

A JOURNEY WITH NIRO CERAMIC GROUP

NIRO CERAMIC GROUP



ZIRCONIO
— the Quintessential —



MUZZE DA
— ESSENCE OF TILES —



“ BRINGING JOY TO PEOPLE THROUGH THEIR LIVING SPACES

_NIRO CERAMIC GROUP **THE HISTORY**



- **Johan Nyrop** inventor of the spray drying machine formed **A/S NIRO ATOMIZER** in Denmark in 1933
- With the availability of the spray dryer, A/S Niro went on to build a new factory in **Cresciano, Switzerland** to manufacture porcelain tiles with spray dryer technology.
- With the rapid growth in the Asian markets, Niro Ceramic Malaysia was established in 1988.



THE EXPANSION FROM MALAYSIA TO ASIA & EUROPE

- From the first establishment in Switzerland, the rapid growth in the Asian markets has successfully led to the establishment of Niro Ceramic Malaysia in 1988.
- Niro Ceramic Group further expanded its operations to Indonesia, China, Vietnam, India and Philippines.

1988



Malaysia

1995



Indonesia

2001



China

2010



Vietnam

2011



India

2016



Philippines

_NIRO CERAMIC GROUP
BRANDS THAT WE HAVE TODAY

**TODAY UNDER NIRO CERAMIC GROUP,
WE CARRY THE BRANDS**

TILE



NIRO GRANITE®
THE SWISS - QUALITY TILE

ZIRCONIO
— the Quintessential —



**BATHROOM
SANITARYWARE**



MOSAIC



MUZZE DA
— ESSENCE OF TILES —

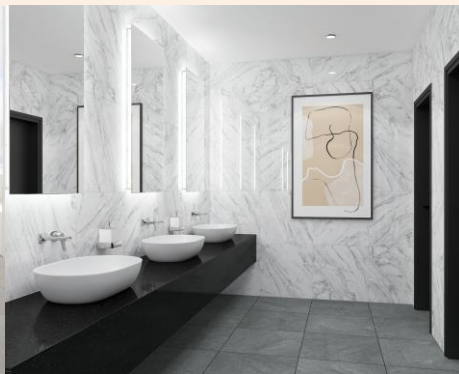
RETAIL



And are also the exclusive distributor for:



(Malaysia, Indonesia, Brunei)



Technical Presentation



EXPERT INSIGHTS ON CERAMIC AND PORCELAIN TILES: FROM RIGHT TILE SELECTION TO AVOIDING COMMON TILING FAILURES

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WHAT IS A CERAMIC/PORCELAIN TILE?

A ceramic/porcelain tile is a product that is manufactured from a mixture of **natural** inorganic materials, comprising mainly of:




- **CLAY**
- **FELDSPAR**
- **TALC**
- **LIMESTONE**
- **SILICA SAND**
- **COLOUR PIGMENTS**

SHADE VARIATION IS INHERENT IN ALL CERAMIC FIRED PRODUCTS

⇒ this is processed and pressed into shape and then fired to high temperatures (up to 1220° C) to produce a strong and durable product.



 **FIRING TEMPERATURE**
Ceramic tiles - 1120°C
Porcelain tiles - 1220°C

CERAMIC TILE STANDARD – MS ISO 13006



Tiles conform to the technical requirements specified in MS ISO 13006

HOW TO DISTINGUISH THE DIFFERENT TYPE OF TILES

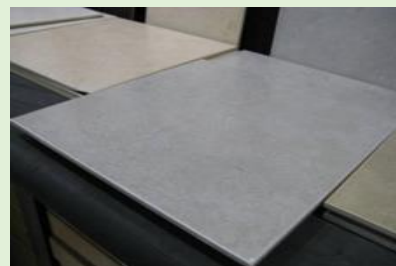
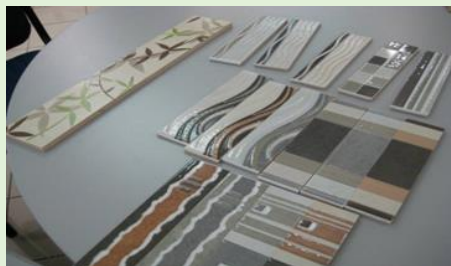


Ceramic tiles are classified into different types or groups according to its **WATER ABSORPTION**.



CLASSIFICATION / TYPES OF TILES

Group	WATER ABSORPTION (%)	MIN. BREAKING STRENGTH (N)	TILE TYPES
<i>Bla</i> <i>Annex G</i>	≤ 0.5	1300	PORCELAIN TILES <i>Examples:</i> <ul style="list-style-type: none"> • TECHNICAL PORCELAIN TILES • POLISHED GLAZE PORCELAIN (PGP) • POLISHED PORCELAIN TILES • GLAZED PORCELAIN TILES • HOMOGENEOUS /FULL BODY TILES
<i>Blb</i> <i>Annex H</i>	>0.5 to ≤ 3	1100	GRES FLOOR TILES
<i>Blla</i> <i>Annex J</i>	>3 to ≤ 6	1000	CERAMIC FLOOR TILES
<i>BlIb</i> <i>Annex K</i>	>6 to ≤ 10	800	
<i>BIII</i> <i>Annex L</i>	>10	600	CERAMIC WALL TILES



MS ISO13006 TECHNICAL SPECIFICATION - PORCELAIN TILES

DIMENSIONAL & SURFACE QUALITY

<i>DESCRIPTION</i>	<i>ISO TEST METHOD</i>	<i>MS ISO 13006</i>	<i>TYPICAL NIRO SPECS (60x60cm)</i>
Length & Width	ISO 10545-2	± 0.6% or (± 2.0mm)	± 1.0mm
Thickness (10mm)	ISO 10545-2	± 5.0% or (± 0.5mm)	± 0.5mm
Straightness Of Sides	ISO 10545-2	± 0.3% or (± 0.8mm)	± 0.6mm
Rectangularity	ISO 10545-2	± 0.3% or (± 1.5mm)	± 1.0mm
Curvature - Edge - Center - Warpage	ISO 10545-2	± 0.4% or (± 1.8mm)	max 1.8mm
Surface Quality	ISO 10545-2	Min. 95% defect free	Comply

PHYSICAL PROPERTIES

Water Absorption	ISO 10545-3	≤0.5%	≤0.5%
Breaking Strength	ISO 10545-4	Min. 1300N	Above 1300N
Abrasive Resistance (Glazed Tiles)	ISO 10545-7	Dependent on glaze type	Comply
Deep Abrasion (Unglazed Tiles)	ISO 10545-6	Max. 175mm ³	< 120 mm ³

CHEMICAL PROPERTIES

Resistance to household chemicals	ISO 10545-13	Min. Class B	Comply
Stain Resistance	ISO 10545-14	Min. Class 3	Comply

HOMOGENEOUS TILES

Homogeneous (or Full Body) tile is a **porcelain** tile where the tile have the same colour/material throughout the whole piece of tile.



GLAZED PORCELAIN TILES

Glazed porcelain tiles can either be on a colour body or non-colour body.



CHOOSING THE RIGHT TILE FOR THE RIGHT APPLICATION

When choosing ceramic tiles, other than the **aesthetic** aspects, it is important to consider tiles with the **correct properties**, eg., abrasive and slip resistance.



AREA OF APPLICATION	RECOMMENDED TILES
1) Heavy traffic areas, and external areas e.g. commercial and public places	➤ PORCELAIN TILES – DURABLE, DENSE, HIGH STRENGTH & SUPERIOR PROPERTIES
2) Wet areas, e.g., swimming pool decks, bathrooms	➤ PORCELAIN TILES WITH AN ANTI-SLIP SURFACE.
3) Outdoor areas	➤ PORCELAIN TILES WITH 20mm THICKNESS ➤ PORCELAIN TILES WITH AN ANTI-SLIP SURFACE.

INDICATION OF SHADE VARIATION (Stones and Marble designs)

V RATING



V1 – UNIFORM SHADE

Minimal differences in tonality and/or texture.



V2 – SLIGHT VARIATION

Slight distinguishable differences in texture and/or pattern.



V3 – MODERATE VARIATION

Significant texture, pattern and/or colour variation



V4 – RANDOM VARIATION

Unique and random colour variation

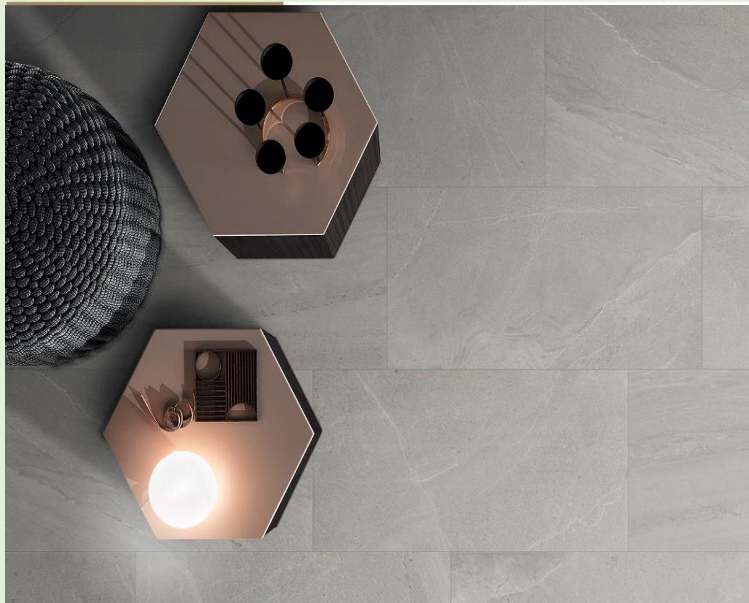
EXAMPLES OF V2 and V3 DESIGNS



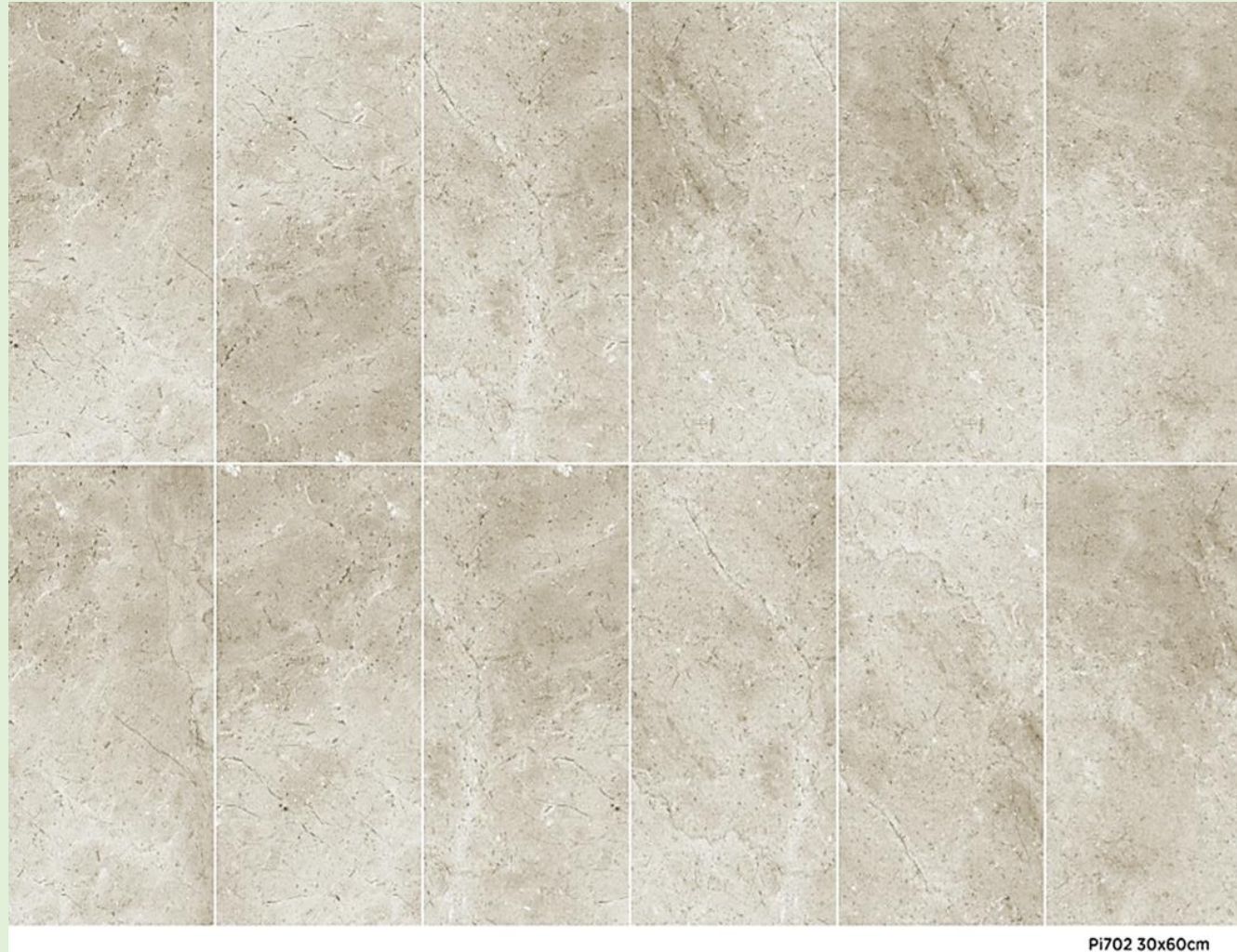
V2 DESIGN



V3 DESIGN



EXAMPLE OF V3 DESIGN



Actual Design for 30x60 PI702 Series comprising of 12 random faces.

INDICATION OF ABRASIVE RESISTANCE OF GLAZE TILE

PEI RATING

The degree to which a **GLAZE** surface will withstand the wear of foot traffic, measured by PEI rating.



*SURFACE
TEXTURE*

**GLOSS
FINISH**



**ROUGH
FINISH**

PEI CLASS	SUITABLE FOR
0	Not recommended for use on floor
1	Internal, Residential homes
2	General Residential areas
3	Residential & Light Commercial areas
4	Regular Traffic Commercial areas
5	Severe Pedestrian Traffic areas

Note: PEI stands for Porcelain Enamel Institute which initiated this test method

INDICATION OF SLIP RESISTANCE

METHOD 1: RAMP RATING

- The ramp slip R rating is determined by the angle of inclination where the subject slips on the tiles.
- Tiles with a rougher surface will provide a better slip resistance which corresponds to a higher R rating.



Ramp Test equipment

**SURFACE
TEXTURE**

ROUGH

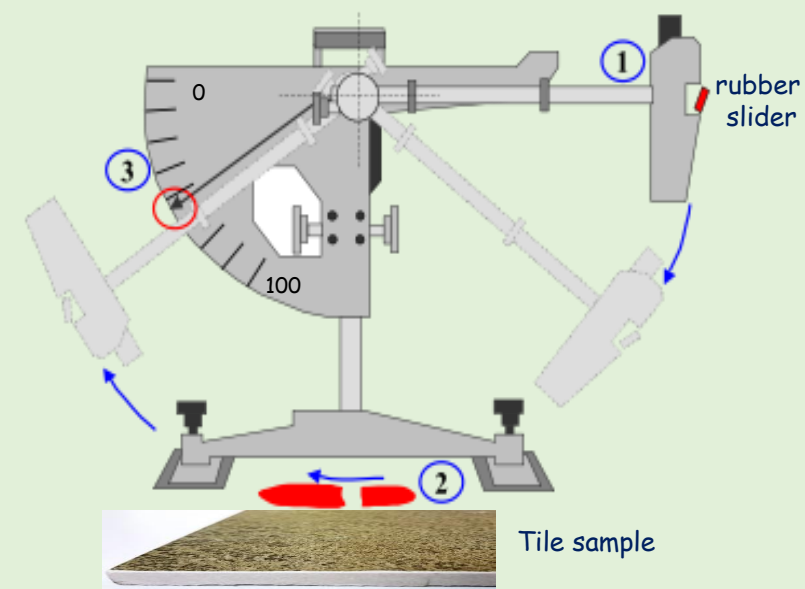


VERY ROUGH

Slip Rating	Suitable for
R9 <i>Minimal Friction</i>	DRY INDOOR AREAS e.g. entrances to buildings, shops in shopping malls, dry corridors
R10 <i>Normal Friction</i>	OCCASSIONAL WET AREAS e.g. corridors, food courts, bathrooms, toilets, dry stairways
R11 <i>Moderate Friction</i>	WET AREAS , e.g., Wet kitchens, pool decks, wet stairways
R12 <i>High Friction</i>	HIGHLY WET & GREASY AREAS , e.g., commercial kitchens, vehicle workshops, ramps and stairs leading to pools
R13 <i>V High Friction</i>	SIGNIFICANT OILY AND GREASY AREAS. e.g., oil factories

METHOD 2: PENDULUM RATING

- Pendulum slip P rating is determined by a rubber slider slipping along a wet tile surface.
- Tiles with gloss or smooth surface, P0 to P2 would only be suited for dry areas.
- For wet areas, a minimum P3 is recommended.



SURFACE TEXTURE

GLOSS
FINISH



ROUGH
FINISH

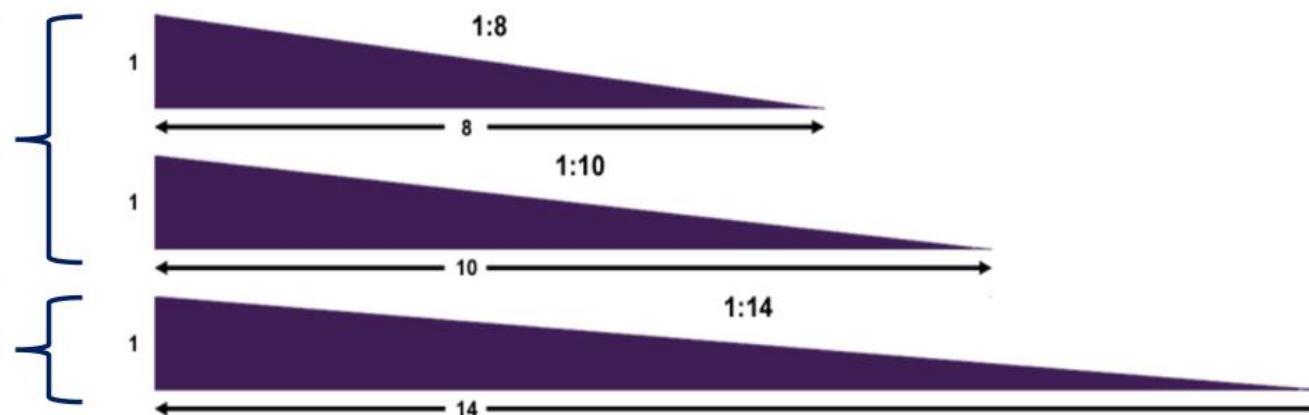
PTV	RISK OF SLIP	CLASSIFICATION	SUITABLE AREAS OF APPLICATION	TILE FINISHES
<12	Extremely High	P0	SUITED FOR WALLS ONLY	GLOSSY CERAMIC TILES
12 – 24	Very High	P1	DRY INDOOR AREAS e.g. entrances to buildings, shops in shopping malls, dry corridors	FULL POLISH
25 - 34	High	P2		SOFT POLISH
35- 44	Moderate	P3	OCCASSIONAL WET AREAS e.g. corridors, food courts, bathrooms, toilets, dry stairways	HONED / LAPPATO
45 - 54	Low	P4	WET AREAS e.g., Wet kitchens, pool decks, wet stairways	SATIN / SILKY
> 54	Very Low	P5	HIGHLY WET & GREASY AREAS e.g., commercial kitchens, vehicle workshops, ramps and stairs leading to pools	MATT
				ROUGH
				ROUGH
				SLIP STOP (IN WET CONDITION)

The minimum slip resistance rating for different areas of application is based on the Australia Standard Handbook, HB 197.

SLIP RESISTANCE – MINIMUM SLIP RESISTANCE RATING FOR RAMPS



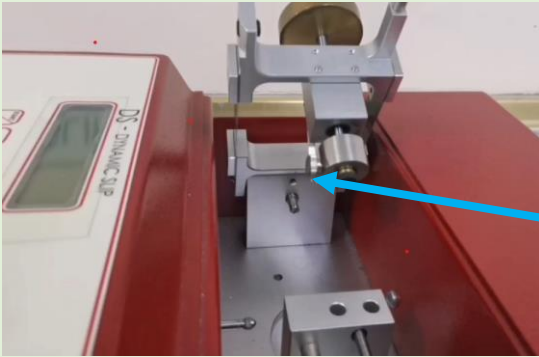
DRY	WET
R11 or P4	R12 or P5
R10 or P3	R11 or P4



METHOD 3: COF SLIP RATING



- The coefficient of friction (COF) rating is determined by the recorded friction of the rubber slider when it moves along the tile surface.
- A tile with a rough surface will provide a higher COF.



Rubber
slider

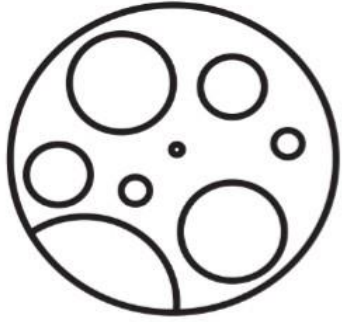


COF VALUE	CLASSIFICATION
< 0.19	Excessive Slipperiness
0.20 to 0.39	High Slipperiness
0.40 to 0.74	Satisfactory Friction
> 0.75	Excellent Friction

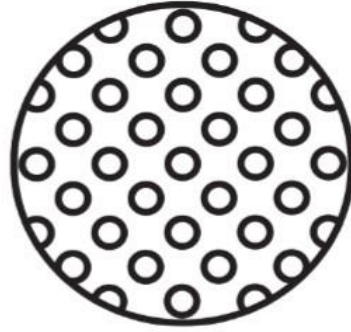
Minimum COF requirement for tiles to be installed on floor is **0.4**

SLIP STOP SERIES

THE TECHNOLOGY OF SLIP STOP SURFACE

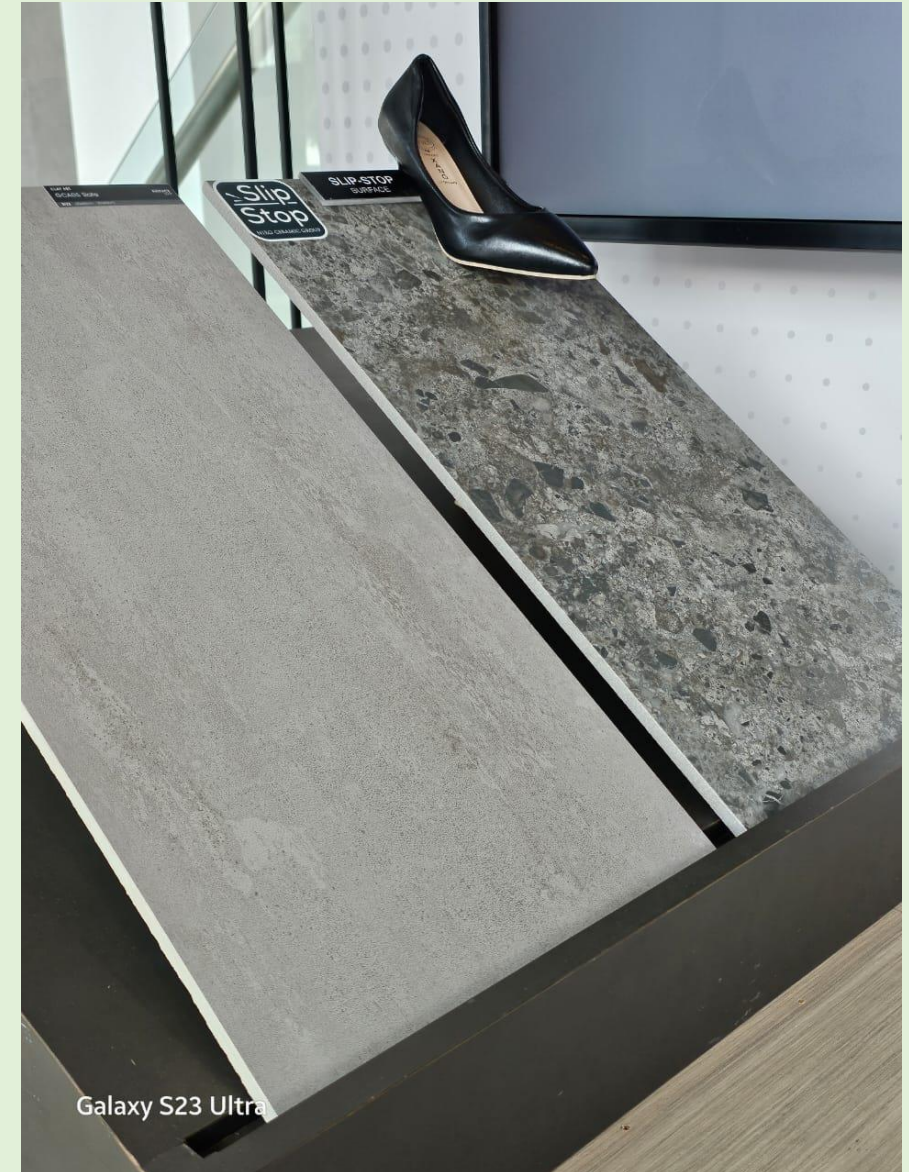


Conventional abrasive material
to create rough surface



Micro texture abrasive material
to create a smooth texture

- The micro texture promote the hydrophilic properties by spreading the water evenly over the tile surface thus providing traction.
- **When dry, soft smooth**
- **When wet, able to achieve slip rating of P5**



RECTIFIED TILES Vs NON RECTIFIED

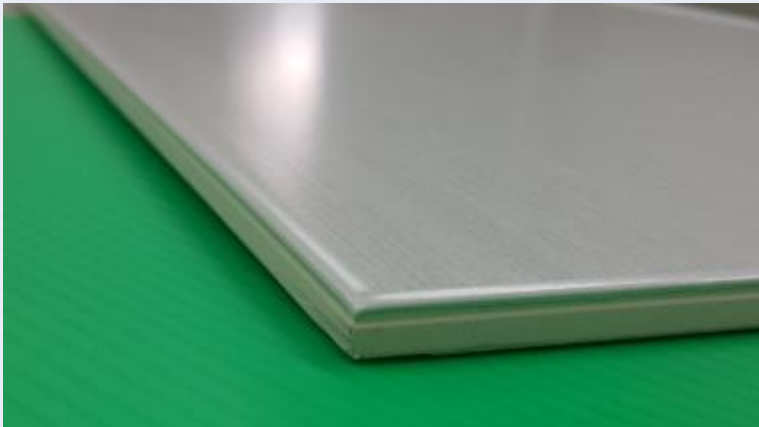
Tiles where the 4 edges are trimmed to obtain a more uniform size tolerance.

NON-RECTIFIED

- Size tolerance : ~ +/- **2.0mm**



- Non-rectified tile have more smoother and rounded edges.

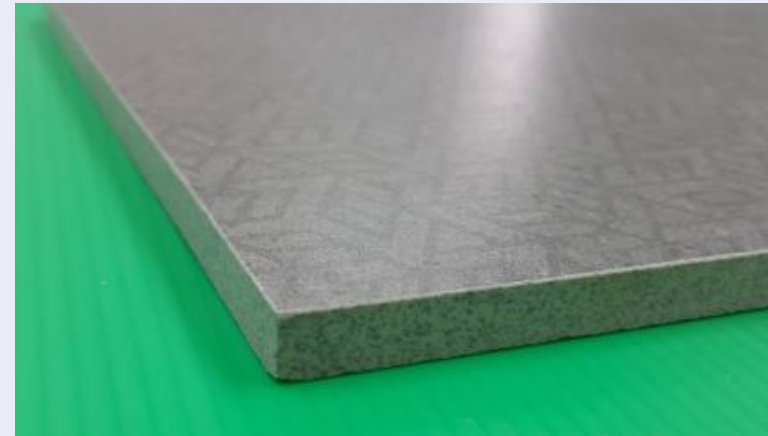


RECTIFIED

- Size tolerance : ~ +/- **1.0mm**



- Chamfered tile edges are sharper



COMMON TILING FAILURES WHICH CAN BE AVOIDED

Hollowness & De-bonding



Lippage



Efflorescence



Chemical Damage

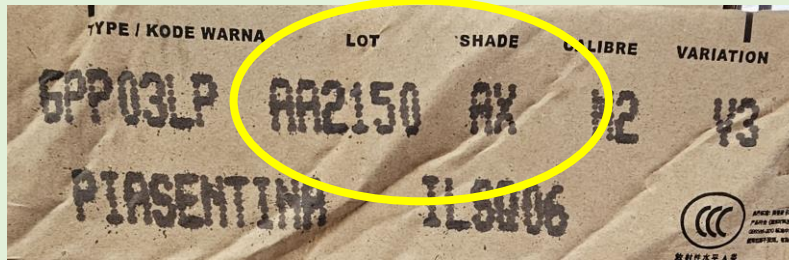


SHADE VARIATION



CAUSES FOR SHADE VARIATION

1. Mixing of different shade and lot no. during installation

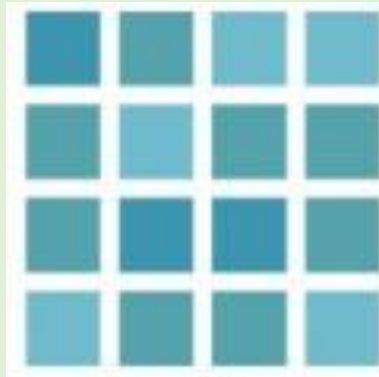


Shade and lot no. indicated
on the box

2. Customer not aware or do not accept the shade characteristics of products with V2 or V3



V2



V3

TILE HOLLOWNESS

Hollowness or drummy when tiles are tapped is an indication of poor bonding or voids under the tiles



Causes of tile hollowness

- Insufficient application of adhesive resulting in poor contact
- Air pockets beneath tiles causing the tile to sound differently from another.
- Hollowness may eventually lead to de-bonding.

TILE DE-BONDING



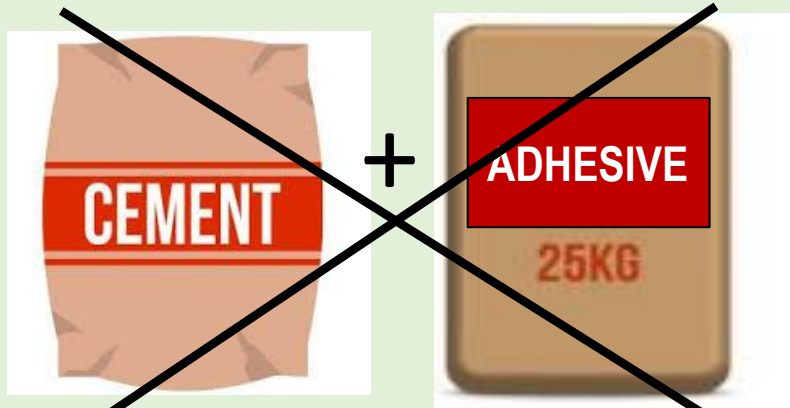
Severe hollowness



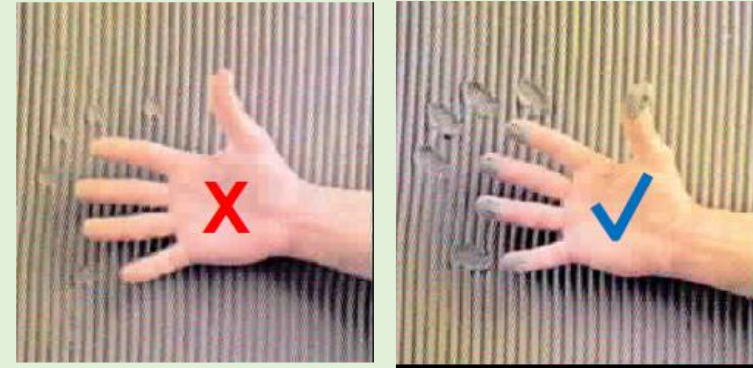
Delamination of Tiles



7 POSSIBLE CAUSES OF HOLLOWNESS / DE-BONDING



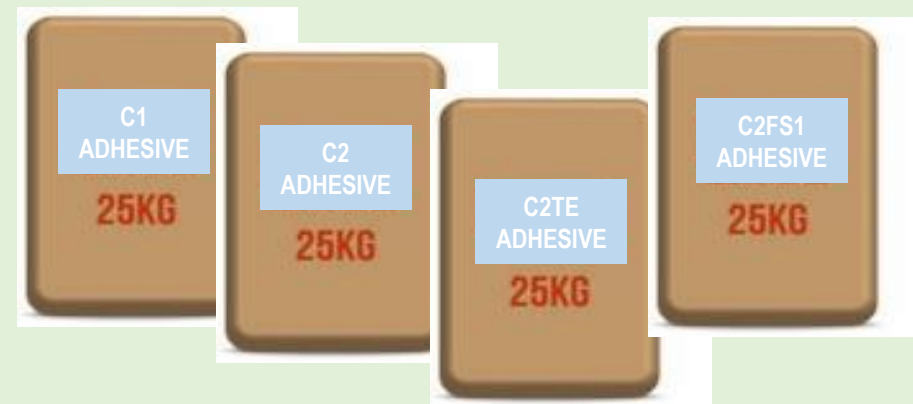
1 FIXING PORCELAIN TILES USING WRONG BONDING AGENT



3 INSTALLING TILES AFTER THE OPEN TIME OF ADHESIVE



2 FIXING TILES ON A DIRTY SURFACE



4 USE OF INCORRECT ADHESIVE

CLASSIFICATION OF ADHESIVES

HOW TO SELECT THE RIGHT TILE ADHESIVE

There are different types of adhesives for different conditions. When purchasing tile adhesive, it's important to take note of the adhesive classifications on the packaging and understand what they mean.



Learn more about various adhesive classifications here!

C2TE is a combination of classifications C2+T+E, which means this is an improved adhesive, with no vertical slip and has an extended open time.

CLASSIFICATION & PERFORMANCE CRITERIA EN 12004 / 12002 AND MS 13007-1

Classification	Characteristics	Requirement
C1 - Normal	Tensile Adhesion Strength @ 28 Days Tensile Adhesion Strength after water immersion, heat aging and freeze-thaw cycles Open Time @ 20 minutes	$\geq 0.5 \text{ N/mm}^2$ $\geq 0.5 \text{ N/mm}^2$ $\geq 0.5 \text{ N/mm}^2$
C2 - Improved	High Tensile Adhesion Strength Tensile @ 28 Days Adhesion strength after water immersion, heat aging and freeze-thaw cycles	$\geq 1.0 \text{ N/mm}^2$ $\geq 1.0 \text{ N/mm}^2$ $\geq 0.5 \text{ N/mm}^2$
F - Fast setting	Early Tensile Adhesion Strength after 6 hours	$\geq 0.5 \text{ N/mm}^2$
T - Slip	Resistant to vertical slip	$\leq 0.5 \text{ mm}$
S1 - Deformable	Transverse Deformation (special deformable characteristic for cementitious adhesives only)	$\geq 2.5 \text{ mm}$ to $\leq 5 \text{ mm}$
S2 - Highly Deformable		$\geq 5 \text{ mm}$
E - Extended Open Time	Extended open time @ 30 minutes : Tensile Adhesion Strength	$\geq 0.5 \text{ N/mm}^2$ After not less than 30 minutes

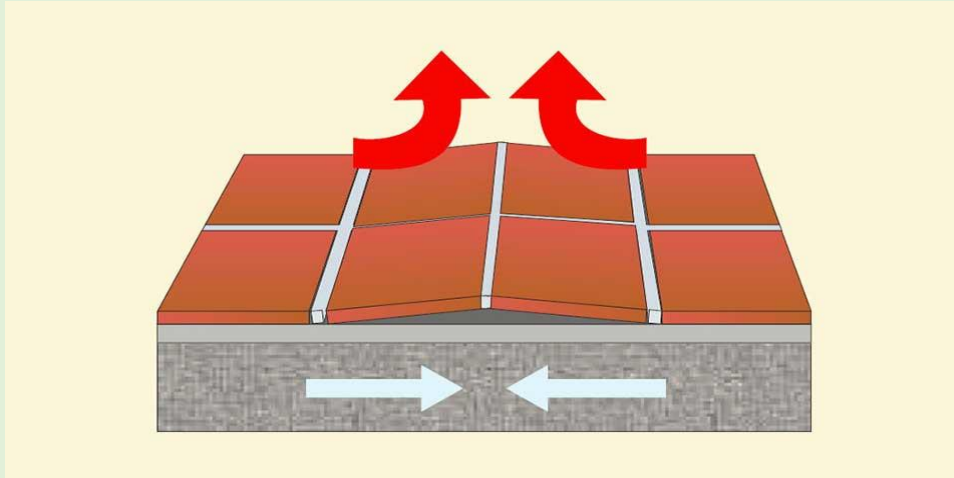
Normal bond strength

Double bond strength

No vertical slip

For flexible substrate

7 POSSIBLE CAUSES OF HOLLOWNESS / DE-BONDING



5 FIXING TILES TOO EARLY AFTER SCREEDING.

MS 1294 recommends the screed layer to be allowed to cure for at least 14 days to complete hydraulic shrinkage.



6 POOR TILE – ADHESIVE CONTACT



7 FIXING TILES WITH BUTT JOINTS

RECOMMENDED INSTALLATION GAP

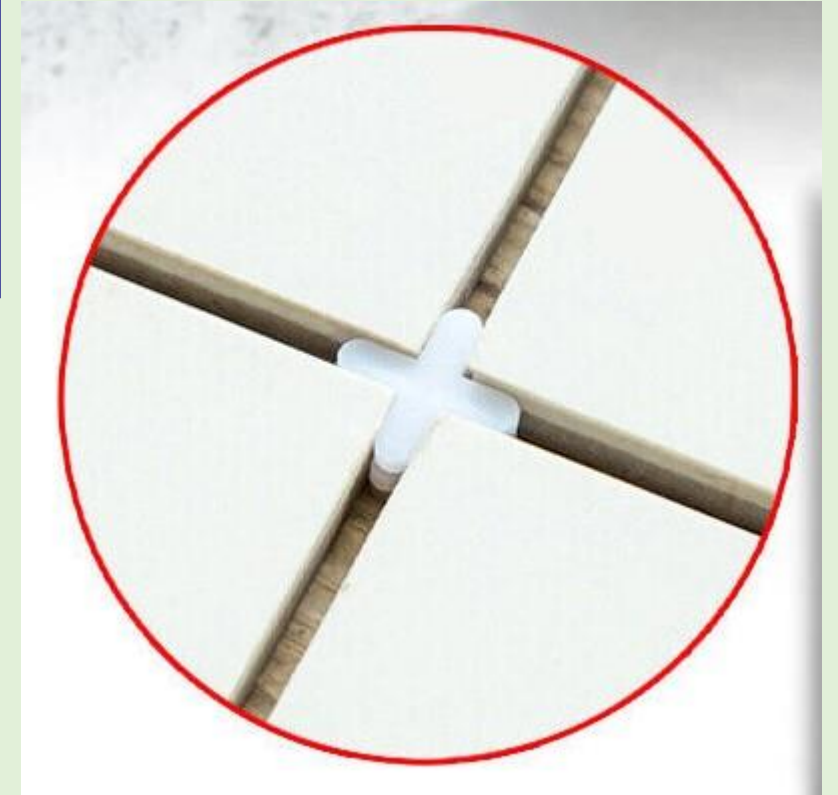
(MS 1294 - Code Of Practice For Ceramic Wall & Floor Tiling)



Minimum 3.0 mm

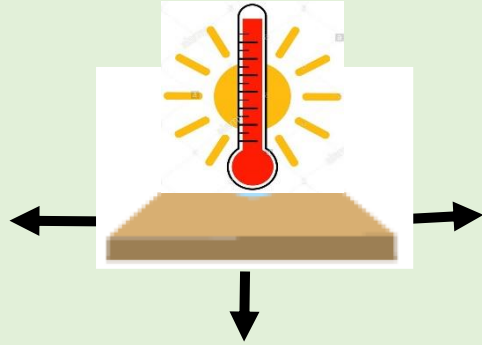
Joints are required to accommodate for

- (i) dimensional tolerance of tiles, and**
- (ii) substrate contraction/expansion and differential movements.**



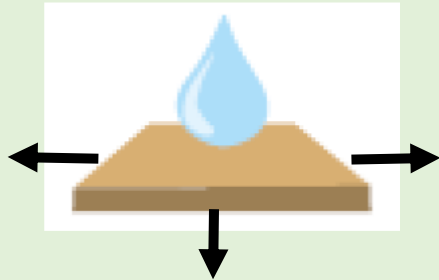
IS TILING FAILURE CAUSED BY EXCESSIVE EXPANSION OF TILES?

1. THERMAL EXPANSION – the expansion of a material when subjected to heat



Material	COEFF. LINEAR THERMAL EXPANSION ($\times 10^{-6} \text{ }^{\circ}\text{C}^{-1}$)
CERAMIC & PORCELAIN TILES	7 to 8
CONCRETE & CEMENT MORTAR	10 to 14

2. MOISTURE EXPANSION – the expansion of a material arising from the adsorption of water.



Material	MOISTURE EXPANSION (mm/m)
CERAMIC TILES	0.2
PORCELAIN TILES	0.0
CEMENT MORTAR	0.55



CONCRETE & CEMENT MORTAR CAN EXPAND 2 TO 3 TIMES HIGHER THAN THE TILES THEREFORE, FAILURE IS NOT CONTRIBUTED BY THE EXPANSION OF THE TILES.

COMMON DE-BONDING FOUND IN CAR PORCH



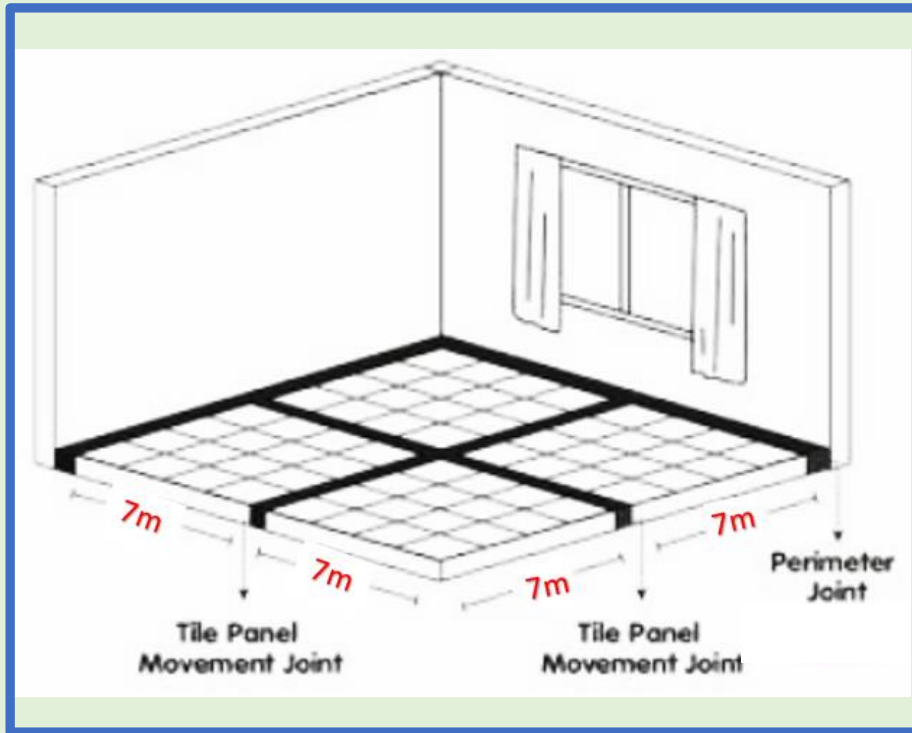
Tiles exposed to
direct sunlight



**FOR EXTERNAL AREAS ESPECIALLY UNDER DIRECT SUNLIGHT,
JOINT WIDTH SHOULD BE MINIMUM 5MM**

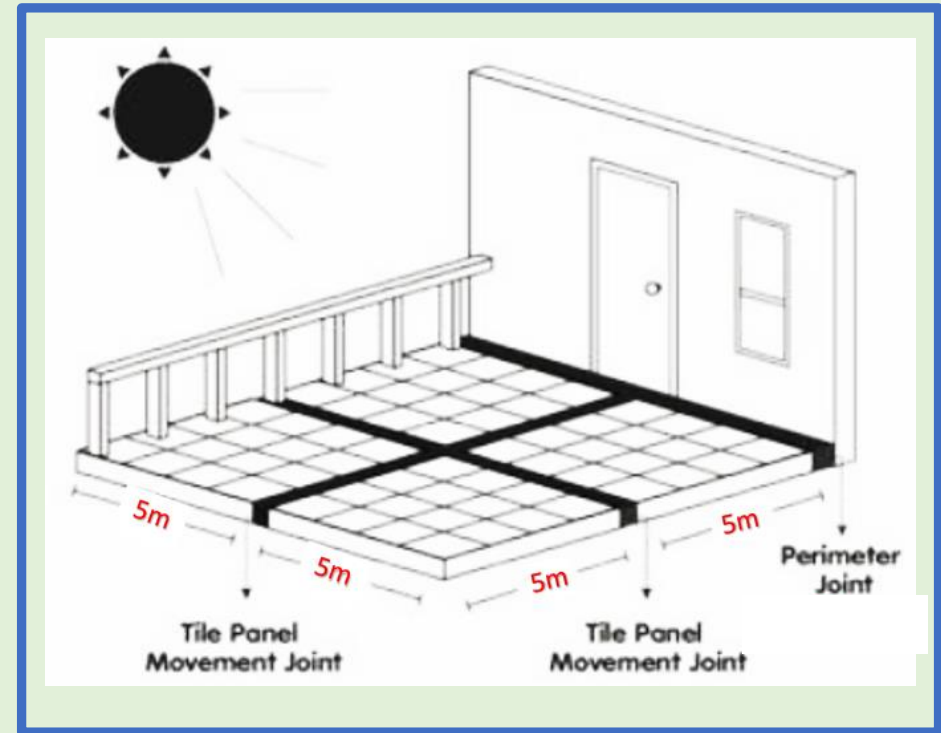
GUIDE ON TILE, MOVEMENT & PERIMETER JOINTS

- Movement & Perimeter joints and tile gaps are important to allow the release of underlying stresses from the substrate.
- Incorporation of these joints is dependent on the size of the **area of application** and the size of the **tiles**.



Interior Wall & Floor

Tile Gap	Min 3 mm
Movement Joint	Min 6mm ~ every 7 to 10m



Areas exposed to sun

Tile Gap	Min 5 mm
Movement Joint	Min 10mm ~ every 5 to 7m

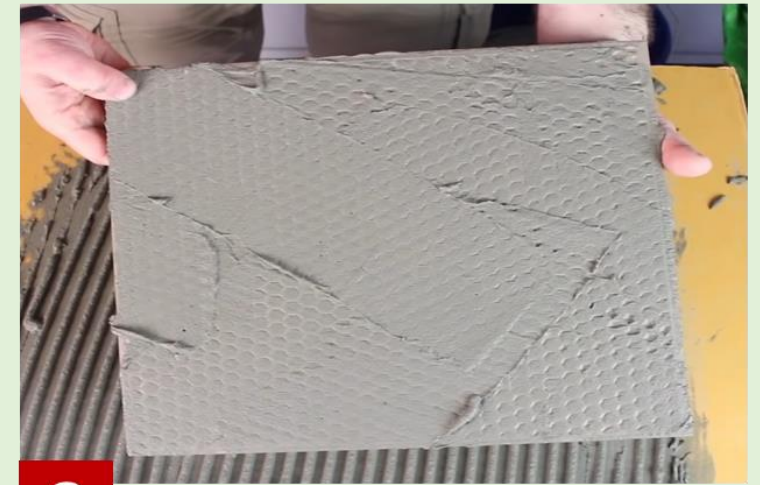
HOW TO ACHIEVE AN OPTIMUM ADHESIVE CONTACT



1 Trowel in one straight direction



2 Apply a thin coat to tile back



3 Thin coat fully applied to tile back

Trowelling in a straight line

Facilitates easier removal of trapped air





STANDARD ON MINIMUM TILE-ADHESIVE COVERAGE



**MINIMUM 90%
ADHESIVE
COVERAGE**

(specified in MS 1294 - Code Of Practice For The Design And Installation Of Ceramic Tiles)

WHY GOOD ADHESIVE CONTACT IS IMPORTANT!

- Full adhesive coverage provide strong impact resistance of the tiles and less prone to breakage

**Straight direction
application**



Multi direction application



Spot bonding



TILE LIPPAGE

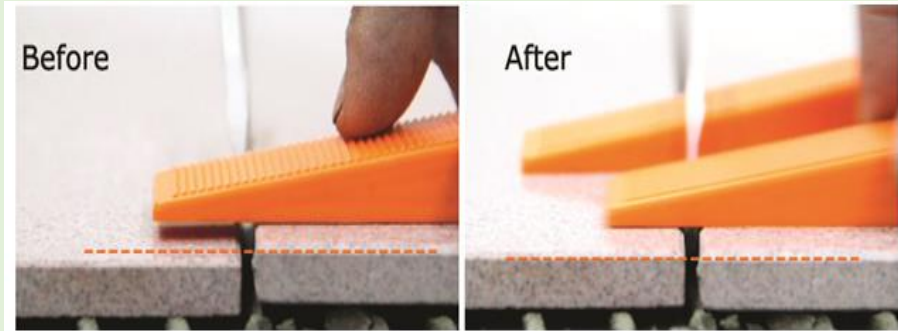
LIPPAGE is a condition where one edge of the tile is not at the same level with the edge of the adjacent tile



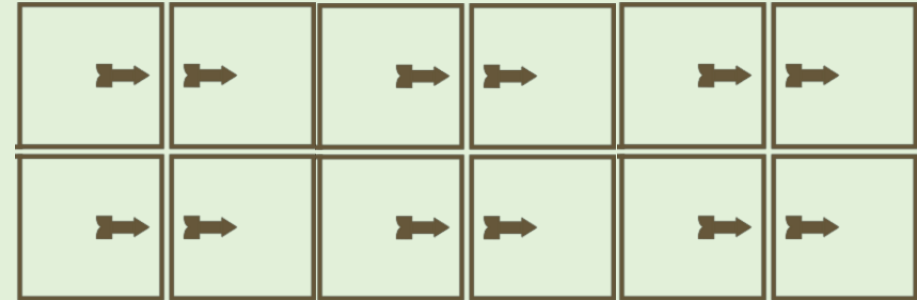
LIPPAGE standard for :-

- **CONQUAS** (*Construction Quality Assessment, S'pore*) - **not more than 0.5 mm**
- **QLASSIC** (*Quality Assessment System in Construction, CIDB*) - **not more than 1.0 mm**

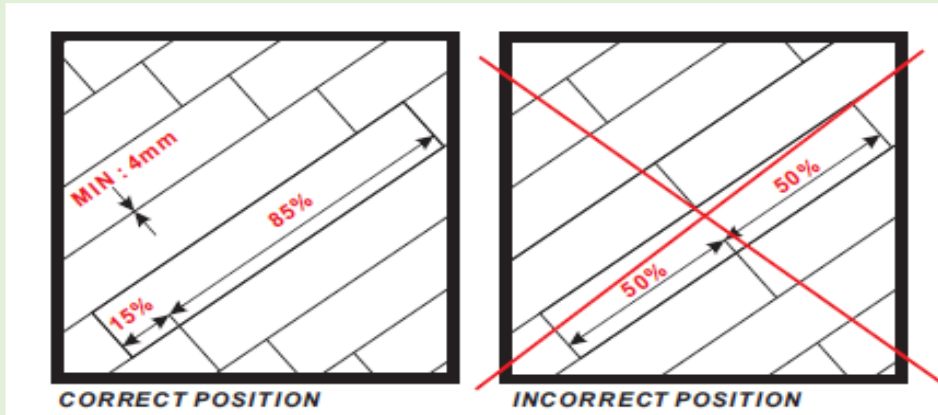
HOW TO PREVENT TILE LIPPAGE



TILE LEVELLERS



FOLLOW ONE DIRECTIONAL ORIENTATION



RECOMMENDED OFFSET AND minimum 4mm GAP



AVOID 50:50 OFFSET

EFFLORESCENCE

- Formation of whitish powder on the tile surface via porous tile joints.
- Found in wet or outdoor areas.



CAUSE OF EFFLORESCENCE

- Caused by process of evaporation where **soluble salts** from **cement**, seep out through the porous tile joints and deposited onto the tile surface.
- Efflorescence may harden over time and difficult to remove.

PREVENTION OF EFFLORESCENCE

1. Ensure the substrate is dry before tiling commences.
2. In external installation, put up a temporary tent to protect the floor from the direct heat and rain



3. Restrict passage of water in and out of the cementitious substrate by using a water resistant or epoxy grout

HAZE MARK ON POLISHED PORCELAIN TILES

- Haze mark is the loss of gloss along the tile edges, typically detected after the protective sheets are removed.
- Haze mark tend to be more severe near open windows that is exposed to rain water.



CAUSE OF HAZE MARK

- 1) Moisture trapped under the plastic sheet reacts with cementitious grout (which contains a high content of Calcium Oxide), produces Calcium Hydroxide (pH 12 – 13) which can attack and etch the polished surface.



PREVENTION OF HAZE MARK



- 1) Allow the grout to **DRY** sufficiently (at least 48 hours) before covering.
- 2) After covering, keep the covered floor DRY.
- 3) Plastic sheet is non-absorbent and may cause condensation and trap moisture.
- 4) Protective materials which are absorbent, e.g., **plywood, kraft paper** are better alternatives.
- 5) Use of non-cementitious grouts, e.g., EPOXY grouts.

CHEMICAL ATTACK

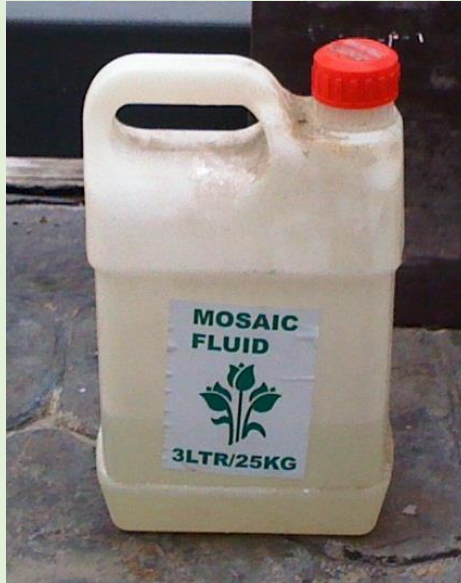
The wrong use of a strong cleaner will cause an irreversible damage to the tile surface



CARE & CLEANING GUIDE



AVOID STRONG CLEANERS



AVOID any cleaners that do not have proper label, e.g., name of manufacturer, product information, usage instructions, etc.



Bleach



**Stain
Remover**



**Toilet
Bowl
Cleaner**

CARE & CLEANING GUIDE

WHAT CLEANERS ARE SAFE TO USE FOR ROUTINE CLEANING?



- Generally, cleaners labelled as **FLOOR CLEANERS** and **MULTI-PURPOSE CLEANER** are safe for cleaning tiles.
- ALWAYS READ the usage directions and precautionary notes on the label before use.

CLEANING GUIDE FOR DIFFERENT TYPES OF STAINS



RESTORE CLEANER

This heavy duty Acidic Cleaner for removing **tough stains, cement residue, efflorescence, rust, etc** from tiles.

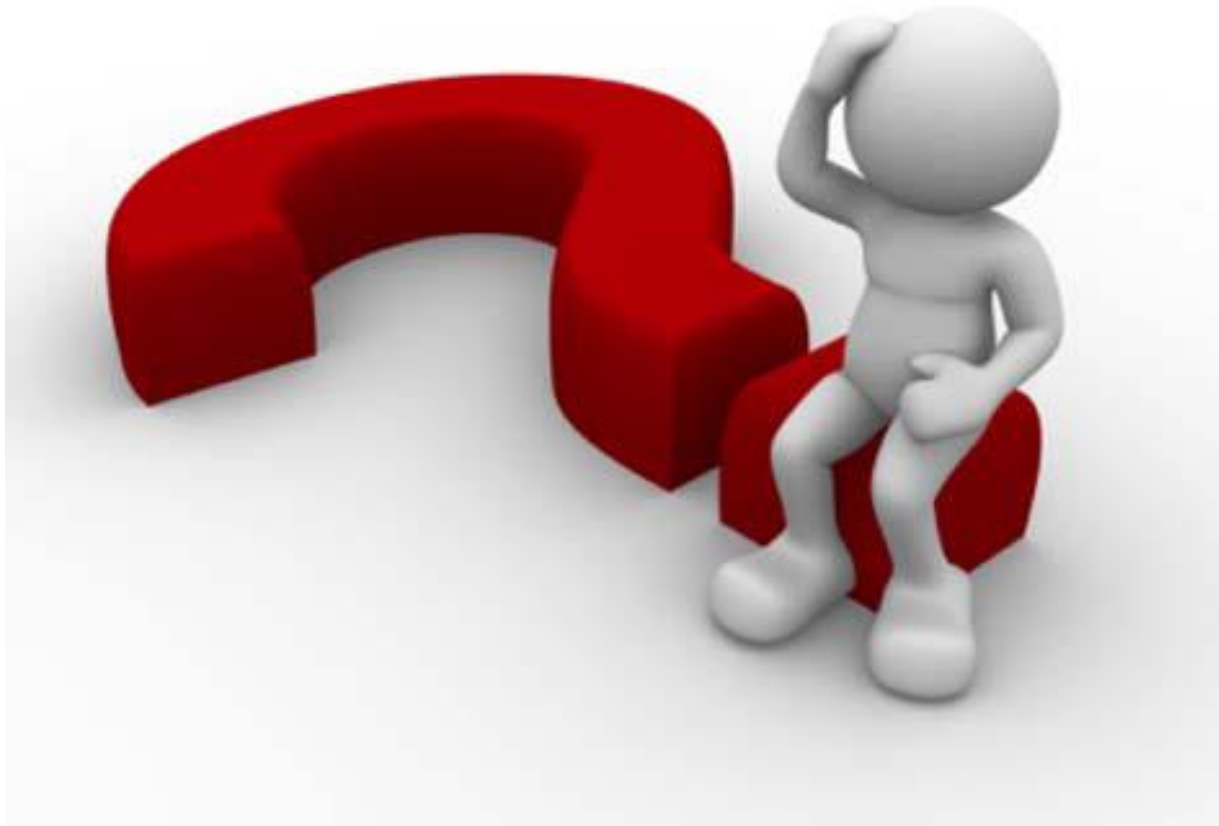
CATEGORY	TYPE OF STAIN	CLEANING RECOMMENDATION
CEMENTITIOUS MATERIAL	Cement/grout residue	RESTORE CLEANER
FOOD	Beer, wine, coffee stains, soy sauce, ketchup, coffee, tea, food colouring	KLENZALL CLEANER
OIL & GREASE	Food oil, engine oil	KLENZALL CLEANER
INK & PAINT	Marker ink, paints, latex	KLENZALL CLEANER or Solvents, eg. Thinner, Turpentine
OTHERS	Soap Scum, Mold	RESTORE CLEANER
	Rubber, footwear stain	KLENZALL CLEANER
	Metal stain, rust	RESTORE CLEANER
	Efflorescence	RESTORE CLEANER

Safe on all tile surfaces. **DOES NOT ETCH** like other strong cleaners and contain low VOC



KLENZALL CLEANER

An Alkaline Cleaner – A strong cleaner for removing **common stains, oil and grease**





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CORPORATE VISION

BRINGING JOY TO PEOPLE THROUGH
THEIR LIVING SPACES



CORPORATE MISSION

TO DELIVER BEAUTY TO LIVING SPACES
THROUGH OUR PRODUCTS AND SERVICE
EXCELLENCE



SAFETY



INTEGRITY



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