

# ATFL-1010: INTRO TO THE FLOOR COVERING INDUSTRY

## Cuyahoga Community College

### Viewing: ATFL-1010 : Intro to the Floor Covering Industry

**Board of Trustees:**

October 2024

**Academic Term:**

Fall 2025

**Subject Code**

ATFL - Appld Indus Tech - Floorlaying

**Course Number:**

1010

**Title:**

Intro to the Floor Covering Industry

**Catalog Description:**

Introductory course covering most aspects and characteristics of the floor laying industry including vinyl composition tile, carpet and ceramic tile and required transitions. In addition, installation procedures, including substrate preparation and edging for polished concrete and resinous floors and respective lay out practices are demonstrated and applied.

**Credit Hour(s):**

2

**Lecture Hour(s):**

2

### Requisites

**Prerequisite and Corequisite**

Departmental approval and a current member of the Carpenter Union

### Outcomes

**Course Outcome(s):**

Describe the different aspects of the floor laying Industry, identify the materials and tools used in flooring installations, and explain the various substrates used in construction and discuss respective contractor policies and documents.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the terms related to the flooring industry.
2. Identify the various flooring applications typical in the commercial industry.
3. Describe the different flooring materials used including wood, resilient, carpeted, and ceramic products.
4. Identify the tools used in the flooring industry and describe the use of each.
5. Describe the different types of floor substrates and explain typical construction and discuss different factors affecting respective floor treatments.
6. Discuss the general contractor policies, chain of command, jobsite conditions, and expectations required of the flooring installer.

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**Course Outcome(s):**

Discuss the importance of proper preparation including safety concerns, levels of patch, material types and demonstrate the ability to apply different hydraulic cements to level different substrates.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define terms related to floor preparation.
2. Identify the different types of hydraulic cements used in substrate preparation.
3. List various contaminants that affect flooring installations and identify common defects that need to be addressed.
4. Discuss the importance of safety awareness with respect to silica standards and identify proper PPE.
5. Describe the process of cleaning substrates including the importance of providing dust free environments.
6. List and differentiate between the levels of patching and discuss the relevance of telegraphed lighting on the desired result.
7. Differentiate between porous and non porous substrates with respect to primer selection and adhesives used for floor coverings type.
8. Explain how feather edging is used to smooth out variable heights in the substrate.
9. Demonstrate the ability to prepare substrates using different patching levels, proper mixing procedures, keying techniques and directional troweling.

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**Course Outcome(s):**

Identify the characteristics, types and uses of resilient wall base including wall preparation and adhesive application.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define terms related to resilient wall base.
2. Explain the characteristics of resilient wall base including appearance and composition.
3. Differentiate between roll base and standard lengths.
4. Identify the different types of resilient wall base and describe the use of each.
5. Describe specialty wall base including unique appearance, dimensions, including thickness and heights and corner treatments.
6. Describe the various wall conditions that may be addressed prior to base installation.
7. Discuss the different application techniques used to apply base adhesive to walls including material acclimation and layout practices.

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**Course Outcome(s):**

Discuss the purpose of transitions including types and applications and describe and apply various installation techniques

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List the different types of floor covering transitions used in commercial and residential applications.
2. Identify and describe the various uses of transition used to terminate flooring edges.
3. Explain the importance of proper storage practices of transitions.
4. Demonstrate the ability to select and install transitions of different floor coverings.

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**Course Outcome(s):**

Identify the tools and adhesives used to glue down different types of carpeting and describe the procedures followed, including "hand fitting", estimates of material and installation techniques, including hot cutting of resilient flooring.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the terms related to glue down carpet installations.
2. Identify the different types of glue down carpeting.
3. List the special hand tools used to layout and install glue down carpeting.
4. Explain the practice of "hand fitting" glue down carpet and describe the procedures followed.
5. Review the math concepts used in estimating material required for various sized rooms/areas.
6. Demonstrate the ability to install glue down carpeting in commercial and industrial buildings in accordance with flooring industry standards.
7. Demonstrate the ability to transition carpeting to flooring materials.
8. Demonstrate the ability to properly hot cut resilient flooring materials around door casings, pipes, and drains.

**Course Outcome(s):**

Discuss the basics of ceramic tile and resinous flooring including material types, grid line layout, concrete imperfections, techniques used to cut ceramic tile, and perform edging operations for concrete polishing

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define terms related to ceramics and resinous floors.
2. Review safety regulations for ceramic installations established by the American.
3. Society of Testing Materials ASTM and the Occupational Safety and Health Administration OSHA.
4. Describe the various types of ceramic/hard tile and discuss the manufacturing process of each.
5. Apply the math concepts and layout procedures to establish grid lines for ceramic tile installations.
6. Identify the different types of thin set mortar and describe the purpose of each.
7. Demonstrate the ability to properly select, mix and spread thin set using keying, and combing techniques using a notched trowel.
8. Demonstrate the ability to cut ceramic tile using snap cutters and tile nippers.
9. Introduce, explain and demonstrate the process of "edging" polished and resinous floors.

**Methods of Evaluation:**

1. Quizzes
2. Tests
3. Class participation
4. Demonstration of installation techniques for all aspects of the course content.

**Course Content Outline:**

1. Hard surfaces
  - a. Terminology
    - i. Hard surface
    - ii. Employability skill
    - iii. Substrate
    - iv. Job document
    - v. Chain of command
    - vi. Material handling
    - vii. Staging
    - viii. Removal
    - ix. Layout
    - x. Carpet
    - xi. Resilient flooring
    - xii. Wall base
    - xiii. Ceramic tile
    - xiv. Laminate
    - xv. Engineered

- xvi. Floor truss
- xvii. Adhesive
- xviii. Disposal
- xix. Recycling
- xx. Polished concrete
- xxi. Epoxy floors
- xxii. Green products
- xxiii. VCT
- b. Flooring application
  - i. Durable installation
    - 1. Easily maintained
    - 2. Green product
  - ii. Vinyl composition tile
    - 1. Economical
    - 2. Labor friendly
    - 3. Costly over time
  - iii. Sound and walking comfort
  - iv. Natural products
    - 1. Wood
    - 2. Cork
  - v. Stairway
- c. Flooring materials
  - i. Wood
    - 1. Solid
      - a. Various species
      - b. Soft wood
      - c. Hard wood
    - 2. Costly
    - 3. Labor intensive
    - 4. Common wood substrate
    - 5. Engineered
      - a. Varying quality
      - b. Stable product
      - c. Variable widths
    - 6. Laminate
      - a. Floating
      - b. Snap together
      - c. Varying quality
  - ii. Resilient
    - 1. Linoleum
    - 2. Vinyl
    - 3. Plank
    - 4. Tile
    - 5. Rubber
    - 6. VCT
  - iii. Carpet
    - 1. Broadloom
      - a. Level loop
      - b. Cut pile
      - c. Greater than 27 inch width
    - 2. Tile
      - a. 18 inch x 18 inch
      - b. 2ft x 2ft
      - c. 3ft x 3ft
      - d. Metric sizes
    - 3. Glue down
      - a. Full spread
      - b. Perimeter glue
      - c. Grid system

- d. Wood substrate
- e. Concrete
- f. Limited existing
- iv. Ceramic
  - 1. Multiple size
  - 2. Wall
  - 3. Floor
  - 4. Different substrate
  - 5. Stone
  - 6. Porcelain
  - 7. Thin
- d. Tools
  - i. Standard
    - 1. Cutting
    - 2. Fastening
    - 3. Layout
    - 4. Cleaning
    - 5. Rulers
    - 6. Preparation
    - 7. Removal
    - 8. Utility
    - 9. Adhesive application
  - ii. Specialty
    - 1. Trowels
    - 2. Rollers
    - 3. Files
    - 4. Chisels
    - 5. Mallet
    - 6. Stapler
    - 7. Dry line
    - 8. Laser
- e. Substrate
  - i. Concrete
    - 1. Vapor barrier
    - 2. Cured
    - 3. Reinforced
    - 4. Water proofed
    - 5. Water-cement ratio
  - ii. Wood
    - 1. Floor construction
      - a. Joists
      - b. Trusses
      - c. Sheathing
      - d. Underlayment
      - e. Opening
      - f. Plywood grading
    - 2. Deflection
    - 3. Acclimation
    - 4. Minimum thickness
  - iii. Factors
    - 1. Moisture
    - 2. Deflection
    - 3. Expansion
    - 4. Contraction
    - 5. Anchored
    - 6. Parting compounds
    - 7. Curing
    - 8. Drying time

- f. Contractor policies
  - i. Chain of command
    - 1. Apprentice
    - 2. Journeyman
    - 3. Foreman
    - 4. Employer
    - 5. Superintendent
    - 6. Project manager
    - 7. Architect
    - 8. End user
  - ii. Policies
    - 1. Break/lunch
    - 2. Restrooms
    - 3. Delivery time
    - 4. Contact person(s)
    - 5. Parking
    - 6. Elevator use
    - 7. Material storage
    - 8. Open flames
    - 9. Resources
      - a. Electricity
      - b. Lighting
      - c. Water
      - d. HVAC
      - e. Staging areas
    - 10. Expectations
- 2. Proper substrate preparation
  - a. Terminology
    - i. Patch
    - ii. Hydraulic cement
    - iii. Existing adhesive
    - iv. Existing floor covering
    - v. Material removal
    - vi. Defect
    - vii. Expansion joint
    - viii. Control joint
    - ix. Silica
    - x. Silica standard
    - xi. Polymer
    - xii. Dust free environment
    - xiii. Porous substrate
    - xiv. Non porous substrate
    - xv. Removal equipment
    - xvi. Patching level
    - xvii. Ramping
    - xviii. Feather edge
    - xix. Keying technique
    - xx. Telegraphing
    - xxi. Telegraphed light
    - xxii. Desired result
    - xxiii. Crazing
    - xxiv. Pop-outs
    - xxv. Scaling
    - xxvi. Spalling
    - xxvii. Blistering
    - xxviii. Cracking
    - xxix. Curling

- xxx. Freeze-thaw deterioration
- xxxi. Delamination
- b. Hydraulic cement
  - i. Hydraulic Portland
    - 1. Grey color
  - 2. Polymer
    - a. Quick drying
    - b. Mold resistant
    - c. High compressive strength
  - ii. Gypsum hydraulic
    - 1. White
    - 2. Versatile
    - 3. Admixture strength
      - a. Latex based
      - b. Mildew resistant
    - 4. Polymer
      - a. Quick drying
      - b. Economical
      - c. Ease of workability
    - 5. Portland overlay
- c. Contaminates and defects
  - i. Contaminates
    - 1. Parting curing compounds
    - 2. Oil
    - 3. Grease
    - 4. Wax
    - 5. Dust
    - 6. Adhesive residue
    - 7. Paint over spray
    - 8. Drywall compounds
    - 9. Water
    - 10. Acids
    - 11. Alki salts
  - ii. Defects
    - 1. Pop-outs
    - 2. Crazing
    - 3. Blisters
    - 4. Cracking
    - 5. Curling
    - 6. Scaling
    - 7. Spalling
    - 8. Freeze –thaw deterioration
    - 9. Delamination
- d. Safety awareness
  - i. Silica standard
    - 1. Types
      - a. Crystalline
      - b. Amorphous
    - 2. History
      - a. 1500's; 14<sup>th</sup> century
      - b. Europe
      - c. 1800's/USA
    - 3. Exposure
      - a. Sawing
      - b. Hammering
      - c. Blasting
      - d. Demolition
      - e. Sweeping
      - f. Pouring/mixing

- g. Abrasive blasting
- h. Shot
- i. Drilling
- j. Cutting
- k. Sanding
- 4. Health effects
  - a. Silicosis
  - b. Lung cancer
  - c. COPD
  - d. Auto-immune
  - e. Chronic kidney failure
- 5. Exposure limits
  - a. Permissible
  - b. Recommended
  - c. Threshold limit values
  - d. Time weighted average
  - e. Action level
- 6. Exposure control
  - a. Need
  - b. Assessment
  - c. Dust control
  - d. Engineered controls
  - e. Work practice
  - f. High efficiency particulate air
  - g. Control plan
  - h. Respiratory protection
- 7. Medical evaluation
- 8. Competent person role

ii. PPE

- 1. Dust contaminate system
  - a. HEPA filter
  - b. Vacuum
  - c. Shroud component
- 2. Respiratory
  - a. Respirator
  - b. Masks
- 3. General

e. Cleaning substrate and dust free environment

- i. Cleaning
  - 1. Scraping
  - 2. Sanding
  - 3. Sweep/vacuum
- ii. Dust free environment
- iii. Wet vs dry

f. Patching levels, telegraphed lighting and desired results

- i. Patching levels
  - 1. Carpet/minor telescoping
  - 2. Vinyl/enhanced
  - 3. Flat/premium
- ii. Telegraphed lighting
  - 1. Sunlight/natural
  - 2. Fluorescent
  - 3. Incandescent
  - 4. Window placement
- iii. Desired results
  - 1. Eye level
  - 2. Defect free
  - 3. Smooth

g. Porous vs non-porous

- i. Porous
  - 1. Water absorption
  - 2. Bond-ability
  - 3. Adhesive set/open time
- ii. Non-porous
  - 1. Non water permeable
  - 2. Closed pores
  - 3. Difficult adhesion requirements
- iii. Primer selection
  - 1. Epoxy: excessive moisture
  - 2. Latex: better bond
  - 3. Polymer modified: latex upgrade
- h. Feather edging
  - i. Purpose
    - 1. Low area filler
    - 2. Blend varying surface edges
  - ii. Directional troweling
  - iii. Consistent pressure applied
  - iv. Cross filling multiple levels
- i. Application
  - i. Substrate preparation
    - 1. Tool selection
    - 2. Evaluate and clean
  - ii. Hydraulic cement selection and mixing
    - 1. Selection
      - a. Fill depth
      - b. Specifications
    - 2. Mixing
      - a. Proper ratio
      - b. Mix time per specification
      - c. Powder to water sequence
  - iii. Substrate application
    - 1. Trowel(s) selection
    - 2. Order
      - a. High to low areas
      - b. Center to perimeter
    - 3. Time constraint per manufacturer
  - iv. Keying techniques
    - 1. Deep fill application
    - 2. Smooth out
  - v. Directional troweling
    - 1. Straight line application
    - 2. Maintain proper thickness, trowel overlap
- 3. Resilient wall base
  - a. Terminology
    - i. Resilient wall base
    - ii. Cove
    - iii. Factory made corner
    - iv. Factory made edges
    - v. Fill section
    - vi. Short return
    - vii. Wall substrate
    - viii. Inside corner
    - ix. Outside corner
    - x. Mitre corner
    - xi. Roll base
    - xii. Specialty base
    - xiii. Acclimation
    - xiv. Plasticizer migration

- b. Base characteristics
  - i. Composition
    - 1. Rubber
    - 2. Vinyl
    - 3. Vinyl-rubber
  - ii. Manufacture process
    - 1. Molded
    - 2. Extruded
  - iii. Appearance
    - 1. Varying height
    - 2. Varying thickness
  - iv. Functional
    - v. Decorative
- c. Standard versus roll base
  - i. Standard
    - 1. 4'-0 conventional
    - 2. General use
    - 3. Straight face
    - 4. Cove face
  - ii. Roll base
    - 1. Lengths
      - a. 50'-0
      - b. 120'-0
    - 2. Straight face
    - 3. Cove face
- d. Types
  - i. Cove
  - ii. Straight face
  - iii. Heights
    - 1. 2 ½ inch
    - 2. 4 inch
    - 3. 4 ½ inch
    - 4. 6 inch
    - 5. Multiple height
- e. Specialty base
  - i. Appearance
    - 1. Multi-colored
    - 2. Paintable
    - 3. Stackable
    - 4. Various shapes
    - 5. Heights
      - a. Minimum 3 inch
      - b. Maximum 8 inch
    - 6. Thickness
      - a. Minimum ¼ inch
      - b. Maximum 1 inch
  - ii. Cover treatments
    - 1. Outside corner
      - a. Individual piece
      - b. Receives designer base
    - 2. Inside corner
      - a. Pre-formed
      - b. Anchored separately
- f. Wall conditions
  - i. Loose wall paper
  - ii. Excess drywall finish
  - iii. Out of square corners
  - iv. Existing adhesive
  - v. Voids or missing drywall
- g. Adhesive application

- i. Tools
  - 1. Notched trowel
  - 2. Caulk gun
- ii. Types
  - 1. Acrylic
  - 2. Latex
- iii. Material acclimation
  - 1. Twenty-four hour minimum
  - 2. Storage
- iv. Application techniques
  - 1. Wall application
  - 2. Base
  - 3. Trowel applied
  - 4. Caulk gun
  - 5. Uniform coverage
  - 6. Contact adhesive
  - 7. Film tape
  - 8. Wet rag wipe

4. Transitions

- a. Types
  - i. Wood
  - ii. Aluminum
  - iii. Resilient
    - 1. Rubber
    - 2. Vinyl
    - 3. Combination
- b. Uses
  - i. Terminating edge
    - 1. Carpet to VCT
    - 2. Carpet to wood
    - 3. Wood to wood
    - 4. Carpet to existing
    - 5. Varying floor heights
  - ii. Nosing
    - 1. Stairs
    - 2. Material
      - a. Rubber
      - b. Wood
      - c. Laminate
- c. Storage
  - i. Containment
    - 1. Tubular protection
    - 2. Flat and straight
  - ii. Protection
    - 1. Twist
    - 2. Deformation
      - a. Moisture
      - b. Crimping
- iii. Acclimation
  - 1. Wood transition
  - 2. Resilient transition

- d. Installation
- i. Tools
  - 1. Saws
    - a. Hacksaw
    - b. Handsaw
  - 2. Mitre box
  - 3. Clamps
  - 4. Aviation snips
  - 5. Knife

- 6. Vinyl cutter
- 7. Hammer
- ii. Layout
  - 1. Location
  - 2. Balanced positioning
  - 3. Field determination
  - 4. Net fit measurements
  - 5. Angle considerations
    - a. Standard 45 degree/90 degree
    - b. Irregular
  - 6. Maximum use per length
- iii. Cut and install
  - 1. Clean and straight
  - 2. Sharp blades
  - 3. Install
    - a. Tight fit
    - b. Anchor mechanical fasteners
    - c. Mitre install first
  - 4. Resilient transition
    - a. Contact cement
    - b. Adhesive tape
    - c. Stretch avoidance
- iv. Sequence
  - 1. Determined by material
  - 2. Tuck allowance
- 5. Glue down carpeting
  - a. Terminology
    - i. Tractoring
    - ii. Open time
    - iii. Working time
    - iv. Bond breaker
    - v. Porosity
    - vi. Pile
    - vii. Latex
    - viii. Bow/skew
    - ix. Foot friendly
    - x. Direct scribe
    - xi. Hot cut
    - xii. Hand fit
  - b. Carpet types
    - i. Action back
      - 1. General use
      - 2. Plastic back
      - 3. Wide range pricing
      - 4. Pliable
      - 5. Workable
    - ii. Soft back
      - 1. Residential or commercial use
      - 2. Cloth back
      - 3. Flexible
    - iii. Unitary latexed
      - 1. Heavy back
      - 2. Thin
      - 3. Commercial application
    - iv. Enhancer
      - 1. Hard rubber
      - 2. Cushion back
      - 3. Cushion cloth back
      - 4. Foot friendly

- v. Vinyl back
  - 1. Poly vinyl chlorine PVC back
  - 2. Carpet tile
  - 3. Sized metrically
- c. Special tools
  - i. Carpet knife
  - ii. Sheer
  - iii. Trimmer
  - iv. Straight edge
  - v. Tractor
  - vi. Hook knife
  - vii. Cushion back cutter
  - viii. Loop pile cutter
  - ix. Notched trowel
  - x. Seventy-five pound roller
- d. Hand fitting
  - i. Net fitting to vertical surface
  - ii. Notching out
  - iii. Back cutting
  - iv. Column wrap
- e. Math estimating
  - i. Perimeter
    - 1. Base requirements
    - 2. Border installation
  - ii. Area
    - 1. Carpet estimate
    - 2. Glue requirement
    - 3. Layout considerations
      - a. Seam location
      - b. Lighting
      - c. Foot and roller
      - d. Pile direction
      - e. Entry location
- f. Glue down installation
  - i. Safety
    - 1. Ventilation
    - 2. Hand tool safety
    - 3. Lifting precaution
    - 4. Gloves
  - ii. Measurements
  - iii. Area cleaning
    - 1. Floor scrape
    - 2. Shop vacuum
    - 3. Floor patch
  - iv. Determine seam location
  - v. Carpet cutting
    - 1. Over size cut
    - 2. Roll cut
  - vi. Position carpet in area
    - 1. Trim allowance
    - 2. Align seams
  - vii. Adhesive application
    - 1. Fold back carpet
    - 2. Apply to substrate
    - 3. Open time allowance
    - 4. Lay carpeting into adhesive
  - viii. Roll and address seams

1. Install additional rolls
2. Seam sealer
3. Tractor
- ix. Trim as needed
- x. Repeat above as required

g. Transitions

- i. Angle determination
- ii. Mitre cut angles
- iii. Cut to length/install
  1. Adhesive film tape
  2. Contact cement
  3. Adhesive

h. Hot cuts

- i. Required areas
  1. Door casings
  2. Pipes
  3. Drains
- ii. Tools
  1. Propane torch
  2. Heat gun
  3. Marking tool
  4. Dividers
  5. Utility knife
  6. Hand roller
- iii. Layout, scribe, heat and fit

6. Ceramic and polished concrete

- a. Terminology
  - i. Ceramic
  - ii. Mortar
  - iii. Gridline
  - iv. Thin bed
  - v. Keying
  - vi. Combing
  - vii. Polymer modified
  - viii. Deflection
  - ix. Shrinkage
  - x. Edging
  - xi. Accelerators
  - xii. Admixtures
  - xiii. Polyuria filler
  - xiv. Hydration
  - xv. Curing
  - xvi. Broad casting
  - xvii. Resins
  - xviii. Acrylic
  - xix. Pigments
  - xx. Batch
  - xxi. Dust shroud
  - xxii. Tile balanced
  - xxiii. Slake time
  - xxiv. Snap cutter
- b. ATSM/OSHA/regulations/flooring
  - i. Silica standard
    1. Dry sweeping
    2. Vacuum
      - a. Dust containment
      - b. High efficiency particulate air filter

- 3. Dust shroud
- 4. Respiratory protection
- ii. Tile testing
  - 1. Hardness
  - 2. Compressive strength
  - 3. Types
  - 4. Size tolerances
- iii. Mortar
  - 1. Pounds per square inch PSI
  - 2. Mixing consistency
  - 3. Types of setting material
- iv. OSHA
  - 1. Respiratory
  - 2. Scaffolding
  - 3. PPE
  - 4. House keeping
- c. Ceramic hard tile type and manufacturer
  - i. Stone: cutting, hone, polish
  - ii. Pavers: pressed
  - iii. Cement body: molded
  - iv. Porcelain: clay fired; kiln
- d. Grid lines
  - i. Math concepts
    - 1. Pythagorean theorem
    - 2. Basic operation
    - 3. Area
    - 4. Centerline determination
  - ii. Purpose
    - 1. Square area
    - 2. Tile alignment
    - 3. Mortar boundary
  - iii. Description
    - 1. Chalk line
    - 2. Tile/mortar boundary
    - 3. Tile alignment
  - iv. Layout
    - 1. 3-4-5 concept
    - 2. Arc scribing
    - 3. Centerline control
    - 4. Tile balanced
- e. Thin set mortar types and purpose
  - i. Dry set
    - 1. Economical
    - 2. General use
    - 3. Application
      - a. Ceramic
      - b. Stone
  - ii. Latex polymer modified
    - 1. Improved adhesion
    - 2. Shock/impact resistant
    - 3. Deflection resistant
    - 4. Wood substrate application
  - iii. Medium bed
    - 1. Minimize slump
    - 2. Thicker bond coat
    - 3. Large tile use
  - iv. Epoxy: ceramic and natural stone

1. Chemical resistant
2. High bond strength
3. High impact resistant
- v. Organic
  1. Interior use only
  2. Floors, walls, and countertops
  3. Not suitable for wet areas
  4. Avoid temperature extremes
- f. Spreading thin set
  - i. Tool selection
    1. Hand tools
      - a. Notched trowel
      - b. Margin trowel
      - c. Chalk line
      - d. Tape measure
      - e. Dust shroud
    2. Equipment
      - a. Drill motor/ 1/2 inch
      - b. Mortar paddle
      - c. Vacuum
  - ii. Layout
    1. Border determination
    2. Grid lines
  - iii. Mortar application
    1. Selection
    2. Mixing/shake time
    3. Placement within grid
    4. Key and comb
  - g. Cutting ceramic
    - i. Safety
      1. Gloves
      2. Eye protection
      3. Hard hats
    - ii. Tools
      1. Wax marker
      2. Tile nippers
      3. Snap cutter
    - iii. Cutting
      1. Nippers
        - a. Layout tile
        - b. Radius cut/"nip"
      2. Snap cutter
        - a. Layout
        - b. Mark
        - c. Align
        - d. Score and snap
  - h. Edging
    - i. Purpose
      1. Blend field with room perimeter
      2. Uniform grid appearance
    - ii. Equipment
      1. Hand held edge
      2. Walk behind
      3. Multi-tool
      4. Dust shroud and containment
    - iii. Edging operation
      1. Safety concerns
        - a. Respiratory
        - b. Eye protection
        - c. Electrical

2. Bond tooling pad selection
3. Grind to range
  - a. Grind
  - b. Hone
  - c. Polish
- iv. Technique
  1. Swirling motion
  2. Light pressure

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Top of page

Key: 4879