



# THE TECHNICAL SPECIFICATIONS OF PORCELAIN STONEWARE MATERIALS

Eiffelgres can proudly stand up to any comparison with quarry products:

the **extremely low water absorption** and **outstanding resistance to wear** and pedestrian traffic typical of **porcelain stoneware**, combined with the elegance of natural quarry stone and marble make Eiffelgres materials the ideal solution for architects and project designers.

This is because Eiffelgres technical ceramics bring together the technical specifications of porcelain stoneware with the aesthetic value of quarry materials.

To recreate the passage of millions of years in an instant.

We have made the development of this process our primary objective, to reproduce the extraordinary natural beauty of quarry material. Our second goal is to call upon technology to do the exact opposite of what it normally does - create expressive randomness, as only nature knows how.

We have achieved these two goals through painstaking research and experimentation conducted at the laboratory in the **Eiffelgres plant at Viano, Reggio Emilia**: today, this is still the world's most advanced facility in the development of "technical porcelain stoneware".

The technical properties of ceramic tiles meet specific requirements setting limits and establishing references which must be met to be judged good quality.

These pre-requisites constitute a declaration of transparency in the relationship between manufacturer and purchaser and act as a sort of identity card for the product. UNI standards in Italy, EN standards in Europe and ISO standards world-wide define the most important features of first choice ceramic tiles :

## Regularity

*dimensions/thickness/straightness of corners/ right angles/ flatness*

To produce top quality tiled surfaces on floors and walls, the material used must be perfect. The features permitting us to obtain excellent technical and aesthetic quality are guaranteed by the modularity of individual tiles, which must have identical dimensions and thicknesses, must have no hollows or rises (flatness) and must have their sides set strictly at perfect right angles.

Production of ceramic material through a single pressing action under the weight of thousands of tons makes it possible to obtain extremely regular surfaces, and solid porcelain stoneware is a primary example of this; its uniform appearance and the definition of grinding on the sides and corners are some of the peculiarities that help identify it as a hi-tech ceramic product.

## Structural features

*water absorbency*

Water absorbency is dependent on the porosity of the material's surface. The least porous ceramic material is porcelain stoneware, at levels of below 0.5%. Eiffelgres hi-tech porcelain stoneware absorbs water at a rate of 0.04% thanks to the specific pressing process conducted in the plant in Viano (RE).

The degree of porosity of a ceramic material is an essential requirement as it determines many other features determining a tile's quality and dependability.

## Massive mechanical properties

### *resistance to bending*

An important distinguishing element of floors is a material's ability to resist given breakage loads. Resistance to bending, which is linked above all to the thickness of the slab, is greater if water absorbency is lower: yet another aspect classifying porcelain stoneware as the most resistant material for tiles.

## Surface mechanical properties

### *resistance to deep scratches*

Ceramic materials must guarantee resistance to scratching and wear due to footprints and to movement of furniture, chairs, wheeled trolleys, etc. over time in order to maintain the original integrity of their texture and their proper functionality. Porcelain stoneware's distinctive compactness guarantees optimal performance in terms of resistance to scratching and durability.

## Thermal and hygrometric properties

### *resistance to temperature excursions; resistance to frost; coefficient of linear thermal dilation*

The thermo-hygrometric properties of porcelain stoneware are dependent on its extraordinary density. As porcelain stoneware has the lowest porosity among ceramic materials, it absorbs less water and therefore is at less risk of cracking or crackling under pressure caused by the increase in volume of water as it freezes. Great temperature excursions are therefore not a problem for porcelain stoneware, a compact material which is homogeneous throughout its entire thickness.

## Chemical properties

### *resistance to chemical products*

In order to resist the attack of chemical substances such as those contained in cleaning products or resulting from use of acids in particular working environments, the compactness of the surface of the material (which, in the case of porcelain stoneware, extends throughout its entire thickness) constitutes a very important quality once again linked with the material's low porosity, which excludes the presence of microscopic cracks that can permit penetration and stagnation of aggressive substances. This is aided by the high firing temperatures reached in ceramic kilns (1200°), permitting achievement of greater chemical inertia.

## Safety features

### *friction coefficient (slipperiness)*

A floor's slipperiness determines the safety of people walking over it and is therefore an essential requirement in a floor.

The slipperiness coefficient, represented by the value "R", refers to a method specified by German standards DIN 51130 and 51097, which classify products on the basis of their friction coefficient in response to the specific requirements of a given environment.

Depending on the degree of slipperiness, which may be linked with use of particular substances in workplaces or to the presence of water, it is obligatory under these regulations to use a flooring material which will generate considerable friction between the surfaces in contact and thereby make the floor less dangerous for people. The higher the friction coefficient, the less slippery the floor.

The standards distinguish between the slipperiness of floor surfaces in areas where people walk with their shoes on (R9-R13) and with bare feet (A,B,C).

The measurement method specified in DIN 51130 distinguishes among the following slipperiness classes and provides indications as to where they may be used:

**R9** - entrances and stairways accessed from outside; restaurants and canteens; shops; clinics; hospitals; schools.

**R10** - shared toilets and showers; small kitchens in restaurants and cafés; garages and basements.

**R11** - food production facilities; mid-sized kitchens in restaurants and cafés; working environments where there is a lot of water and sludge; laboratories; laundries; hangars.

**R12** - production facilities for foods rich in fats such as dairy products, food oils, cured meats; large kitchens in restaurants and cafés; industrial areas where slipper substances are used; car parks.

**R13** - places where large quantities of fats are used; food processing areas.

In the presence of water, where people walk barefoot, the flooring is subject to even more restrictive requirements. These may be measured on the basis of DIN 51097 standards and classified into assessment groups A, B and C with increasing values:

**A** - dressing rooms; areas accessed barefoot; etc.

**B** - showers; swimming pool sides; etc.

**C** - sloped swimming pool sides; steps for climbing into pools; etc.



## Lightfastness

The chemical and physical properties Eiffelgres requires its materials to meet also include lightfastness of colours, the standards for which are set by German DIN 51094 standards.

The need to test this property is demonstrated by the fact that porcelain stoneware is often used in outdoor flooring or on the façades of buildings, where the material is exposed to sunlight for prolonged periods. Porcelain stoneware is generally resistant, especially that made by Eiffelgres, which has passed all tests of ability to maintain tile colour unaltered.

## GAUGE

During the firing process the porcelain stoneware is reduced in size to an extent which depends on the temperature of the kiln. And so it may occur that tiles of the same article fired in different cycles are subjected to temperatures which are not perfectly identical, with consequences for linear shrinkage and therefore final dimensions. These tiles will not be of exactly the same size: they will have a different gauge, a different size, though to a limited extent. Eiffelgres supports its customers' purchasing process and guarantees that tiles are packaged up in lots of homogeneous gauge to eliminate the risk of laying materials of different sizes at the same site.

The "nominal" dimensions appearing on the package are the dimensions used to designate the product (for instance: 60x60), the "manufacturing" dimensions, that is, the "gauge", (such as 59.5x59.5) or the predetermined production dimensions, which the tile's real dimensions must approximate within the limits on tolerance permitted by the standards.