



Pembroke Hopkins Park Construction Outreach Program

13355 E. 3000 S. Rd., Pembroke Township, IL 60958

Tel: (815) 944-8897 Fax: (815) 944-5675

**Cement
Materials and Equipment**

Level One

MODULE 23101 – INTRODUCTION TO CONCRETE CONSTRUCTION AND FINISHING (10 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Trainee Module
Small container of cement
Small container of sand
Small container of gravel
Small container of water
Transparencies
Module Examinations
Markers/chalk
Pencils and paper

MODULE 23102 – SAFETY REQUIREMENTS (5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment:
Hard hats Hearing protectors
Safety glasses Face shields
Knee pads Knee boards
Rubber gloves Rubber boots
Safety shoes Dust masks
Respirators Safety harnesses
Concrete hand tools
Power float or trowel
Hand sprayer
Concrete saw
Carbon monoxide meter
Trainee Module
Pencils and paper



Markers/chalk
OSHA standards
Company safety manual
Operator's manuals for concrete equipment
Material Safety Data Sheets
Transparencies
Module Examinations
Performance Profile Sheets

MODULE 23103 – PROPERTIES OF CONCRETE (10 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Mixing boards (plywood)
Hoes
Square-end shovels
Buckets or cubic foot boxes
Slump test kits
Appropriate Personal Protective Equipment
Trainee Module
Transparencies
Pencils and paper
Markers/chalk
Example specification sheets
Example reinforcing steel bars
Portland cement
Sand
Aggregate
Water
Admixture samples
Module Examinations
Performance Profile Sheets

MODULE 23104 – TOOLS AND EQUIPMENT (7.5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Steel tape
Engineer's rule
Carpenter's level
Builder's level
Straightedge



Rake
Come-along
Bullfloat
Shovel
Highway straightedge
Darby
Rubber float
Finishing trowel
Walking trowel
Pointing trowel
Hand-held jointer
Basic edger
Pair edgers
Radius edger
Finishing broom
Water broom
Hand stone
Hand-held concrete vibrator
Gasoline-powered concrete saw
Electric grinder
Walk-behind power trowel
Trainee Module
Transparencies
Markers/chalk
Pencils and paper
Module Examinations
Performance Profile Sheets

MODULE 23105 – PREPARING FOR PLACEMENT (12.5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Engineer's level
Laser level
Level rods
Hand level
Measuring tape
Sandbox(es)
Shovels
Come-alongs
Hammers
Appropriate Personal Protective Equipment
Trainee Module



Transparencies
Markers/chalk
Pencils and paper
Construction stakes
Batter boards
Dimensional lumber (2 x 4 and 2 x 6)
Nails
String (mason's line) and cutter
Grease crayon or marking pen
Reinforcing steel
Waterstop
Site plan
Module Examinations
Performance Profile Sheets

MODULE 23106 – PLACING CONCRETE (12.5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Sandbox(es)
Wheelbarrows
Come-alongs
Square-end shovels
Poker vibrators
Straightedges
Darbies
Highway straightedges
Bullfloats
Slab forms
Trainee Module
Transparencies
Pencils and paper
Markers/chalk
Example placing checklist
Module Examinations
Performance Profile Sheets
Concrete
Water
Aggregate



MODULE 23107 – FINISHING, PART ONE (20 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment

Sandboxes (4 ft. x 4 ft.)
Hammers
Come-alongs
Square-end shovels
Straightedges
Darbies
Bullfloats
Hand floats
Edgers
Groovers
Trowels
Concrete saw(s)
Rubbing stone(s)
Chalk lines
Steel tape
Brooms
Wheelbarrows
Power saws
Trainee Module
Transparencies
Markers/chalk
Pencils and paper
Nails
Concrete (ready-mixed recommended)
Sand
Lime
Water
Dimensional lumber slab form
Burlap
Grout mixture
Marking pencils
Module Examinations
Performance Profile Sheets



MODULE 23108 – CURING AND PROTECTING CONCRETE (5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Manual compound sprayers
Trainee Module
Transparencies
Pencils and paper
Markers/chalk
Water
Plastic sheeting
Scrap lumber and rocks
Wide plastic tape
Samples of curing compounds
Module Examinations
Performance Profile Sheets

MODULE 23109 – INTRODUCTION TO TROUBLESHOOTING (5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Trainee Module
Transparencies
Markers/chalk
Paper and pencils
Photographs of concrete problems
Module Examinations
Performance Profile Sheets

Level Two

MODULE 23201 - PROPERTIES OF CONCRETE, PART TWO (7.5 Hours)

Overhead projector and screen
Whiteboard/chalkboard
Appropriate Personal Protective Equipment
Trainee Module
Transparencies
Paper and pencils
Markers/chalk
Module Examination



MODULE 23202- ESTIMATING CONCRETE QUANTITIES (10 Hours)

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
Trainee 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

MODULE 23203- FORMING (20 Hours)

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

MODULE 23204- SITE CONCRETE (30 Hours)

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
Trainee 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

MODULE 23205- ARCHITECTURAL FINISHES (20 Hours)

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
Trainee 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

MODULE 23206- INDUSTRIAL FLOORS (22.5 Hours)

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
Trainee 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' x 32' x 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



MODULE 23207- SUPERFLAT FLOORS (22.5 Hours)

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

Trainee 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 preplacement checklist
Brochure on laser screed

MODULE 23208- SURFACE TREATMENTS (12.5 Hours)

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



Trainee 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

MODULE 23209- QUALITY CONTROL (10 Hours)

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
Trainee 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

MODULE 23210- MAKING REPAIRS (10 Hours)

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
Trainee 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



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**Cement
Competencies / Objectives**

Level One

MODULE 23101- INTRODUCTION TO CONCRETE CONSTRUCTION AND FINISHING (10 Hours)

1. Define terms associated with concrete construction.
2. Identify the composition and characteristics of concrete.
3. Identify the uses of concrete as a building material.
4. Identify the effect of craftsmanship on finished concrete.
5. Explain the concrete construction process.
6. Identify site operation work requirements.
7. Explain the career potentials in concrete construction and finishing.

MODULE 23102– SAFETY REQUIREMENTS (5 Hours)

1. Describe and wear different types of safety gear for the work site.
2. State the guidelines for dressing appropriately for concrete work.
3. Describe how to safely handle concrete when forming, placing, curing, and finishing.
4. Describe safety precautions to follow when working in extreme heat and cold.
5. Describe safety precautions to follow when working with hazardous materials.
6. Describe proper procedures for handling and maintaining concrete construction tools safely.

MODULE 23103– PROPERTIES OF CONCRETE (10 Hours)

1. Describe the properties of concrete.
2. Explain how the properties of concrete are used in construction.
3. Determine how the ingredients of concrete influence mix, placement, finishing, durability, and performance.
4. Describe quality-control tests on concrete ingredients, fresh concrete, and hardened concrete.
5. Mix a test batch of concrete.
6. Perform a slump test.



MODULE 23104– TOOLS AND EQUIPMENT (7.5 Hours)

1. Name the tools used in placing and finishing concrete.
2. Name the power equipment used in placing and finishing concrete.
3. Describe how each tool is used.
4. Describe how the power equipment is used.
5. Associate trade terms with the appropriate tools and equipment.

MODULE 23105– PREPARING FOR PLACEMENT (12.5 Hours)

1. Describe basic site layout using levels and measuring tools.
2. Properly locate, grade, and build forms for horizontal placement.
3. Perform compaction activities on subgrades.
4. Describe various joints and where to locate them.
5. Describe various reinforcements and how to place them.
6. Describe information needed when ordering concrete.

MODULE 23106 – PLACING CONCRETE (12.5 Hours)

1. Describe how concrete is conveyed and placed.
2. Draw up a pre-placement checklist.
3. Demonstrate the use of equipment and tools for placing concrete.
4. Demonstrate the process of depositing, spreading, consolidating, and striking off concrete in a form.
5. Associate trade terms with the appropriate processes and equipment.

MODULE 23107– FINISHING, PART ONE (20 Hours)

1. Describe the basic finishing process.
2. Use the following finishing hand tools: float, edger, groover, and trowel.
3. Mark and cut joints with a saw.
4. Apply a broom finish.
5. Apply a rubbing finish.
6. Associate trade terms with the appropriate processes and equipment.

MODULE 23108– CURING AND PROTECTING CONCRETE (5 Hours)

1. Describe the process of curing concrete.
2. Identify methods of curing concrete.
3. Describe how each method is applied.
4. Identify when each method is used.
5. Associate trade terms with the appropriate processes and equipment.



MODULE 23109– INTRODUCTION TO TROUBLESHOOTING (5 Hours)

1. Describe a basic troubleshooting methodology that can be used to identify a variety of concrete construction problems and their causes.
2. Identify problems with fresh concrete and describe ways to prevent them.
3. Identify different concrete defects such as crazing, cracking, dusting, scaling, pop-outs, and efflorescence, and describe ways to prevent them

Level Two

MODULE 23201- PROPERTIES OF CONCRETE, PART TWO (7.5 Hours)

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.

MODULE 23202 - ESTIMATING CONCRETE QUANTITIES (10 Hours)

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.

MODULE 23202 – FORMING (20 Hours)

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.

MODULE 23204- SITE CONCRETE (30 Hours)

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.

MODULE 23205 - ARCHITECTURAL FINISHES (20 Hours)

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.



MODULE 23206- INDUSTRIAL FLOORS (22.5 Hours)

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

MODULE 23207 – SUPERFLAT FLOORS (22.5 Hours)

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.

MODULE 23208- SURFACE TREATMENTS (12.5 Hours)

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

MODULE 23209- QUALITY CONTROL (10 Hours)

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.

MODULE 23210- MAKING REPAIRS (10 Hours)

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