DUNE
UNIQUE MATTERS

TECHNICAL MANUAL

Installation guide for ceramic tiles

Recommendations for a durable, well-executed installation with the best finish.

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HOW TO USE THIS MANUAL

It sets out the basic guidelines for laying ceramic tiles correctly: from substrate preparation to final cleaning. The values given are for guidance only; if in doubt, the instructions of the manufacturer of each adhesive, mortar or sealant, and current regulations, always take precedence.

These installation instructions are based on the technical criteria of standard UNE 138002:2023 and should be regarded only as a guide to construction recommendations. In all cases, the standards and laws in force in each country for ceramic tile installation must be consulted and applied. The suitability of the construction solution adopted is the sole responsibility of the parties involved in each project.

01 Introduction

Advances in raw materials, manufacturing processes, design and quality control have greatly improved both the technical performance and the appearance of ceramic floor and wall tiles.

Installation is often seen as a secondary matter. However, poor installation can ruin the finish and also reduce the performance and durability of the tile.

Before deciding which tile to install and with which materials, six aspects should be analysed:

01
The tiles
Characteristics of the tile and of the chosen ceramic floor or wall tiling.

02
The substrate
Properties of the surface on which it will be laid.

03
Bonding materials
Performance of the adhesives and mortars to be used.

04
Structural behaviour
Expected response of the substrate to loads and movements.

05
Ambient conditions
Environment to which the installation will be exposed once finished.

06
End use
Type of traffic and level of demand it must withstand.

02 Planning

Before laying the first tile, plan the work and check that site conditions are suitable.

Temperature	Work at temperatures between 5 and 30 °C.
Humidity	If it is raining, check that the work area is not excessively humid.
Frost	Rule out any risk of frost during installation and setting.
Direct sunlight	Prevent direct sunlight on the work area.
Wind	Avoid wind and strong draughts or gusts.

It is also important to know what the floor or wall will be used for, as the end use may impose specific requirements.

Next, check the condition of the substrate and note any irregularities. This is the stage at which the type of laying and movement joints to be used is defined.

03 Safety and guidance for the installer

A safe work environment protects the installer and improves the final result.

Gloves	Wear them when handling tiles to prevent cuts and abrasions.
Safety footwear	Protects feet against falling pieces.
Ventilation	Keep the work area well ventilated.
Dust control	Prefer wet methods, which reduce or prevent dust. If not possible, use local extraction or work in an enclosed system. Remove accumulated dust by vacuuming or wet cleaning.
Dry cutting	When dust is generated, e.g. when dry cutting, use respiratory protection, goggles and suitable clothing.

04 Substrates and laying surfaces

The laying surface is the top layer of the assembly on which the bonding material is spread and the tiles are then bedded.

Beneath it are the base substrate and any intermediate layers added for insulation, waterproofing or protection. There are many types of substrate (concrete, plaster, mortar, precast blocks, wood…) and each requires its own treatment; only general issues are covered here.

Cleaning and drying

Any residue on the substrate prevents adhesion. It must therefore be thoroughly cleaned and left to dry completely. Otherwise weak spots will appear which, over time, may cause tiles to detach.

Flatness

Irregularities are another critical point. With the thick-bed method, the bedding mortar itself can compensate for them. With the thin-bed method, however, surfaces must be perfectly flat, as the tile faithfully reproduces the substrate it rests on. Building standards set these tolerances, measured with a 2-metre straightedge:

2 mm
Maximum tolerance on **walls**, measured with a 2 m straightedge.

4 mm
Maximum tolerance on **floors**, measured with a 2 m straightedge.

05 Adhesive materials

The adhesive must ensure that the tile is bonded across the whole substrate surface. There is a wide variety on the market.

Standard **EN 12004** classifies ceramic tile adhesives by chemical composition:

- **C** · Cementitious adhesives
- **D** · Dispersion adhesives
- **R** · Reaction resin adhesives

Each type is divided into classes according to performance: two fundamental (1 and 2) and three optional (F, T and E).

Characteristic	Class	Code
Normal	Fundamental	1
Improved	Fundamental	2
Fast setting	Optional	F
Reduced slip	Optional	T
Extended open time	Optional	E

Cementitious adhesives

These are the most widely used today. They consist of a main binder (Portland cement), aggregates and additives that improve performance.

Cementitious adhesives — TYPE C · EN 12004

ADVANTAGES
- Easy to use
- Excellent adhesion
- Deformable
- Suitable for any type of substrate
- Suitable for very low absorption tiles

LIMITATIONS
- Class 1 is not suitable for large-format tiles
- Low resistance to prolonged contact with water

USES
- Floors and walls
- Indoor and outdoor

Dispersion adhesives

Ready-to-use mixtures of organic binders in aqueous dispersion, with additives and mineral fillers. They are the least used, as they are limited to dry interiors and tiles with medium or high water absorption.

Dispersion adhesives		TYPE D · EN 12004
ADVANTAGES • Easy to use • Excellent adhesion • Deformable • Suitable for any substrate, even painted walls	LIMITATIONS • Indoor use only • Not suitable for swimming pools • Not suitable on metal substrates • Not suitable for low absorption tiles	USES • Floors and walls • Indoor only

Reaction resin adhesives

Based on synthetic resins that harden through a chemical reaction between their components. They offer very high performance, but all components must be mixed carefully.

Reaction resin adhesives		TYPE R · EN 12004
ADVANTAGES • Excellent adhesion • Flexible • Suitable for very low absorption tiles	LIMITATIONS • Require very careful handling • Components must be measured precisely	USES • Floors and walls • Indoor and outdoor

The characteristics shown are typical of each product family. Always consult the manufacturer before applying any of them.

06 Laying joints and grouting

The laying joint is the straight gap, of variable width, left between adjacent tiles.

It has several functions:

- It absorbs substrate deformation and stresses from expansion or contraction of building materials, preventing them from reaching the tiles.
- It increases the contact area between the tiles and the bonding material.
- It contributes to the overall aesthetic effect.
- It helps with waterproofing.

Grouting should be done once the adhesive has cured sufficiently and the tile is firmly fixed to the substrate. Joint width depends on the tile type, its dimensional variations, thickness and size.

Recommended joint widths

Type of installation	Tile side	Joint width
Indoor floor and wall tiling on a stable substrate	Less than 90 cm More than 90 cm	1.5 – 3 mm 3 – 5 mm
Indoor floor and wall tiling on a less stable substrate (e.g. underfloor heating)	Less than 30 cm More than 30 cm	1.5 – 3 mm 3 – 5 mm
Indoor commercial or industrial flooring	Less than 30 cm More than 30 cm	1.5 – 3 mm 3 – 5 mm
Swimming pools, thermal baths and spas, tanks and fountains	Less than 30 cm More than 30 cm	1.5 – 3 mm 3 – 5 mm
Outdoor floors, roofs, terraces and balconies	Any size	3 – 5 mm
Urban paving	Any size	Over 5 mm
Façades	Any size	Over 5 mm

Grouting materials

Under standard **EN 13888**, grouts are classified by chemical composition into two types: **CG** (cementitious) and **RG** (reaction resin). Cementitious grouts are subdivided into two classes:

Description	Class
Normal cementitious grout	1
Improved cementitious grout: high abrasion resistance (A) and reduced water absorption (W)	2
Fast setting (F): optional feature in both classes	—

Cementitious grout

TYPE CG · EN 13888

ADVANTAGES
- Aesthetic
- Easy to use
- High adhesion
- Durable
- Withstands immersion
- Deformable
- Good mechanical strength

LIMITATIONS
- Not waterproof
- Significant shrinkage in normal class: not recommended for joints over 1.5 mm
- Limited abrasion resistance

USES
- Floors and walls
- Indoor

Reaction resin grout		TYPE RG · EN 13888
ADVANTAGES • Ready to use • Mechanical strength • Chemical resistance • Waterproof	LIMITATIONS • Requires very careful handling	USES • Floors and walls • Indoor and outdoor

How to apply grout

Joints must be empty, free of adhesive residue, fragments or dirt, and of uniform depth. How the material is applied depends on the surface and the product chosen.

On floors

- With grouting mortar or latex additives, fill the joints with a sharp-edged hard rubber float.
- With two-component products, which are usually more viscous, use a very flexible steel spatula or a steel trowel, taking care not to damage the tile surface.
- If the joint must be completely full, apply the material with an extrusion gun and finish with a steel spatula.
- Large areas can be grouted by machine with a rotating, non-abrasive hard rubber disc.

On walls

Use a grouting mortar specific for this use and spread it with a sharp-edged hard rubber float.

In both cases, pass the float repeatedly diagonally across the joints and use it to collect the excess. Clean with a fine sponge soaked in clean water and well wrung out. Never use esparto scourers or abrasive cleaners that may alter the colour, or steel wool, which can scratch the glaze.

IMPORTANT

- Use the amount of mixing water stated on the packaging.
- Do not add water to the mix once curing has begun.
- Do not add sand or other additives unless expressly recommended by the manufacturer.
- Leave a minimum joint of 0.5 – 1 mm. 1 mm is usually recommended, although the final decision rests with the client.
- Avoid grouts coloured with carbon black (micronised carbon): they may later be impossible to clean.

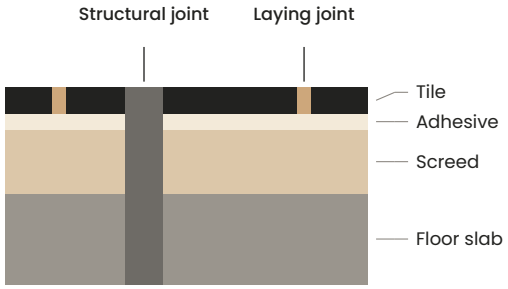
07 Movement joints

Also called deformation joints, these are gaps deliberately left between the laid tiles. Their function is to absorb dimensional changes in the assembly formed by substrate, bonding material and tile.

Types of joints

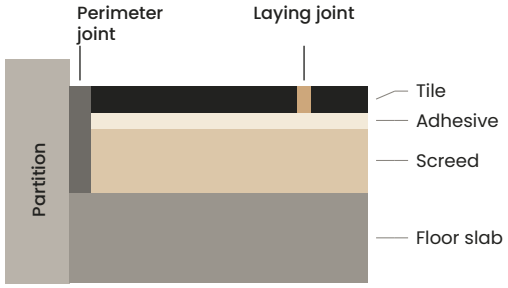
Structural

These coincide with the building's structural joints and are 1 to 3 cm wide. They must have been defined at the design stage by a qualified professional.



Perimeter

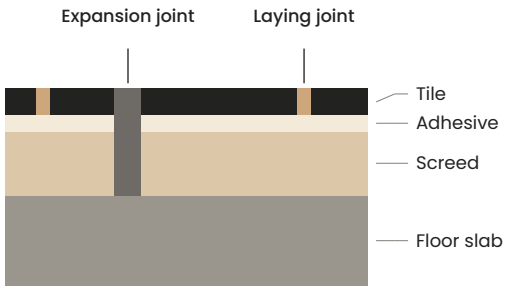
These are placed where the floor meets a partition, pillar, large window or other building element. They are usually 4 or 5 mm wide and are hidden under the skirting. They must reach the substrate or the separation layer, if any.



Expansion

These allow the tile, adhesive and substrate to deform freely due to temperature or moisture. They can be formed on site according to these criteria:

- Minimum width of 5 mm.
- Arranged so that there are no continuous runs over 6 m or solid areas over 30 m².
- Flexible, waterproof and well bonded, and they must also pass through the levelling layer.



Forming and sealing

The expansion joint must be deep enough to reach the structural support element or the separation layer, if any.

1 Clean the joint

- Remove any adhesive that may have entered while the tiles were being laid.

2 **Insert the filler material**

- Protect the tile edges with masking tape.

3 **Prime**

- With a brush, apply a coat of primer along the joint edges and the filler, to ensure the sealant adheres.
- The primer may be a synthetic resin in aqueous dispersion or a neoprene solution.

4 **Seal**

- With preformed PVC profiles during installation (indoors only), or with high-elasticity silicone sealant once installation is complete (indoor and outdoor).
- Apply it with a rubber spatula or extrusion gun, and remove the excess and the masking tape once pressed into the joint.

Possible sealants: polysulphide (two-component), epoxy polysulphide (two-component), polyurethane (two-component), bituminous latex (one-component) and silicone latex (one-component).

08 Installation methods

There are two basic methods: the traditional thick-bed method with cement mortar, and the thin-bed method with adhesive. This manual focuses only on the latter, as the former is now obsolete.

In the **thin-bed** technique, the bonding material is thin (1 – 5 mm). Compared with thick-bed, it offers several advantages: it needs less adhesive, eliminates the risk of errors when measuring and mixing on site, and is faster and more precise.

Adhesive installation · Floors

1 **Prepare the substrate**

- Thoroughly clean the surface to be tiled and check that it is flat.
- Level it with a material compatible with the future tiled bed; usually a pre-mixed mortar.
- If the substrate is plaster, apply a primer first to improve adhesion.
- Mark the expansion joints and set the level of the laying plane.

2 **Prepare the adhesive**

- Follow the manufacturer's instructions and mix with a mechanical mixer until smooth and lump-free.

3 Apply the adhesive and lay

- Always leave a laying joint between tiles. Do not soak the tiles in water.
- Work in small areas: spread the adhesive on the substrate and comb it with the notched trowel specified by the manufacturer.
- Also apply adhesive to the back of the tile and comb it (back-buttering), especially on large formats.
- Bed each tile with light pressure and keep the joint constant with spacers.
- Tap each tile with a rubber mallet so that it is firmly bedded.
- From time to time, lift a tile to check that the adhesive covers its whole surface.

4 Grout

- Wait at least 24 hours after laying.
- Choose the material according to joint width and the physical and chemical performance needed; pre-mixed products are recommended to ensure the correct composition.
- Remove adhesive residue from the joints and apply the mortar with a sharp-edged hard rubber float.

5 Clean and protect

- Clean the joints with a damp sponge before the grout hardens.
- Remove the excess and sponge again.

Adhesive installation · Walls

1 Prepare the substrate

- Clean thoroughly, check flatness and mark the perimeter junctions.

2 Prepare the adhesive

- Mix with a mechanical mixer following the manufacturer's instructions, until smooth and lump-free.

3 Apply and lay

- Spread the adhesive in small areas and comb it with a notched trowel (notches about 8 – 10 mm deep).
- Also apply adhesive to the back of the tile and comb it (back-buttering), especially on large formats.
- Bed the tile on the fresh adhesive, pressing with a slight back-and-forth movement to increase coverage.
- Lay the tiles as close together as possible, leaving only the minimum joint required by small edge differences.
- After covering a small area, bed the tiles fully with a clean rigid rubber sheet tapped with a rubber mallet.
- Check some freshly laid tiles from time to time to make sure coverage is correct.

4 **Grout**

- Wait at least 24 hours after finishing laying.
- Remove adhesive residue and other impurities from the joints.
- Apply the grout with a sharp-edged hard rubber float and clean with a damp cloth before it hardens.

5 **Clean and protect**

- Clean the tiles with water and a cleaning product, using cloths, sponges or plastic brushes. Never metal scrapers or abrasive cleaners.

09 Special cases

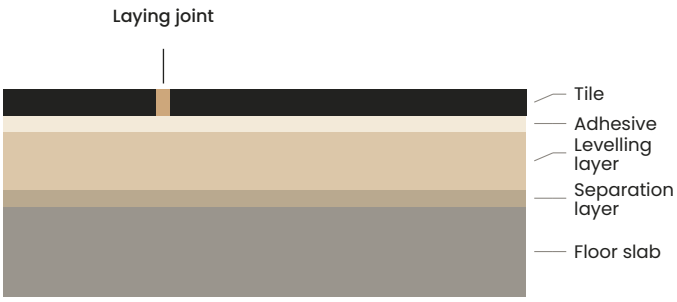
Some situations require specific construction solutions: floating floors, outdoor screeds and building refurbishment.

Floating floor

The layers that make up a tiled surface, especially a horizontal one, expand and contract with the movements of the assembly. These stresses may cause problems in the finished floor.

The current trend is to isolate the ceramic floor and its bonding layer from the rest of the system with a **separation layer** (or slip layer), which complements the effect of expansion joints. Its purpose is to let the floor "float" on the substrate and make small movements, so that structural stresses are not transmitted to the tiles.

This layer can be a simple 5 mm bed of sand or panels of cork, plastic or pressed polyurethane, which also provide thermal or acoustic insulation. On top, a layer of mortar of about 20 mm is spread, the **levelling layer**, which corrects irregularities and defines the surface to which adhesive will be applied. This layer may include a metal mesh to spread loads, especially if stresses are expected in the load-bearing structure.



Floating floor diagram

Outdoor flooring

Points to consider:

- Carefully plan the movement joints to be included.
- Use a laying joint of at least 3 mm and include a slip layer ("floating floor").
- Take measures against adverse weather that may impair setting (very dry air, very low temperatures, etc.).

- In uncovered areas, create a 1 – 2% slope so that rainwater drains and does not pool on the floor.

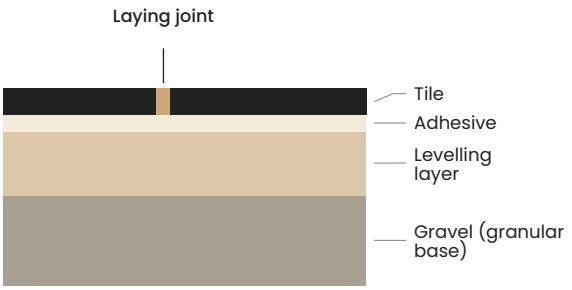
Materials:

- As bonding material, use special mortars (with latex-type additives) that do not shrink and are flexible and waterproof. Back-buttering is essential to avoid voids and ensure the tile is firmly bonded.

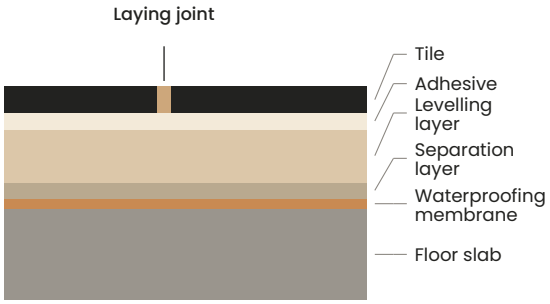
- The grout must adhere well to the tile and substrate, and be waterproof and highly flexible to prevent water entering and pockets forming between substrate and tiles.

These points are especially important in frost-prone areas: if water gets between the tile and the substrate and freezes, it creates stresses that damage the floor (spalling of the ceramic, lifting tiles…). Outdoors, and especially where it freezes, porcelain tiles are therefore recommended.

Construction diagrams



Without waterproofing membrane



With waterproofing membrane

Building refurbishment

Refurbishments often involve old floor and wall coverings made of cement, ceramic, metal, wood, plaster or stone. Refurbishment requires more care than new build, and preparing the existing substrate is especially important. In general it must be completely clean, free of any material or dirt that may affect adhesion between the bonding material and the surface. To form expansion joints correctly, any skirting must first be removed.

Cement screed

Clean the surface. If it is uneven, apply a levelling layer. Tiles can be laid with adhesive mortar. It is useful to insert a slip layer between the new substrate and the old floor (floating floor).

Old ceramic floor

The best option is to remove the old floor and install a new floating floor. If it is kept, clean it thoroughly to remove dirt and any poorly bonded glaze. Once completely dry, apply a synthetic resin bonding primer (bonding bridge) recommended by the adhesive manufacturer. After the time it specifies (about 45 minutes), a layer of mortar can be spread to level the surface if needed.

Plastic-coated surfaces

The plastic must be removed. A floating floor solution is recommended.

Metal surfaces

The main problem is the different expansion of substrate and tiles with temperature changes, which creates considerable stresses. The adhesive could also attack the metal: organic adhesives suitable for metals must therefore be used, and their flexibility carefully assessed. If the metal is rusty, remove all rust by careful sanding. A floating floor is recommended.

Wooden surfaces

The structure must be able to bear the weight; if not, it must be reinforced, otherwise the floor could give way and the tiles lift or crack. A floating solution is recommended: a slip layer is laid on the wood, topped with a levelling mortar with reinforcing mesh; then a thin layer of adhesive is applied (usually tile adhesive mortar or latex mortar). In wet areas, a moisture barrier should be placed between the wooden base and the levelling mortar. A primer and a layer of levelling mortar can also be applied to the wood to form the future laying surface. If the wooden floor is badly deteriorated, it must be replaced with insulating panels (e.g. PVC) and a floating ceramic floor laid on top.

10 Cleaning and maintenance

Good maintenance starts with careful handling of the material, even during transport to site and installation itself.

The floor is not usually the last job on site, so it must be protected from damage caused by later work. It can be covered with cardboard or plastic.

Daily cleaning	For normal traffic dirt, clean water and an eco-friendly neutral pH detergent are enough. Non-hazardous, non-polluting cleaning products are advised.
Persistent stains	Many products of different concentrations are available that are diluted in water. First check in the DUNE technical catalogue that the tile is resistant to that chemical. Then rinse with plenty of clean water.
Joints	Clean them with water and neutral detergent, using a sponge or plastic brush. Never with abrasive cleaners or esparto scourers.
If the stain will not come out	Contact your DUNE representative as soon as possible.

WHEN USING CHEMICALS

Wear rubber gloves and proceed with caution. Read the manufacturer's instructions and recommendations first, and avoid pouring residues or cleaning water containing chemicals onto the ground or into the drains.

11 Porcelain stoneware

Because of its huge popularity, porcelain stoneware deserves a special mention. It is used on both floors and walls and stands out for its high mechanical and chemical resistance, great hardness and water absorption below 0.5%.

Substrate

It must meet the same requirements as for any other tile, described in section 04 of this manual.

Adhesive material

The best bonding materials are cementitious adhesives with mixed binders (classes C2E and C2TE under EN 12004) or reaction adhesives (type R, EN 12004), with excellent adhesion and chemical and mechanical resistance. Cementitious ones are advised, as type R requires very meticulous handling.

For excellent adhesion it is essential to:

- Follow the manufacturer's recommendations.
- Prepare the mix with a mechanical mixer so that it is homogeneous.
- Apply the adhesive with a suitably notched trowel so that it spreads evenly over the whole surface.

Grouting and sealing

For grouting porcelain stoneware floors, cementitious joint mortars with characteristics similar to the C2E adhesives used for bonding are recommended: ready-made products based on cement, sand, synthetic resins and other additives that improve water retention. They suit joints of 0.2 to 10 mm, are easy to apply and clean without scratching the glaze, very durable and adherent, and resistant to water and frost. They are type CG2 or derivatives, under standard EN 13888.

Expansion joints are sealed as explained in section 07: with preformed PVC profiles during installation or with high-elasticity silicone sealant once finished. PVC profiles are recommended only for indoor floors; silicone sealant is suitable for indoor and outdoor use.

Installation method

The recommended method for DUNE porcelain stoneware tiles is the thin bed of adhesive, described in detail in section 08.

Back-buttering

This technique is advisable: adhesive is applied to both the substrate and the tile. On the substrate, spread it and comb it with the notched trowel; on the tile, apply a thin layer with the flat side of the trowel.

Rectified porcelain

The bonding and grouting materials are the same as above. Take extreme care when laying so that edges are not damaged by pieces resting against each other.

Maintenance and cleaning

They require the same maintenance as any other tile (see section 10). As they are extremely resistant, for very persistent stains a commercial acid detergent diluted in water can also be used, provided it is not derived from hydrofluoric acid (HF).

Suitability for use

Their excellent performance —low water absorption, making them frost resistant; high flexural strength and abrasion resistance— and great beauty allow them to be laid in any type of space, however demanding the conditions: indoors and outdoors, residential or service areas and high-traffic premises such as hotels, shopping centres, restaurants or terraces.

12 Rectified tiles

Rectified tiles require special attention during installation.

To make them, the perimeter of the piece is machined so that all four sides are perfectly straight and square. This allows them to be laid with very narrow joints, enhancing the overall look, especially when faithfully imitating marble or natural stone. On the other hand, care must be taken that edges do not chip when resting against each other.

Substrate

It must meet the same criteria as for any tile (section 04), with one nuance: flatness must be as good as possible, and to achieve this the substrate must be levelled.

Adhesive material

The most suitable are adhesives with mixed binders (classes C2E and C2TE, EN 12004): easy to use, with good adhesion and high deformability. For good adhesion, the same guidelines as in section 11 (porcelain stoneware) apply.

Grouting and sealing

Laying joints must be as narrow as possible, between 1 and 2 mm, making them practically invisible. Cement-based grouting mortars are recommended: easy to apply and clean, they do not scratch the glaze, and are very hard, adherent and resistant to water and frost; they are type CG2 or derivatives under EN 13888.

As for expansion joints, only perimeter joints are used, because rectified tiles are laid on small areas and other joints that would spoil their look are best avoided. Perimeter joints are sealed with preformed PVC profiles during installation.

Installation method

A thin bed of adhesive is recommended, as detailed in section 08. With large formats, as with porcelain, adhesion problems may arise: in that case, use the back-buttering technique in section 11.

Maintenance and cleaning

They are easy to maintain and clean, as there are practically no joints where dirt can build up. The cleaning process is described in section 10.

Suitability for use

Rectified tiles are very popular for the look of a surface without visible joints; polished ones also perfectly imitate marble or natural stone. However, no expansion joints can be left in the middle of the surface, so any movement can only be absorbed at the perimeter joints, which are covered by another tile or the skirting.

RECOMMENDATION

For this reason, rectified tiles are advised for indoor areas of moderate size, such as bathrooms. For large spaces, consult the technical department first.

13 Environmentally responsible installation and removal

Laying and removing tiles responsibly reduces waste and protects the environment.

During installation

- Make the most of the material to minimise offcuts and waste.
- Manage waste correctly (tile fragments, adhesive and grout residue) by placing it in the containers provided on site.
- Do not pour leftover mixed adhesive, joint mortar or cleaning water onto the ground or into the drains.
- Keep the work area clean, tidy and well ventilated, preventing dust from building up in the air.

During removal

- Separate ceramic waste from other materials generated (adhesives, mortars, packaging, etc.).
- Removed tiles are considered inert waste and must be handed to an authorised waste manager.
- Where feasible, reuse auxiliary items such as pallets or packaging in good condition.

Packaging management

Tile packaging must be managed responsibly, both during installation and in any later removal:

- **Primary packaging** (cardboard boxes): place it in the paper recycling bin or hand it to an authorised waste manager.
- **Secondary or transport packaging** (plastics and wooden pallets): hand it to a waste manager.

14 Reference manufacturers

Some brands of adhesives, grouts and auxiliary products for reference:

FILA	MAPEI	GRUPO PUMA	WEBER	KERAKOLL

Recommended products

References for adhesives, treatment products and grouts.

Adhesives

Manufacturer	C1 tile adhesive	C2 tile adhesive	Epoxy adhesive
KERAKOLL	ESPECIAL ECO	H 40 ECO FLEX	SUPERFLEX ECO
MAPEI	TIXOBOND	KERAFLEX MAXI S-1	KERALASTIC T

Manufacturer	Latex adhesive mortar
LATICRETE	Mortar 211 + Laticrete 4237

Treatment products

Surface	Code	Description	PHP code
GLASS	185463	ANTIGLISS	D787
STONE	184507	LIQUID PROTECTIVE WAX	D945
STONE	184508	STAIN-PROOF SEALER	D969

Grouts

Manufacturer	Cementitious grout	Epoxy grout
KERAKOLL	FUGABELLA ECO PORCELANA	FUGALITE
MAPEI	KERACOLOR FF	KERAPOXY
LATICRETE	LATICRETE 1600 series	—

DUNE

UNIQUE MATTERS

HEAD OFFICE
Partida Rachina, 12130 - Sant Joan de Moró (Castellón) - España

CONTACT
+34 964 657 400
dune@duneceramics.com
www.duneceramics.com