

ATFL-1808: SPECIAL TOPICS IN INTRODUCTION TO HARD TILE

Cuyahoga Community College

Viewing: ATFL-1808 : Special Topics in Introduction to Hard Tile

Academic Term:

Spring 2020

Subject Code

ATFL - Appld Indus Tech - Floorlaying

Course Number:

1808

Title:

Special Topics in Introduction to Hard Tile

Catalog Description:

Introductory course covering ceramic tile installations including tile types, substrate requirements, mortar specifications and backer board selection. Also covered are basics of reading construction drawings and grid layout procedures. Demonstration and application of substrate preparation, mortar selection and mixing and layout and installation practices using ceramic tile is an integral part of this course.

Credit Hour(s):

2

Lecture Hour(s):

2

Requisites

Prerequisite and Corequisite

Departmental approval and a member in good standing in the United Brotherhood of Carpenters and Joiners of America Union UBC.

Outcomes

Course Outcome(s):

I Discuss the different mortar systems and selection process with respect to various substrate requirements and employ basic layout procedures used to establish floor grids for ceramic tile.

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 hard tile trends.
2. Identify the different mortar setting systems and explain the advantages of each.
3. Assess different substrates for ceramic floor tile and determine specific mortar system with respect to existing conditions.
4. Explain how different concrete admixtures affect bonding ability and concrete hardness including air entrained.
5. List different substrate deficiencies and describe corrective procedures.
6. Review basic 3-4-5 layout procedures used for floor tile installations.
7. Establish control grids for ceramic floor tile and explain the function served.

Course Outcome(s):

II Review different mortar specifications and ceramic tile installation standards, identify specialty tools, and demonstrate the ability to properly lay-out required grid lines and set different tile sizes.

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. Review the mortar specifications as prescribed by the Tile Council of America (TCA) to maintain updates on current mortar use recommendations.
2. Explain the importance of proper mortar mixing consistency to maintain good tile bonding.
3. Identify the different trowel types and describe the various uses for mortar application.
4. List the different types of floats and describe respective uses.

Demonstrate the ability to properly select and mix mortar and thin set, establish grid lines, and set various specified ceramic tile in accordance with industry standards

Course Outcome(s):

III Identify the sheets of construction of drawings including documents and reproduction, tile backer boards and jobsite checklists for project start up procedures.

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 construction drawings, backer board and jobsite checklists.
2. Describe the methods used to draw and reproduce prints.
3. Identify and describe the types of construction drawings and documents.
4. List and explain the information typically found in construction drawing title blocks.
5. List the different types of backer board with respective uses.
6. Describe the substrate requirements with respect to wall and floors to receive backer board and tile.

Identify the common work practices as part of a job checklist to ensure project efficiency

Course Outcome(s):

IV Discuss the selection process for backer board application including specification research, cutting, and installing backer board with respective fasteners and identify and use specific tools required for layout and drilling operations for ceramic tile.

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 ceramic tile layout and installation including backer board application.
2. Describe the selection process for backer board with respect to standard construction specifications referencing moisture protection and finishes.
3. Describe the procedures followed for backer board applications including expansion allowances and sequence.
4. Identify the tools used for ceramic tile layout including specialty tools and demonstrate the ability to perform specific layout operations.
5. List the specialty tools used for cutting and drilling ceramic tile and demonstrate the ability to operate them in a safe manor.

Course Outcome(s):

V Demonstrate the ability to install ceramic floor tile including starting point determination, cuts and penetrations and trowel mortar and apply grout.

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. Select the hand and power tools and equipment needed for tile installation.
2. Establish starting point with respect to gridlines.
3. Determine border tile sizes and cut/dry fit along walls.
4. Layout, drill and install/dry fit floor penetrations, intricate cuts and transitions.
5. Mix and trowel mortar under all cuts and field ceramic tile.
6. Mix and apply grout per specifications at joints and cuts.

Methods of Evaluation:

1. Quizzes
2. Tests
3. Class participation
4. The student will demonstrate the ability to perform installation practices of ceramic tile in accordance with industry standards.

Course Content Outline:

1. Mortar systems, substrates, and grids
 - a. Terminology
 - i. Large format tile
 - ii. Porcelain
 - iii. Natural stone
 - iv. Levelling products
 - v. Mastic
 - vi. Epoxy
 - vii. Dry set
 - viii. Pot life
 - ix. Potable water
 - x. Slake time
 - xi. Polymer modified
 - xii. Admixture
 - xiii. Grid
 - xiv. Substrate
 - xv. hawk
 - xvi. Mortar system
 - xvii. Air entrained
 - xviii. Retarding admixture
 - xix. 3-4-5
 - b. Setting mortar systems
 - i. Types
 1. Mastic
 2. Epoxy mortar
 3. Cement mortar
 - a. Dry set
 - b. Polymer modified
1. Advantages/applications
 - a. Mastic
 - i. Interior application
 - ii. Wall/floor
 - iii. Ready to use
 - iv. Easy spread
 - v. Limited use
 - b. Epoxy mortar
 - i. 100% solid
 - ii. Moisture sensitive tile
 - iii. Stone/marble use
 - iv. Chemical resistant
 - v. Stain
 - vi. High temperature areas
 - c. Cement mortar substrate
 - i. Concrete substrate
 - ii. Interior drywall
 - iii. Concrete drywall
 - iv. Areas without freeze-thaw concerns
 - d. Cement: polymer modified
 - i. Increased bond strength
 - ii. Increased flexural strength

- iii. Increased tensile strength
 - iv. Water resistant
 - v. High freeze- thaw tolerance
 - vi. Greater flex substrate application
 - vii. Improved handling characteristics
2. Substrate and mortar system
- a. Substrate
 - i. Wood
 - 1. Spacing
 - 2. Plywood
 - 3. Oriented strand board OSB
 - ii. Concrete
 - 1. Deflection concerns
 - 2. Flatness
 - 3. Finishing
 - iii. Backer board
1. Mortar system
- a. Medium bed
 - i. Concrete
 - ii. Wood
 - b. Thinset: tile 18" x 18" or less
 - c. Epoxy
 - i. Mortar
 - ii. Grout
 - d. Mastic
 - i. Wall/floor
 - ii. Minimal water exposure
2. Admixtures: Bonding, hardness and air entrained
- a. Bonding
 - i. Concrete defects
 - 1. Scaling
 - 2. Micro cracking
 - ii. Excessive porosity
 - 1. Moisture
 - 2. Drying
 - b. Hardness
 - i. Accelerator admixtures
 - 1. Speeds curing
 - 2. Calcium chloride
 - ii. Retarders
 - 1. Increased rate of hardening
 - 2. Difficult setting materials
 - c. Air entrained
 - i. Uses less water
 - ii. Improves workability
 - iii. Less sand required
 - iv. Improved flatness
3. Substrate: deficiencies and corrective procedures
- a. Deficiencies
 - i. Curling
 - ii. Shrinkage cracks
 - iii. Excessive flatness deviations
 - iv. Structural cracks: $\geq 1/16"$
 - v. Excessive internal moisture
1. Surface imperfections
- a. Laitance
 - b. Scaling
 - c. Dusting
 - d. Crazeing
 - e. Aggregate segregation

- f. Contamination
- g. Improper surface troweling
- 2. Corrective procedures
 - a. Proper drainage
 - b. Damp curing
 - c. Additional steel reinforcement
 - d. Control joint placement
 - e. Slab protection
 - i. Wind
 - ii. High humidity
 - f. Controlled concrete finishing
 - g. Broom finish
 - h. Elimination of contaminants
 - i. Floor slab cleaning
- 3. 3-4-5 Layout
 - a. Predominate wall determination
 - b. Room measurements
 - c. Establish control lines
 - d. Mid-point selection
 - e. Perpendicular line build
 - f. Repeat
- 4. Control grids
 - a. Purpose
 - i. Maintain grout line/tile bond line alignment
 - ii. Versatile installations
 - iii. Allows for continuous border cutting
 - b. Establishment
 - i. Determine grid size
 - ii. Establish centerlines
 - iii. Verify grid squareness
 - iv. Grid layout
 - v. Diagonal crosscheck
- 1. Mortar: Specifications, Standards, Tools and Installation
 - a. Specifications
 - i. Tile Council of America TCA
 - 1. On grade concrete
 - a. Service rating
 - b. Heave use
 - c. Limited rating/fragile tile
 - d. Membrane options
 - 2. ANSI requirements
 - a. Ceramic tile
 - b. Glass tile
 - c. Cementitious
 - d. Crack isolation membrane
 - ii. Environmental exposure
 - b. Standards: mortar mixing
 - i. Slake time
 - 1. Manufacturers' recommendations
 - 2. Minimum set
 - 3. Maximum set
 - ii. Pot life
 - 1. Variables
 - 2. Minimum
 - 3. Maximum
 - iii. Mixing practices
 - 1. Low speed
 - 2. Paddle size by manufacturer
 - 3. Potable water

4. Water introduced first
 5. Lump free
 6. Trowel check
- c. Mortar trowels
- i. Pointing
 1. Tile tapping
 2. Tile alignment
 3. Difficult placement
 - ii. Flat
 1. Hawk application
 2. Mortar transfer
 3. Spreading mortar
 - iii. Buttering
 1. Pure cement application
 2. Larger tile
 - iv. Margin
 1. Hand mixing
 2. Small batches
 3. Cleaning/scraping containers
 4. Mortar application
- d. Floats
- i. Wood
 1. Flat trowel replacement
 2. Smoothing irregularities
 3. Floor and walls
 - a. Horizontal
 - b. Vertical
 - ii. Grout
 1. Grout/joint application
 2. Excess removal
 - iii. Epoxy
 1. Softer float surfaces
 2. Chemical resistant mortars
- e. Hard tile installation
- i. Tools and equipment
 1. Hand tools
 - a. Tape measure
 - b. Chalk line
 - c. Trowels
 - d. Floats
 2. Equipment
 - a. Drill motor
 - b. Shop vacuum
 - ii. Tile/mortar selection
 - iii. Layout: 3-4-5
 1. Establish perpendiculars
 2. Grid layout
 - iv. Mortar mixing
 1. Determine quantities
 - a. Water
 - b. Mortar
 2. Mixing consistencies
 3. Grid line mortar application
 - v. Tile setting
 1. Starting point establishment
 2. Perpendicular/control line
 3. Grout size maintenance
 - vi. Industry standards

1. Interior installation
 - a. Minimum coverage 80%
 - b. Border cuts: ½ tile size or greater
 2. Exterior/wet areas
 - a. 95% mortar coverage
 - b. Border tile ½ tile or greater
2. Drawings, backer boards and jobsite checklist
- a. Terminology
 - i. Construction drawing
 - ii. Title block
 - iii. Plan view
 - iv. Sections
 - v. Working sketch
 - vi. Details
 - vii. CVU
 - viii. Backer board
 - ix. Wet area
 - x. Grout
 - xi. Sundry supplies
 - xii. Jobsite checklist
 - xiii. Jobsite communication
 - xiv. Addendum
 - xv. Staging
 - xvi. Specifications
 - b. Prints: draw and reproduce
 - i. Drawing prints
 1. Hand drawn
 2. Computer aided design CAD
 - ii. Drawing reproduction
 1. Conventional copy
 2. I pad
 - iii. BIM building information model
 - c. Drawing types and documents
 - i. Drawings
 1. Architectural
 - a. Plans
 - b. Elevations
 - c. Sections
 - d. Details
 - e. Schedules
 2. Pictorial
 - a. Perspective
 - b. Isometric
 - c. Oblique
 - d. Orthographic
 - e. Exploded
 3. Structural
 4. Electrical
 5. Mechanical
 - ii. Documents
 1. Specifications
 2. Addendums
 3. Contracts
 4. Change orders
 - d. Title block
 - i. Job name
 - ii. Architect
 - iii. Date
 - iv. Page numbers

- v. Type of information
- vi. Scale
- vii. Revision dates
- e. Backer board
 - i. Types
 - 1. Glass
 - 2. Mat
 - 3. Water resistant
 - 4. Gypsum
 - 5. Fiber cement
 - 6. Cementuous foam
 - 7. Fiber reinforced gypsum
 - ii. Uses
 - 1. Height requirements
 - 2. Mortar adhesion
 - 3. Water proofing
 - 4. Structural
 - 5. Applications
 - a. Ceramic tile
 - b. Glass
 - c. Stone
- f. Substrate requirements
 - i. Deflection control: 1/360 if span
 - ii. Flatness
 - 1. 1/8" /6'0
 - 2. 3/16" /10'0
 - iii. Special requirement: 1/180 of span
 - 1. Marble
 - 2. Stone
 - 3. Wood floors: 1 ¼" thickness
 - 4. Clean, dry and contaminate free
- g. Jobsite check list
 - i. Project location
 - 1. Building floor
 - 2. Wing
 - 3. Room number
 - 4. Contact person
 - a. General contractor
 - b. Superintendent
 - c. End user
 - ii. Work schedule
 - 1. Times
 - a. Start
 - b. Finish
 - 2. Job meetings
 - 3. Safety meetings
 - 4. Progress reports
 - iii. Communication
 - 1. Superintendent
 - 2. Foreman
 - 3. Co-workers
 - 4. Working trades
 - iv. Rules and requirements
 - 1. Requirements
 - a. Safety data sheets
 - b. Power source
 - c. Water
 - d. Waste handling
 - e. Emergency

2. Rules
 - a. Safety training
 - b. Drug testing
 - c. Attendance
 - d. Participation
 - e. Conduct
 - f. Dress code
 - g. PPE
 - h. Storage procedures
 - i. Authorized access routes
3. Ceramic tile: backer boards, layout, and cutting
 - a. Terminology
 - i. Expansion zone
 - ii. Joist spacing
 - iii. Joint spacing
 - iv. T-bevel
 - v. Water level
 - vi. Trammel point
 - vii. Angle divider
 - viii. Wet saw
 - ix. Nippers
 - x. Straight edges
 - xi. Carborundum
 - xii. Coated glass fiber mesh tape
 - b. Backer board selection
 - i. Finish schedule
 - ii. Specification book
 1. Divisions
 - a. Moisture protection
 - b. Finishes
 2. Shop drawings
 - c. Backer board: installation and sequence
 - i. Installation
 1. Fasteners
 - a. Hot dipped galvanized roofing nails
 - b. Corrosion resistant screws
 2. Tools
 - a. Hand
 - b. Power
 3. Specialty
 - a. Scoring
 - b. 6 inch knife
 - c. Sheers
 - d. Pneumatic nailer
 - ii. Sequence
 1. Substrate preparation
 2. Fitting/cutting
 3. Staggered joints
 4. Mortar application
 5. Anchoring
 - d. Layout and leveling
 - i. Layout
 1. Ceramic tile
 2. Control line/perpendicular
 3. Grid
 4. Tools
 - a. Chalk line
 - b. Tape measure
 - c. Square

- d. Bevel
- e. Angle divider
- f. Compass scribe
- g. Trammel point
- ii. Leveling
 - 1. Substrate
 - 2. Surfaces
 - a. Vertical
 - b. Horizontal
 - 3. Tools
 - a. Spirit level
 - b. Water level
 - c. Laser
 - d. Straight edge
 - e. Plumb bob
- e. Cutting and drilling
 - i. Cutting
 - 1. Portable saw
 - 2. Wet saw
 - 3. Hand tools
 - a. Tile cutter
 - b. Chipping hammer
 - c. Hand saw
 - d. Grout saw
 - e. Hack saw
 - f. Rod saw
 - g. Nippers
 - h. Rubbing stone
 - ii. Drilling
 - 1. Power tool
 - a. Hand drill
 - b. Drill motor
 - c. Hand grinder
 - 2. Safety
 - a. PPE
 - b. Electrical
 - c. Housekeeping
 - d. Tool operation
- 4. Application
 - a. Tools
 - i. Hand tools
 - 1. Tape measure
 - 2. Mortar trowel
 - 3. Chalk line
 - 4. Margin trowel
 - 5. Trammel points
 - 6. Nippers
 - 7. Broom
 - 8. Marker
 - 9. 6 inch knife
 - 10. Hammer
 - 11. Stone
 - ii. Power tools
 - 1. Drill and paddle
 - 2. Wet saw
 - 3. Portable Hand grinder
 - iii. Equipment

1. Wet saw
 2. Laser
 3. Tile cutter
- b. Starting point
- i. Predominate wall determination
 1. Longest wall
 2. Most visible
 - ii. Establish control line
 1. Centerline of predominate wall
 2. Balance border cut tiles
 3. Measure/mark center
 4. Mark with chalk line
 - iii. Establish control line perpendicular
 1. Determine midpoint
 2. Layout perpendicular using 3-4-5 multiple
 3. Repeat opposite side of control line
 4. Extend line to adjacent walls using 3-4-5 multiples
 5. Check for accuracy
 6. Check border tile sizes
 7. Adjust "cuts" per specifications
- c. Border tile
- i. Sizes
 1. Based on control line
 2. Based on perpendicular
 - ii. Grouting
 1. Established per specification
 2. Field determined
 - iii. Dry fit
 1. Expansion allowance
 2. Determined by grout line
- d. Intricate cuts and penetrations
- i. Layout
 - ii. Cut
 - iii. Dry fit
 - iv. Transitions
 1. Measure and cut
 2. Set into mortar
- e. Mortar application
- i. Mixing
 1. Mix per ratio specification
 2. Select drill and paddle per manufacturer specifications
 3. Mix time
 4. Lump free
 5. Set for slake
 6. Remix
 - ii. Troweling
 1. Selection
 2. Key within gridline
 3. Directional combing
 - iii. Set tile within grid
 1. Align
 2. Straight/balance
 3. Flat/ledge free
 4. Establish work flow to exit point
- f. Grout application
- i. Consistency per ratio
 - ii. Float selection
 - iii. 45degree angle spread with respect to grout lines
 - iv. Thorough joint penetration

- v. Grout cleaning/sponge
 1. Initial surface removal
 2. Wet sponge post set time
 3. Final wet sponge cleaning

Resources

Tile Council of North America Committee. *TCNA Tile*. current. Tile Council of North America, Anderson, South Carolina, 2016.

National Tile Contractors Association. *NTCA Reference*. 2016/2017 Edition. NTCA Technical Committee, Jackson, Mississippi, 2017.

Carpenters International Training Fund. *United Brotherhood of Carpenters- GS0004M*, , *Carpenters International Training Fund*, , *Carpenters International Training Fund*,. CURENT. Carpenters International Training Fund, Las Vegas, Nevada, 2019.

Resources Other

<https://www.ardexamericas.com/products/tsis/adhesives-mortars/>

<https://www.tecspecialty.com/products/mortars-additives/>

Top of page

Key: 4850