NAVIGATING THE WORLD OF TILE

Presented by:

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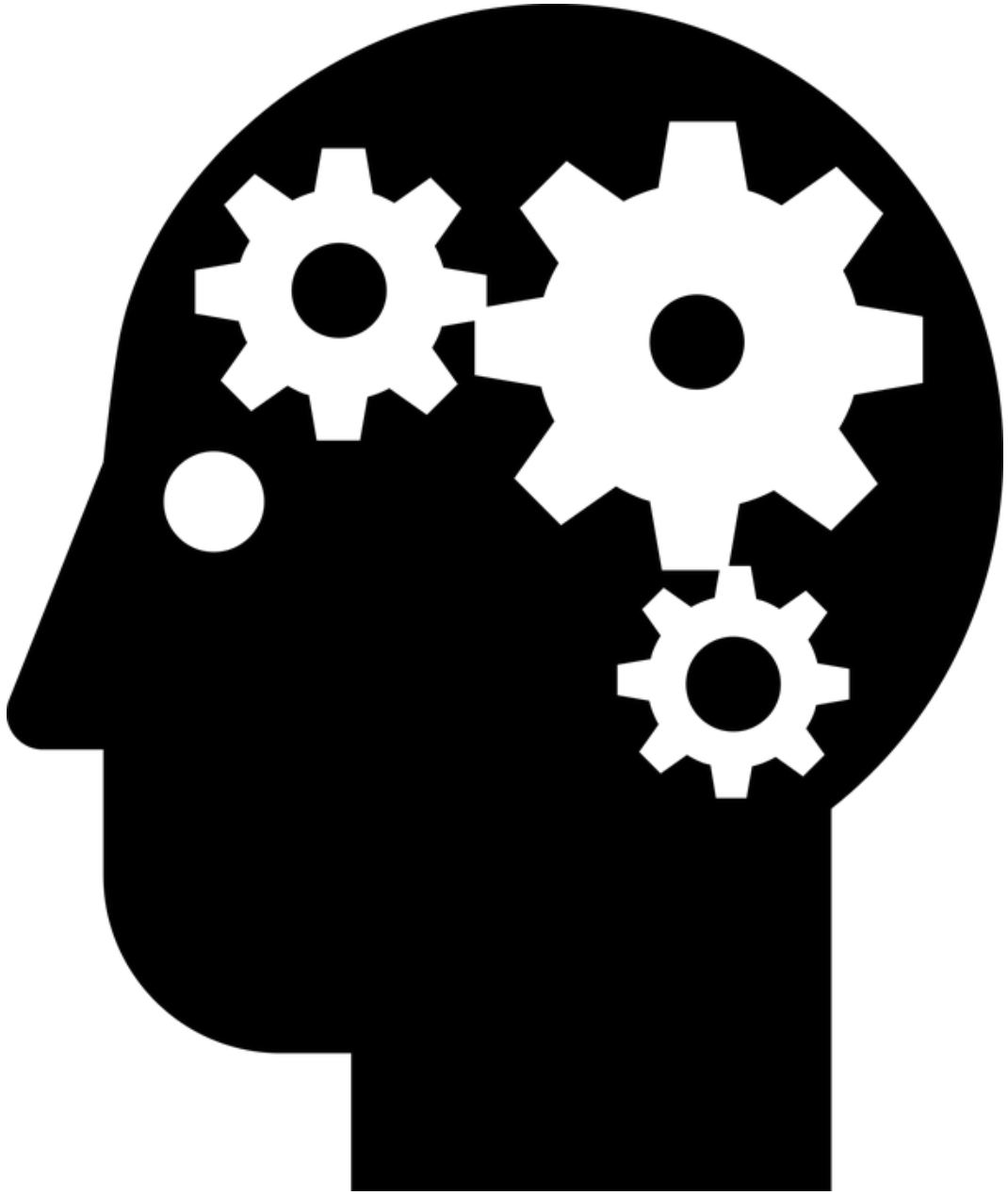
COURSE OBJECTIVES

Participants will learn:

1. History of Tile
2. Differences between the various types of tile
3. Tile Terminology
4. Manufacturing Processes
5. Installation Basics
6. Benefits of Making Tile Your Choice



1 TILE: A TIMELESS BEAUTY

Alexander Mosaic, from the House of Faun, in Pompeii. The house was built in the 2nd century BC. The mosaic survived the eruption of Vesuvius in 79 AD.

12th century mosaics adorn the Basillica San Clemente in Rome

18th Century Masterpiece

Casa de los Azulejos in Mexico City is adorned with talavera tile

Classic Looks

Original NY “subway” tile was used as early as 1907 by artists Heinz and LaFarge and is still in use today

WHAT IS CERAMIC TILE?

ANSI A137.1 defines TILE as

“a ceramic surfacing unit, usually relatively thin in relation to facial area, having either a glazed or unglazed face and fired above red heat in the course of manufacture to a temperature sufficiently high to produce specific physical properties and characteristics."

Porcelain is defined as a “type” of ceramic tile, and the only differentiation between the two as outlined in ANSI 137.1 states that porcelain is “a ceramic tile that has a water absorption of 0.5% or less that is generally made by the pressed or extruded method…”.

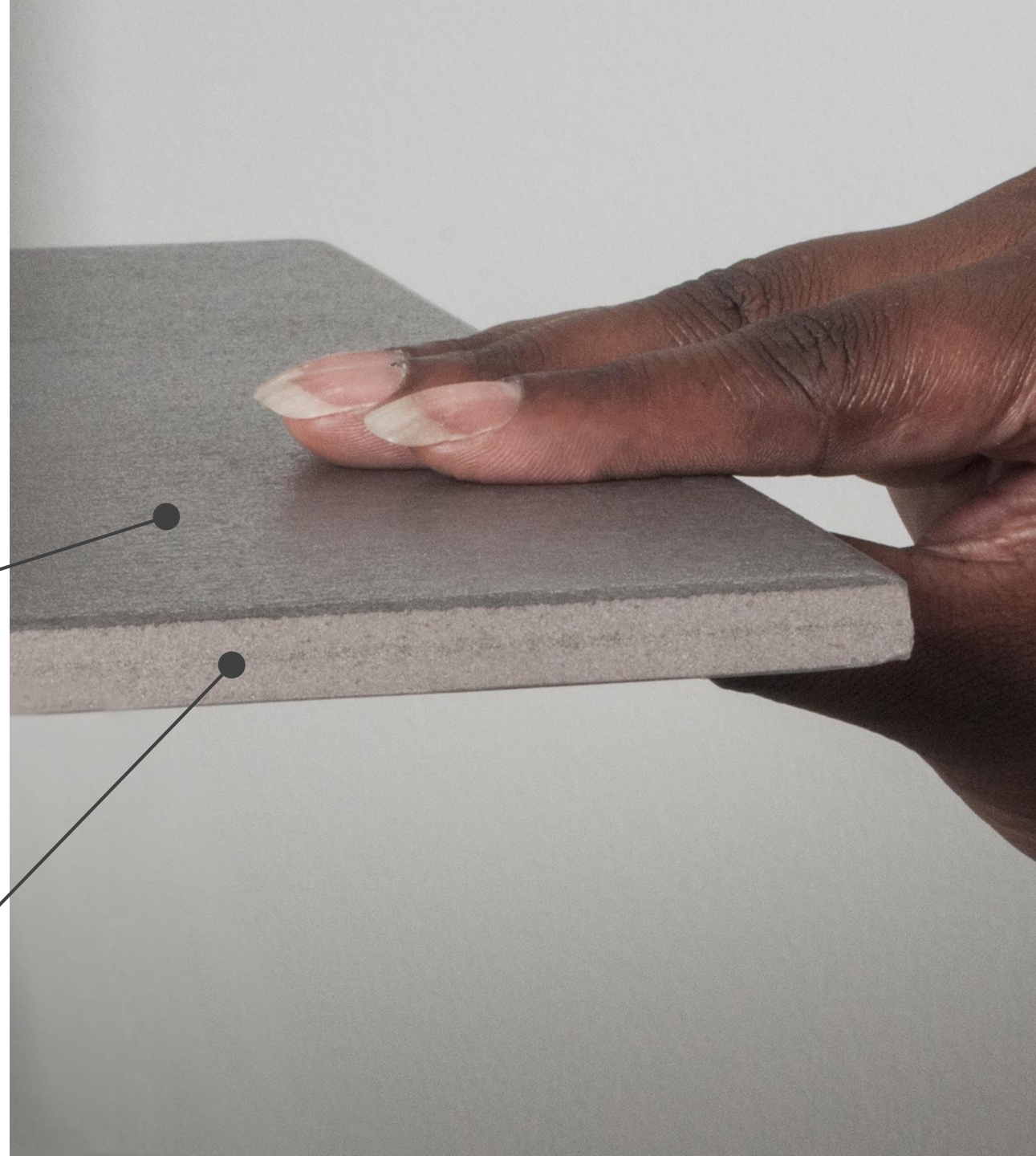
ANATOMY OF FLOOR TILE

The Surface Finish: The designs are developed for each product series and style. The surface's finish determines the recommended usage, based on the presence or absence of glazes or other surface textures.

Finishes include polished, unpolished, honed, textured, lappato, structured and glazed

The Body: composition is developed using raw materials mined from the earth. Quarry, porcelain and ceramic tiles are all made with organic clays.

Some porcelains are double loaded, meaning the surface color is a porcelain veneer over a white or grey porcelain. This is normally done to save pigment and money.



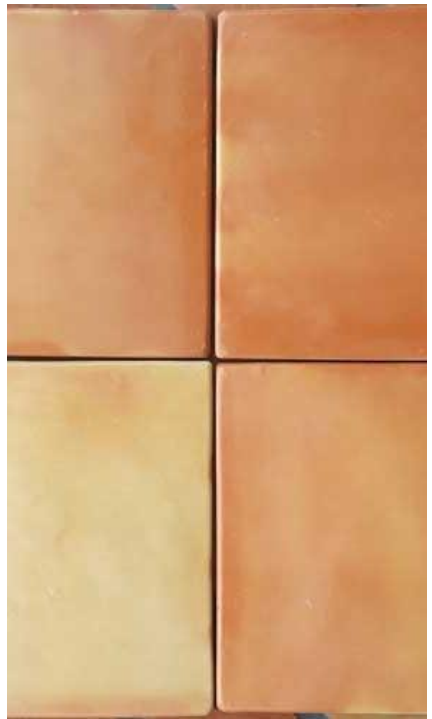
TYPES OF TILE

CERAMIC
Glazed Floor & Wall Tile

PORCELAIN
Glazed
Through-Body
Double-Loaded

QUARRY
Extruded and Fired

SALTILLO
Shaped and Sun Dried



GLASS

MOSAICS

Ceramic Floor Tile

- Can be installed on floors and walls
- Typically has a red body
- Clays are Pressed, glazed and fired
- Water absorption for ceramic tile Is greater than 0.5%
- Vitreous (High density) ceramic tiles fall between 0.5% and 3% absorption, making them suitable for outdoor applications
- Semi Vitreous ceramic tiles fall between 3% and 7% and are not frost resistant

Porcelain Tile

- Can be installed on interior and exterior floors and walls
- Pressed or extruded
- Calibrated or Rectified
- Glazed (possibly color body) or Unglazed (through body)
- Made with Dense Ceramic Clays
- Must have 0.5% or less water absorption to be called porcelain (impervious)
- Must be installed with modified mortar due to density.

Quarry Tile

- Extruded
- Natural clay and shale
- Typically Unglazed
- Water absorption typically ranges from <0.5% - 7%
- Frequently used in commercial kitchens and outdoor patios, due to its slip resistance, chemical resistance and low cost

Glazed Wall Tile

- Glaze is applied to a talc based bisque and fired.
- Talc based body typically suitable only for interior wall use due to high absorption rate and low breaking strength
- Water absorption typically ranges from 7% - 20% (non Vitreous)

Decorative Mosaic Tile

- Can be ceramic, porcelain, stone, metal, glass or any combination
- Installed on floors and walls
- Pressed or extruded
- Glazed or Unglazed
- Can be mesh mounted or face mounted
- Face mounting allows for maximum mortar coverage, and is used for submerged applications

TILE TERMINOLOGY & TESTING

Calibrated vs. Rectified Tile

Calibrated tiles are pressed, glazed and fired.

After cooling, the tiles are sorted by size and color consistency.

Tiles are assigned a caliber (size) and lot (color) which places the most similar tiles together for optimal installations.

Installers should pull tile from several boxes at a time, even if tile is from the same lot and caliber

Rectified tiles are also pressed, glazed and fired.

After firing, the edges are “rectified” (ground down) for maximum size consistency from tile to tile

Rectified tiles can NOT be installed “butt jointed”/without a grout joint.

Grout joint minimum for rectified tiles is 1/16”

Very flat substrates (1/8’ in 10’), special mortar, and skilled installers are needed to achieve minimal grout joint size.

Shade and Variation

V1 Low Variation

Uniform tone and texture within each box.

V2 Moderate Variation

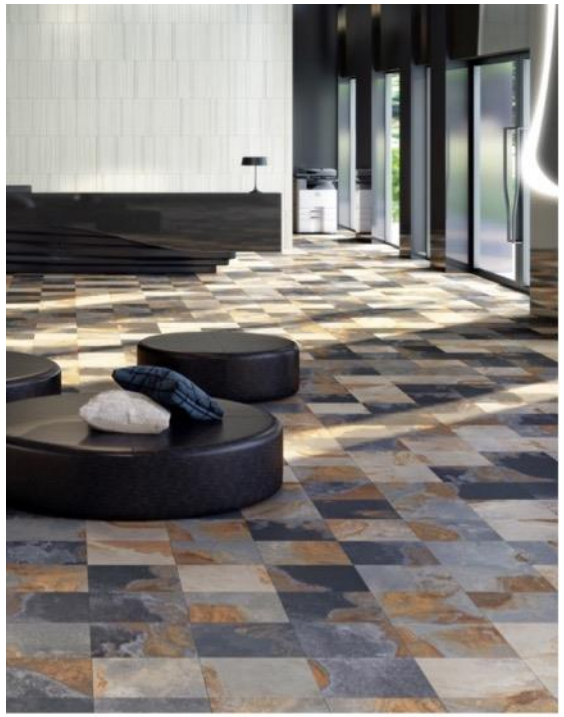
Low to moderate variation in tone and texture within each box.

V3 High Variation

High variation in tone and texture within each box.

V4 Substantial Variation

Very high variation in tone and texture from piece to piece within each.



PEI Wear Rating/Abrasion Resistance

As a means to report abrasion resistance, the rating system created by the Porcelain Enamel Institute (PEI) is sometimes used for floor tiles. This is a 5 step scale, ranging from 1 (least abrasion resistant) to 5 (suitable for heaviest traffic) “Abrasion Resistance” values can also be reported as an alternative to PEI ratings.

It’s important to remember that “PEI” and “Abrasion Resistance” are only measured on GLAZED tiles. An unglazed porcelain will not have a rating assigned, but is suitable for very heavy traffic, just like a glazed tile with a PEI of 4 or 5.

PEI ratings and Abrasion Resistance results have no impact on slip/fall probability, and are used as a guide to compare the suitability various glazes.

PEI I
Light Residential Traffic

All residential areas such as living rooms, bedrooms, bathrooms, and any area without direct access outside.

PEI II
Moderate Residential Traffic

All residential areas such as kitchens, hallways, and even those with direct access outside.

PEI III
Light Commercial Traffic

All commercial areas such as specialty boutiques and stores without direct access outside.

PEI IV
Moderate Commercial Traffic

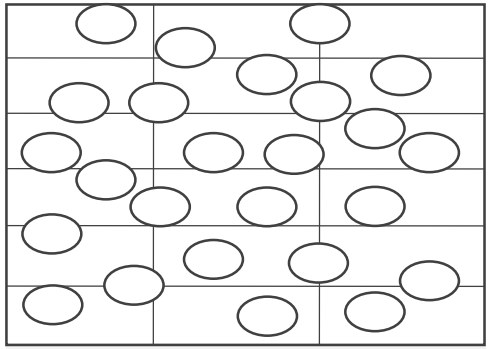
All commercial areas such as restaurants, stores, and even those with direct access outside.

PEI V
Heavey Commercial Traffic

All types of commercial traffic, such as restaurants, malls, public buildings.

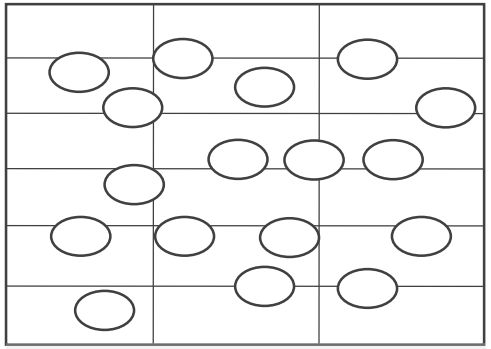
Tile Density / Water Absorption

Non-Vitreous Tiles



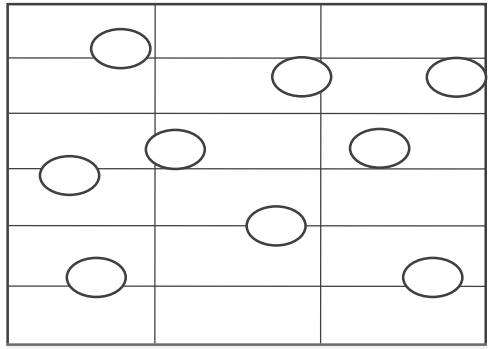
Non-vitreous tiles absorb 7% or more of its body weight in water. They are suited for indoor use only and considered to be non-frost resistant. Glazed wall tile is an example.

Semi-Vitreous Tiles



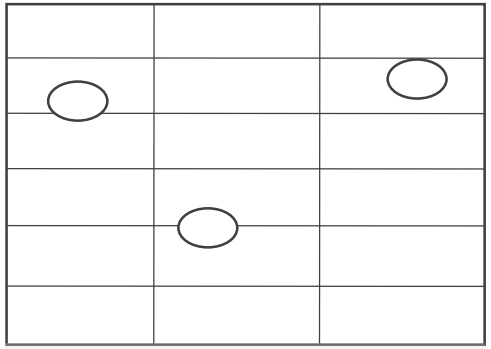
Semi-vitreous tiles absorb between 3% to 7% of its body weight in water. They are suited for indoor use only and considered to be non-frost resistant.

Vitreous Tiles



Vitreous tiles absorb between 0.5% to 3% of its body weight in water. They are suited for both interior and exterior applications Vitreous tiles are considered to be frost resistant.

Impervious Tiles



Impervious tiles are the densest. They absorb between 0 and 0.5% of their weight in water.

They are suited for both interior and exterior applications. Impervious tiles are frost resistant.

Product Comparison

VITREOUS CERAMIC vs. PORCELAIN		
PRODUCT CHARACTERISTICS	GLAZED CERAMIC TILE	GLAZED PORCELAIN TILES
% Water Absorption	0.5% - 3.0%	<0.5%
Breaking Strength	400+	>450
Freeze/Thaw Resistant	Yes	Yes
Exterior Use	Yes	Yes
Firing Temperature	2180 F	2180 F
Stain Test	Resistant	Resistant
Thermal Shock	Resistant	Resistant
Chemical Resistant	Yes	Yes
Crazing Resistant	Yes	Yes
ANSI A137.1*	Pass	Pass
DCOF >0.42	Yes	Yes
Commercial Application	Yes	Yes

*ANSI A137.1 refers to the Dynamic Coefficient of Friction test method.

Slip Resistance:
DCOF Acutest^{SM} Test Method

After 20+ years of specifying ASTM C1028 as the standard test method for COF in the U.S., the method and requirement for measuring DCOF Is now part of ANSI A137.1

The standard now includes the use of a testing device known as the BOT 3000 (or equivalent)

Tile meant to be walked on when wet must achieve a DCOF of .42 or greater.

If a tile with a DCOF of less than .42 is to be used on a walk surface, measures must be taken to dry the walk surface if it becomes wet. Examples of this type of use include hotel lobbies and shopping malls.

What about the ADA “requirement”?

Commonly we hear that the SCOF of commercial floors is *required* to be 0.60 per the 1991 Americans with Disabilities Act.

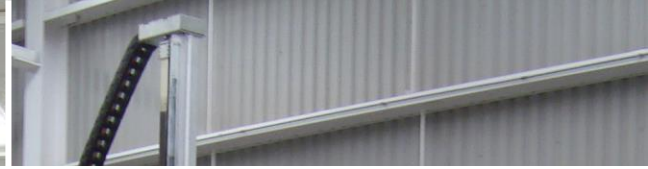
The ADA did not set a requirement, but rather referenced accessibility guidelines (Section A4.5) that recommended a value of 0.6 SCOF. However, the **ADA failed to specify a means of measurement.**

There were **over 10 devices in the marketplace**, all measuring COF differently and providing very different values. The result was that the recommended **0.6 SCOF value was *meaningless without a standardized test method***.

When the ADA accessibility guidelines and the guidelines for access to Federal facilities covered by the Architectural Barriers Act (ABA) **were updated in 2004, the 0.6 SCOF recommendation was withdrawn**.

UNDERSTANDING THE MANUFACTURING PROCESS



POWDER PREPARATION

PRESSING

GLAZE LINES & DECORATION

SORTING & PACKAGING



Manufacturing Ceramic & Glazed Porcelain

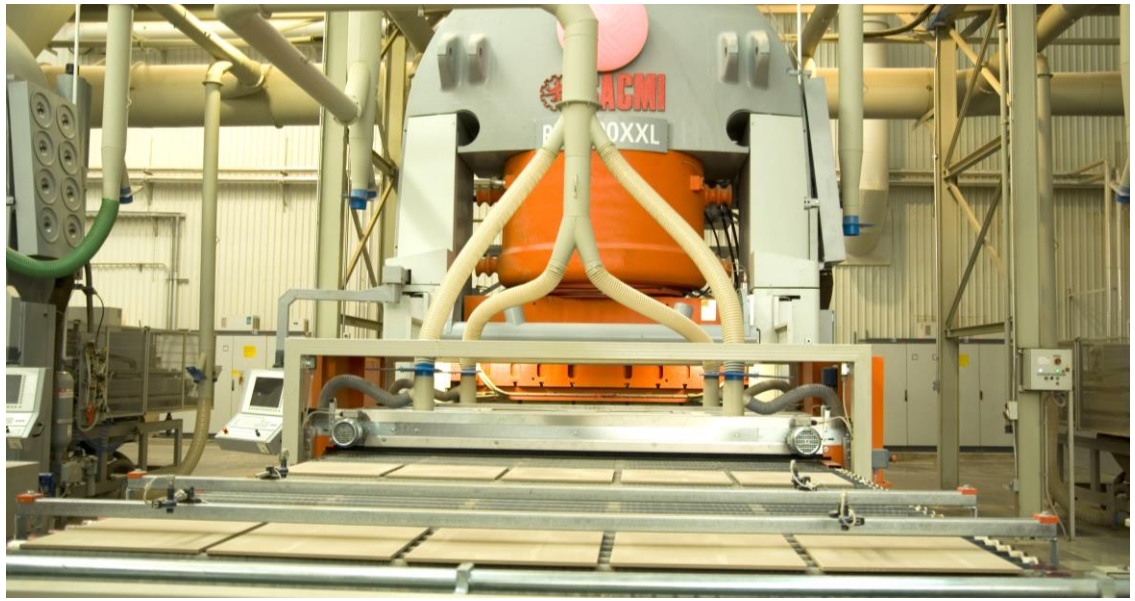
1 Clay Receiving

Clay is received and then positioned into different silos, dividing the soil into controlled increments.

2 Slurry & Powder

The mixture of clay and minerals is placed in a ball mill until they are ground into a semi-fine powder. Once the powder is properly mixed, water is added to form a mud-like liquid called Slurry.

Manufacturing Ceramic & Glazed Porcelain



3 Drying

The slurry is pumped into a large spray dryer the size of a four story building. Here the liquid is sprayed into a vortex of hot air where particles lose moisture in the form of vapor, resulting in a sphere shaped grain. This guarantees the adequate size and moisture level for every particle. The end result is a warm sand-like powder.

4 Pressing

The sand is pressed and formed into the shape of the tile. There are two main components that shape the tile: the mold and the punch. The mold determines dimensions and prevents sand from leaving a desired area while the punch actually compresses the sand into the mold and gives it the desired texture. Once the piece is pressed, it is transported to a drier that extracts all moisture.

Manufacturing Ceramic & Glazed Porcelain

5 Glazing

Different types of glazes such as primers, colors or decorations are applied at different stages in the process.

6 Decoration

Glaze can be applied by a high pressure spray, direct pour, screen print or state of the art digital printing technology.

Manufacturing Ceramic & Glazed Porcelain

7 Firing

The tiles are now fired at temperatures up to 2000F, going through a complex transformation. Every aspect of the firing process is carefully monitored, including time and temperature.

8 Sorting & Packing

Each piece is inspected by an automated system prior to packaging.. This method consists of lasers, cameras and infra-red sensors that monitor strict parameters in size, shape, width, color, shine and texture as well as any other manufacturing defect. Pieces that do not meet the standards are automatically recycled.

INSTALLATION BASICS

Installation tips for installing floor tile

Select the proper mortar. Modified for porcelains, LHT for anything over 15”

Use the right trowel. Larger tiles, larger trowel.

Minimum coverage recommended for dry areas = 80%.

Notch Series Guide

Measurement Format: Notch width x notch depth x space apart. All measurements in inches.
All notch profiles shown are 100% of actual size.
Always refer to manufacturer’s instructions for notch recommendations.

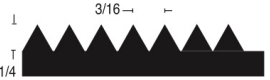
Premium Trowel – Small
Equivalent to 1/4" x 1/4" x 1/4" SQ
Thin-Set;
Tile 8" or smaller

Premium Trowel – Medium
Equivalent to 1/4" x 3/8" x 1/4" SQ
Thin-Set;
Tile 8" to 16"

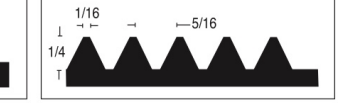
Premium Trowel – Large
Equivalent to 1/2" x 1/2" x 1/2" SQ
Thin-Set or Medium Bed Mortar;
Tile 15" or larger, Pavers and Natural Stone

44 Series
3/16" x 5/32" V
Adhesives;
Wall tile 6" or smaller

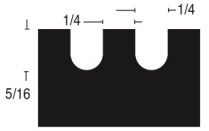
77 Series
3/16" x 1/4" V
Adhesives;
Wall tile 6" to 12"



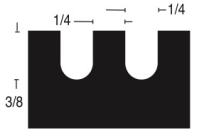
55 Series
5/16" x 1/4" x 1/16" V
Adhesives;
Wall tile 8" to 16"



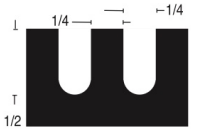
87 Series
NTCA RECOMMENDED
1/4" x 5/16" x 1/4" U
Thin-Set;
Tile 8" or smaller



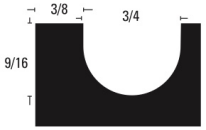
52 Series
NTCA RECOMMENDED
1/4" x 3/8" x 1/4" U
Thin-Set;
Tile 8" to 12"



53 Series
NTCA RECOMMENDED
1/4" x 1/2" x 1/4" U
Thin-Set;
Tile 12" or larger

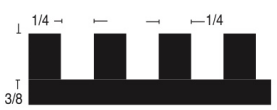


56 Series
NTCA RECOMMENDED
3/4" x 9/16" x 3/8" U
Medium Bed or Marble & Granite Mortars; Marble, Granite or Natural Stone

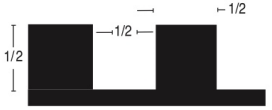


88 Series
1/4" x 1/4" x 1/4" SQ
Thin-Set;
Tile 8" or smaller

51 Series
1/4" x 3/8" x 1/4" SQ
Thin-Set;
Tile 8" to 16"



99 Series
1/2" x 1/2" x 1/2" SQ
Thin-Set or Medium Bed Mortar;
Tile 15" or larger, Pavers and Natural Stone



Installation tips for installing floor tile

Ensure the substrate is ready to accept tile.

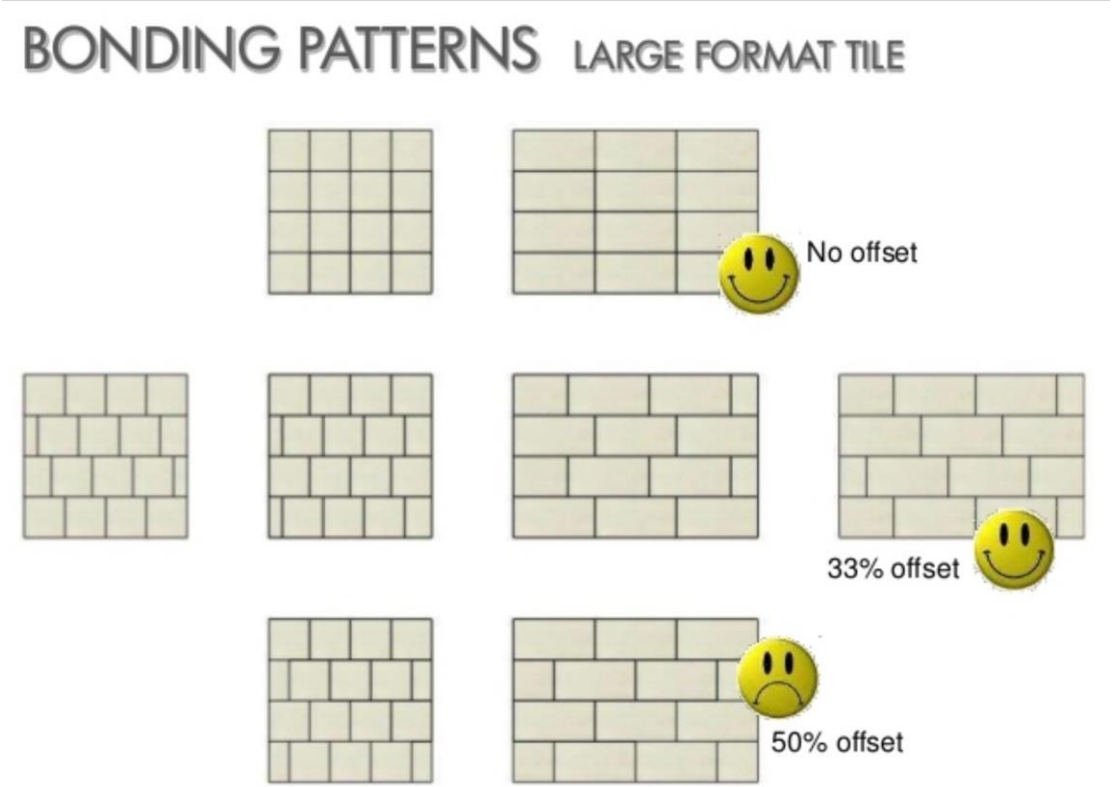
Prepare the floor as needed to achieve minimum flatness. (1/8” in 10’ for large format tile)

Use directional troweling.

Installation tips for installing floor tile

Ensure that patterns & grout joints comply with TCNA guidelines. No 50% offset on tiles > 18”

Use expansion joints: interior movement joints shall be placed no more than 25’ apart in each direction. Expansion joints on exterior, structural floors or interiors with direct sunlight shall be placed no more than 12’ apart in each direction



Installation tips for installing wall tile

Select the proper mortar. No mastic in wet areas!

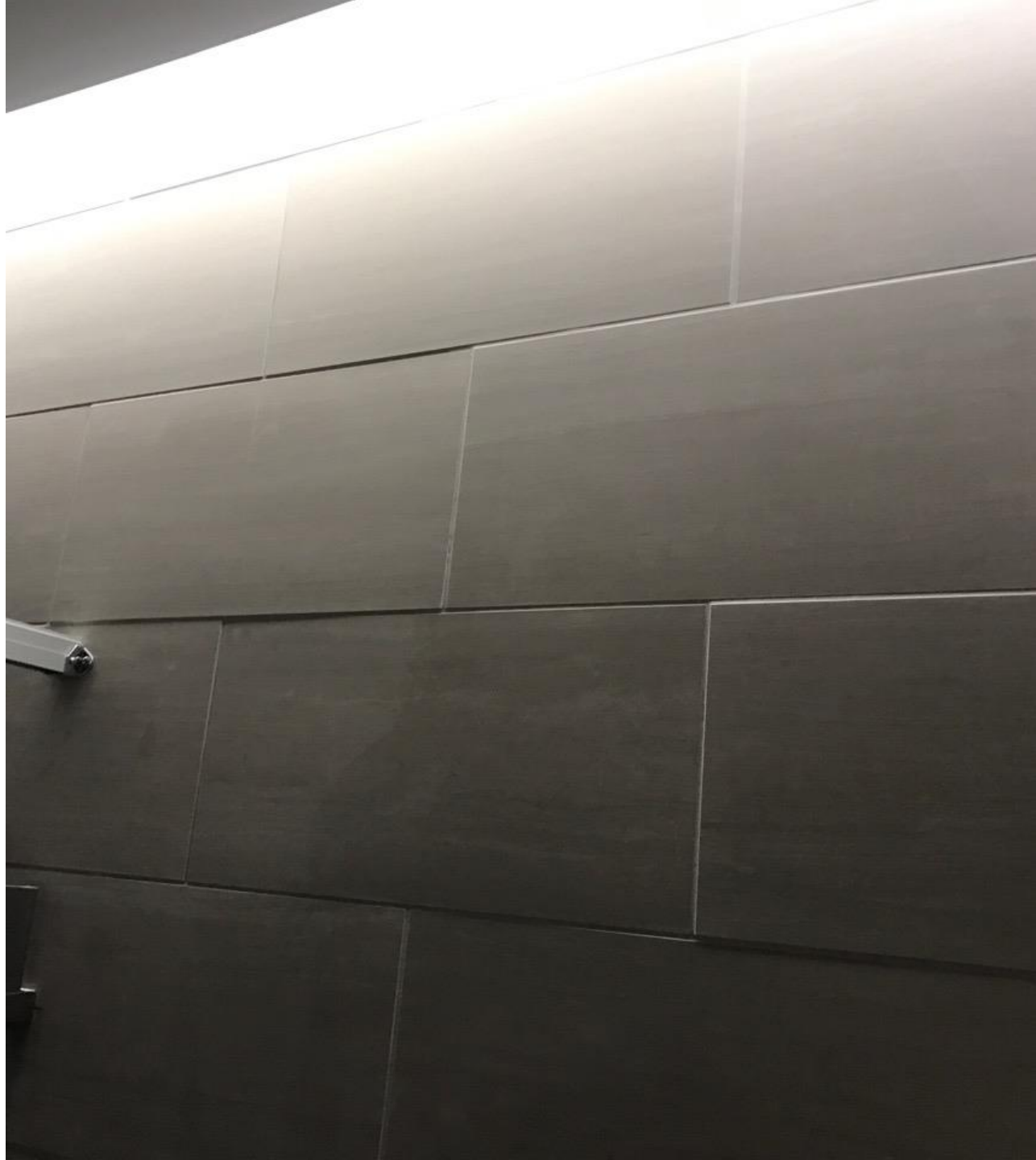
Minimum mortar coverage recommended for wet areas = 95%..

Ensure the substrate is ready to accept tile. Prepare the surface as needed to achieve minimum flatness recommendations

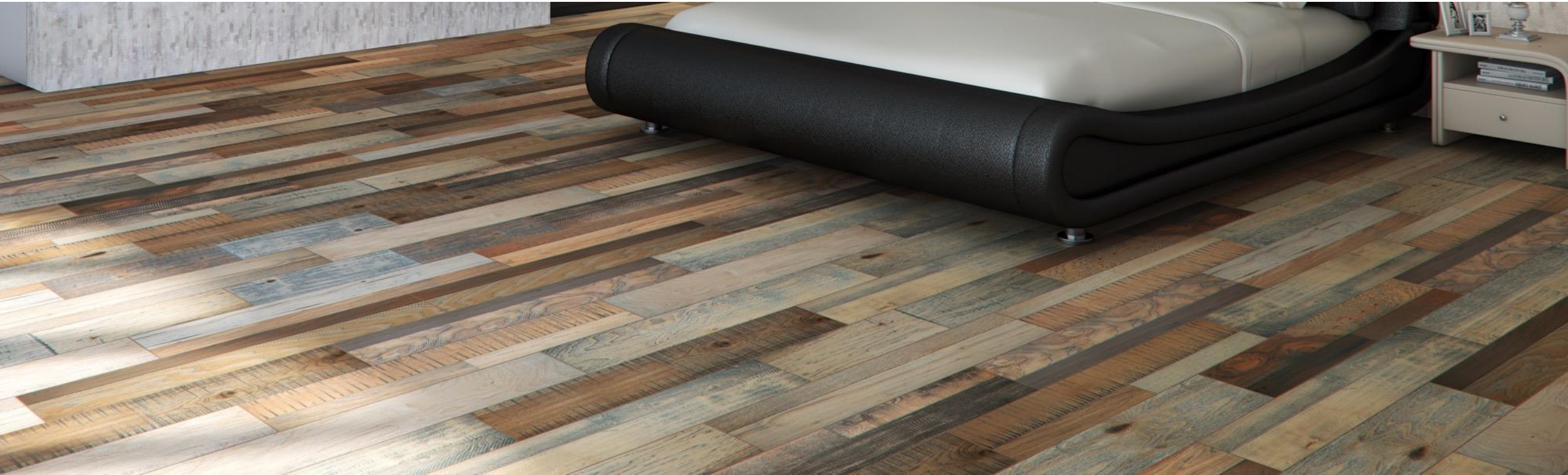
Ensure that patterns & grout joints comply with manufacturer recommendations. 50% offset may emphasize the crown, even in rectangular wall tiles <18”

Lighting affects the appearance. Ideally, overhead lighting should be placed at least 2’ from the wall to avoid wall washing.

Use a soft joint at the change of planes.



BENEFITS OF MAKING TILE YOUR CHOICE



Benefits of Using Tile

HEALTHY AIR

No VOCs

(Volatile Organic Compounds)

LIFETIME CHOICE

Longer Life is better for the environment

EXTENSIVE OPTIONS

An array of design options

EASY TO MAINTAIN

Just sweep and mop with a pH neutral cleaner

FIRE RESISTANT

Naturally heat and fire resistant

LOW LIFE CYCLE COST

Lowest life cycle cost of any other flooring type

Life cycle cost analysis for floor finishes

Life-Cycle Costs for Floor Finishes (per square foot)			
Floor Finish	Installed Cost	Life Cycle Cost	Expected Life (y)
Quarry Tile	$6.83	$16.13	50
Glazed Ceramic Floor Tile	$7.00	$16.30	50
Glazed Porcelain	$8.34	$17.64	50
Mosaic Tile	$8.20	$17.50	50
Unglazed Porcelain	$8.30	$17.60	50
Natural Hardwood	$9.31	$20.80	50
Turkish Travertine	$12.50	$21.80	50
Marble	$21.00	$30.30	50
Laminate	$8.84	$17.77	25
Man-Made Hardwood	$9.58	$18.51	25
Portland Cement Terrazzo	$14.88	$24.27	30
Stained Concrete	$12.40	$24.60	25
Carpet	$3.22	$6.50	6
Resin Terrazzo	$8.50	$16.53	15
Sheet Vinyl	$6.90	$13.90	10
Poured Epoxy	$8.18	$15.18	10
VCT	$3.91	$18.35	10

THANK YOU

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