 1992.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1988.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

Guide to Cast-In-Place Architectural Concrete Practice, American Concrete Institute, Farmington Hills, MI, 1997.

PERFORMANCE PROFILE TASKS

- 1. Identify a minimum of four architectural finishes by looking at a set of photographs of concrete surfaces.**
- 2. Apply two separate color shakes to adjacent surfaces without mixing the colors.**
- 3. Use the seeding method to place exposed aggregate.**
- 5. Use the water washing technique to remove surface paste and expose aggregate.**

INDUSTRIAL FLOORS

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Prepare an industrial floor area for placing concrete.
2. Place and finish concrete for an industrial floor.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Water containers
Shovels
Optical levels
Level rods
Laser level
Highway straightedges
Mechanical vibrators
Screeds
Bullfloats
Wheelbarrows or chutes
Tape measures
Hammers
Drills and drill bits
Concrete mixer

Materials

Trainee Task Module
Transparencies
Module Examinations
Performance Profile Sheets
Paper and pencils
Markers/chalk
Freshly prepared fly ash mixture
(fly ash, water, sand)
Dimensional lumber for form
(16' × 32' × 8" deep)
Pea gravel or equivalent aggregate
Construction stakes
Dowels
Dowel baskets
Working drawings of dowel installation
Dowel release agent or substitute
Manufacturer's literature on profileograph
and dipstick
Sample of shake hardeners

HOW TO USE THIS INSTRUCTOR'S GUIDE

For each 2½ hour class session in this Instructor's Guide, the basic Presentation Sequence is as follows:

- Introduction/Overview
- Classroom, and/or Demonstration, and/or Laboratory
- Class Break
- Classroom, and/or Demonstration, and/or Laboratory
- Summary

Suggested time periods for classroom sessions are included throughout this Instructor's Guide. These time periods should be adapted to meet local conditions and training requirements.

Each class session is presented with two columns of information. On the left side of the page, a narrow column provides suggested trainee and instructor actions, icons to call your attention to material, safety, audiovisual, or testing requirements, and space for your notes. The right-hand column provides the outline of the suggested presentation for each class session.

In this Instructor's Guide, the terms classroom, demonstration, and laboratory are defined and used as follows:

Classroom: Sessions are designed for lectures, group discussions, coaching, and additional activities. Trainees should be encouraged to actively participate.

Demonstration: Instructors will demonstrate all procedures before trainees attempt them. Instructors should make sure that trainees can point out all safety procedures during demonstrations to be assured of the proper use of equipment by trainees.

Laboratory: Instructors will facilitate all laboratory activities, coach trainees as they practice the procedures, monitor trainee progress, and provide feedback. The instructor will make sure that safety rules are followed at all times and that protective equipment is worn.

NCCER Standardized Craft Training Programs

The National Center for Construction Education and Research (NCCER) provides a standardized national program of accredited craft training. Key features of the program include instructor certification, competency-based training, and performance testing. The program provides trainees, instructors, and companies with a standard form of recognition through a National Craft Training Registry. The program is described in full in the *Guidelines for Accreditation*, published by the NCCER. For more information on standardized craft training, contact the NCCER at P.O. Box 141104, Gainesville, FL 32614-1104; or call 352-334-0911.

MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to requirements and techniques for placing and finishing concrete industrial floors.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

- Core Curricula; Concrete Finishing Level One;
- Concrete Finishing Level Two, Modules 23201 through 23205

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 22½ hours or nine sessions of training time are suggested to cover *Industrial Floors*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Nine 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Forms And Screeds Demonstration	1.0.0 – 3.3.0
2	Laboratory/Performance Profile Testing	3.3.0
3	Embedments – Joints Demonstration	3.4.0 – 3.6.0
4	Laboratory/Performance Profile Testing	3.4.0 – 3.6.0
5	Placing – Saw Cutting Joints Demonstration	4.0.0 – 8.0.0
6	Laboratory/Performance Profile Testing	4.0.0 – 8.0.0
7	Demonstration/Laboratory	4.0.0
8	Placing and Finishing Laboratory	4.0.0 – 5.0.0
9	Module Examination Performance Profile Testing	

Note: (1) Because of the number of Performance Profile Tasks in this module, they have been scheduled throughout the module sessions instead of at the end.

(2) Fresh concrete can be simulated for the demonstrations, laboratories, and Performance Profile Tasks by using a mixture of fly ash, sand, and water.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Construction and Estimating, Craig Avery, Craftsman Book Company, Carlsbad, CA, 1991.

Concrete Manual, International Conferences of Building Officials, Whittier, CA, 1992.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1988.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

Standard Specifications for Tolerance for Concrete Construction and Materials and Commentary, ACI 117R-90, American Concrete Institute, Farmington Hills, MI, 1990.

PERFORMANCE PROFILE TASKS

- 1. Using dimensional lumber, lay out, install, and set an 8-inch deep concrete form to grade and elevation with the use of an optical level and level rod.**
- 2. Use drawings to locate the correct place for dowel assemblies in concrete slab.**
- 3. Drill holes and insert two dowels.**
- 4. Apply release agent to dowels.**
- 5. Place a wet screed to grade using an optical level and level rod.**
- 6. Place a wet screed to grade using a laser level and level rod.**

PERFORMANCE PROFILE TASKS

- 7. Place, consolidate, and screed a concrete slab to a given elevation.**
- 8. Use a highway straightedge to remove high areas and fill low areas of a slab.**

SUPERFLAT FLOORS

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Discuss the requirements for installing a superflat floor.
2. Prepare an area and materials for finishing a superflat floor.
3. Place and finish concrete for a superflat floor.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Dipsticks
Highway straightedges
Optical levels
Level rods
Chalk lines
Hammers
Measuring tapes
Block planes

Materials

Trainee Task Module
Transparencies
Module Examinations
Performance Profile Sheets
Paper and pencils
Markers/chalk
Construction stakes
Dimensional lumber for edge forms
Nails
Carpenter's pencils
Keel
Existing concrete floor
Plans for floor construction and rack layout
Photographs or brochures of superflat floors
Sample replacement checklist
Brochure on laser screed

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the procedures and methods used to construct superflat floors. Information is provided about flatness and levelness requirements and the finishing methods used to meet the required tolerances.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

- Core Curricula; Concrete Finishing Level One;
- Concrete Finishing Level Two, Modules 23201 through 23206

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 22½ hours or nine sessions of training time are suggested to cover *Superflat Floors*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Nine 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Factors Influencing F-number Values	1.0.0 – 2.3.0
2	Preparation – Mix Design Demonstration	3.0.0 – 3.4.0
3	Forms/Laboratory	3.2.0
4	Placing – Form Monitoring Demonstration	4.0.0 – 4.3.0
5	Placing/Laboratory Site Visit	4.0.0
6	Finishing – Measuring Demonstration	5.0.0 – 5.3.2
7	Measuring/Laboratory	5.3.2

Session	Topic	Trainee Module Section(s)
8	Curing – Grinding Performance Profile Testing	6.0.0 – 7.0.0
9	Module Examination Performance Profile Testing	

Note: Arrange for the site visit well in advance. Make sure you know the schedule for the concrete placing activities. Make sure sufficient transportation is available for all trainees.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Manual, International Conference of Building Officials, Whittier, CA, 1992.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1998.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Floors and Slabs, American Concrete Institute, Farmington Hills, MI, 1996.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1996.

Standard Specification for Tolerances for Concrete Construction and Materials and Commentary, ACI 117R-90, American Concrete Institute, Farmington Hills, MI, 1990.

The Contractor's Guide to Quality Construction, American Concrete Institute, Farmington Hills, MI, 1997.

PERFORMANCE PROFILE TASKS

- 1. Set a 20-foot wooden edge form on grade to a specified elevation and check top of the form for flatness with a highway straightedge. Mark areas that are not true.**
- 2. Using a floor plan and rack layout, prepare a placing sequence for a defined-traffic floor.**
- 3. Mark gridlines on a floor slab for measuring guides.**
- 4. Use a dipstick to take measurements for flatness and levelness.**
- 5. Identify areas in the floor section that are out of tolerance and mark the areas for grinding.**

SURFACE TREATMENTS

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Describe different surface treatments.
2. Apply common surface treatments.
3. Finish a concrete floor to receive toppings.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Concrete mixer
Shovels or scoops
Floats
Shotblasting or equivalent equipment
Magnets
Brooms
Water hose

Materials

Trainee Task Module
Transparencies
Module Examination
Performance Profile Sheets
Markers/chalk
Paper and pencils
Dimensional lumber for 4' x 4' sandboxes
Fly ash
Sand
Water
Epoxy compound
Mineral shake hardener
Metallic shake hardener
Color shake hardener
Paper bags for containers
Hardened concrete slab
ICRI guideline No. 03732
Concrete surface profile (CSP) chips

HOW TO USE THIS INSTRUCTOR'S GUIDE

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- Classroom, and/or Demonstration, and/or Laboratory
- Summary

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the various types of surface treatments used to repair and protect concrete structures. Preparation of the slab's surface and applications of various treatments are described.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

Core Curricula; Concrete Finishing Level One;
Concrete Finishing Level Two, Modules 23201 through 23207

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 12½ hours or five sessions of training time are suggested to cover *Surface Treatments*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Five 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Applying Natural-Aggregate Dry Shakes Demonstration	1.0.0 – 3.3.0
2	Applying Dry Shakes/Laboratory	3.2.0
3	Self-Leveling Toppings And Underlayments – Application Surface Preparation Demonstration	4.0.0 – 6.3.0
4	Surface Preparation Laboratory	2.3.0
5	Module Examination Performance Profile Testing	

Note: For this module you will need to prepare several 4' × 4' slabs to use with the demonstrations and laboratories. These slabs can be made by constructing a 4' × 4' box using 2" × 4" lumber as the forming material. Fill the box with a mixture of sand, fly ash, and water to simulate fresh concrete.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Manual, International Conference of Building Officials, Whittier, CA, 1992.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Thirteenth Edition, Portland Cement Association, Skokie, IL, 1988.

Guide for Concrete Floor and Slab Construction, ACI 302.1R-96, American Concrete Institute, Farmington Hills, MI, 1997.

The Contractor's Guide to Quality Construction, American Concrete Institute, Farmington Hills, MI, 1997.

Selecting and Specifying Concrete Surface Preparation For Sealers, Coatings, and Polymer Overlays, Guideline No. 03732, International Concrete Repair Institute, Sterling, VA, 1997.

TRANSPARENCY 2

TASK MODULE 23208, SURFACE TREATMENTS

PERFORMANCE PROFILE TASKS

- 1. Apply an even-colored finish to a wet surface.**
- 2. Uniformly broadcast and work with a mineral hardener.**
- 3. Uniformly broadcast and work with a metallic hardener.**
- 4. Properly use shotblasting or equivalent equipment to prepare a surface to a specified concrete surface profile.**
- 5. Properly clean a surface after using shotblasting or equivalent equipment.**

QUALITY CONTROL

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Describe the purpose, frequency, sampling requirements, and procedures for performing common concrete tests.
2. Perform each concrete test.
3. Describe and perform preplacement inspections.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Four-function calculators
Shovels or scoops
Slump test kits
Yield test kits
Cylinder molds
Tamping rods
Thermometer for temperature test
Cover sheets or caps
Scales
Strikeoff plates or straightedges

Materials

Trainee Task Module
Transparencies
Module Examinations
Performance Profile Sheets
Paper and pencils
Markers/chalk
Labels
Six different sizes of rebar
Freshly mixed concrete or fly ash based mixture
Copies of ASTM standards C31, C138, C143, and C172
Copies of ACI testing references

HOW TO USE THIS INSTRUCTOR'S GUIDE

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- Introduction/Overview
- Classroom, and/or Demonstration, and/or Laboratory
- Class Break
- Classroom, and/or Demonstration, and/or Laboratory
- Summary

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the requirements for controlling the quality of materials and craftsmanship used in concrete construction. Standard test methods and procedures accepted by the industry are also presented.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

Core Curricula; Concrete Finishing Level One;
Concrete Finishing Level Two, Modules 23101 through 23208

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 10 hours or four sessions of training time are suggested to cover *Quality Control*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Four 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Test and Acceptance Criteria Demonstration/Laboratory	1.0.0 – 3.5.0
2	Field Testing – Temperature Test Procedure Demonstration/Laboratory	4.0.0 - 4.4.2
3	Inspections – Bulkheads Demonstration/Laboratory	5.0.0 - 7.2.0
4	Module Examination Performance Profile Testing	1.0.0 - 7.2.0

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Construction and Estimating, Craig Avery, Craftsman Book Company, Carlsbad, CA, 1991.

Concrete Manual, International Conferences of Building Officials, Whittier, CA, 1992.

Concrete Parking Lots: Eight Steps to Quality Construction, Videotape 18:32 minutes, Portland Cement Association, Skokie, IL.

Concrete Technology, Third Edition, George R. White, Delmar Publishers, Inc., Albany, NY, 1991.

Design and Control of Concrete Mixtures, Third Edition, Portland Cement Association, Skokie, IL, 1998.

Finishing Concrete Flatwork, Videotape 32:00 minutes, Portland Cement Association, Skokie, IL, 1991.

Guide for Concrete Floor and Slab Construction, American Concrete Institute, Farmington Hills, MI, 1997.

TRANSPARENCY 2

TASK MODULE 23209, QUALITY CONTROL

PERFORMANCE PROFILE TASKS

- 1. Sample concrete according to ASTM standard C172. Prepare a test cylinder according to ASTM standard C31.**
- 2. Perform a slump test according to ASTM standard C143.**
- 3. Perform a yield test and calculate yield, unit weight, and air content according to ASTM standard C138.**
- 4. Correctly identify at least four out of six sizes of rebar according to bar markings.**

MAKING REPAIRS

OBJECTIVES

Upon completion of this module, the trainee will be able to:

1. Describe common surface defects.
2. Repair cracks.
3. Describe and locate delaminations.
4. Stone or sack rub surfaces.

Note to the Instructor

Before teaching this module, you should review the details in this Instructor's Guide for Equipment and Materials, Testing, and the suggested Teaching Sequence. Be sure to allow ample time to prepare your own training plan or lesson plan and to gather all required equipment and materials.

Required Equipment and Materials

The following are required for instruction using this module:

Equipment

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Concrete slabs with cracks, spalls, and discolorations
Mixing containers
Water containers
Concrete saws
Chipping hammers or hammers and chisels
Vacuum cleaners or airblasters
Brushes for bonding material
Pointing or mason's trowels
Floats
Straightedges
Grinder
Caulking guns

Materials

Trainee Task Module
Transparencies
Paper and pencils
Markers/chalk
Manufacturer's literature on milling machines (if available)
Joint filler or substitute
Preformed joint strips
Patching compound or substitute
Cement
Sand
Water
Bonding compound or substitute
Burlap for rubbing
Curing materials
Module Examinations
Performance Profile Sheets

HOW TO USE THIS INSTRUCTOR'S GUIDE

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MODULE OVERVIEW

This module introduces the Concrete Finishing trainee to the methods and procedures used in making repairs to concrete structures. The trainee will learn how to recognize problems and determine the best way to make the repair.

Prerequisites

Please see the Course Map. Prior to training with this module, it is recommended that the trainee shall have successfully completed the following modules:

- Core Curricula; Concrete Finishing Level One;
- Concrete Finishing Level Two, Modules 32201 through 23209

Safety Considerations

Ensure that the trainees are equipped with appropriate personal protective equipment.

Teaching Time for This Module

Approximately 10 hours or 4 sessions of training time are suggested to cover *Making Repairs*. The training class session is a suggested 2½ hour time period, which includes at least one break. **You will need to adjust the time required for hands-on activities and testing based on your class size and resources.** All time periods for this module are suggested, and you will need to adapt the suggested lesson plan to meet your local conditions.

Suggested Teaching Sequence — Four 2½-Hour Sessions

Adjust your class times based on class size and resources.

Session	Topic	Trainee Module Section(s)
1	Introduction – Large Areas Demonstration/Laboratory	1.0.0 – 3.2.0
2	Grinding and Milling – Stone Rubbing Demonstration/Laboratory	4.0.0 – 7.2.0
3	Joint Maintenance And Repair – Shotcrete Repairs Demonstration/Laboratory	8.0.0 – 9.0.0
4	Module Examination Performance Profile Testing	

Note: This module covers repairs to hardened concrete. The instructor should prepare beforehand a small slab of concrete for each trainee. As the slabs cure, the instructor should induce spalls, chips, and cracks into each slab so that the slabs will be ready for use during the laboratory sessions.

Optional References for Advanced Study

This module is intended to present thorough resources for task training. The following reference works are suggested for both instructors and motivated trainees interested in further study. These are optional materials for continued education rather than for task training.

Concrete Manual, International Conferences of Building Officials, Whittier, CA, 1992.

Concrete Repair, Volumes 1 and 2, The Aberdeen Group, Addison, IL, 1992.

Design and Control of Concrete Mixtures, Portland Cement Association, Skokie, IL, 1988.

Evaluation and Repair of Concrete Structures, Manual 1110-2-2002, U.S. Army Corps of Engineers, Washington, DC, 1995.

Floors and Slabs, Compilation 35, American Concrete Institute, Farmington Hills, MI.

Guide For Selecting and Specifying Materials For Repair of Concrete Surfaces, Guideline No. 03733, International Concrete Repair Institute, Sterling, VA, 1996.

TRANSPARENCY 2

TASK MODULE 23210, MAKING REPAIRS

PERFORMANCE PROFILE TASKS

- 1. Patch a crack and cure it.**
- 2. Sack rub a discolored patch and cure it.**
- 3. Cut and fill a joint and cure it.**

