UNDERSTANDING

WEATHERING OF NATURAL STONE EXTERNAL PAVING

Natural Stone has been used for external paving for the past 5,000 years, and the extraordinary resilience of natural stone for this purpose can be seen in the ancient flagstones that pave the floors of ancient Egyptian temples and Babylonian palaces, which are still walked on to this day.

However, stone will take time to acclimatise to its location, and because our climate is cooler and weather patterns can be quite erratic and regularly experiences temperatures below freezing, this weathering can be more extreme and can affect the appearance or strength of the stone. It is perfectly normal for stone to weather with time and this is very much part of the aesthetic of a natural product; and this will vary from stone to stone and location to location.

Generally weathering becomes noticeable several months (and sometimes even up to years) following installation; depending on atmospheric conditions. Generally the surface will appear more rough and small cavities or fault lines open. This effect is often more clearly seen when the surface of the tile is dirty and wet, therefore regular cleaning with a product like our Sarsen Home Deep Clean, Paving Cleaner or a similar natural stone cleaning product is a good option.

Having supplied natural stone for paving for many years, we have found that, generally, when any extensive surface damage occurs due to weathering, it is an extreme case. We would advise retaining some spare tiles from your original order in case of such occasions, and replacing tiles if desired - alternatively you may leave the paving to take on its own character as has happened to ancient stone paving nationwide.

What is Frost Resistance Testing?

Frost Resistance is an industry term used to describe the inherent strength of a natural stone to withstand freeze-thaw weathering. However, it is important to understand that there is no accepted basis for passing or failing a frost test under the BS standards; rather frost resistances tests merely provide comparison to other materials. These tests are highly subjective however, and although we regularly retest materials within our range for frost resistance, it is important to remember that Natural Stone is natural, and thus naturally imperfect.

Natural Stones can experience enormous variance in frost resistance between different areas of the quarry, different production batches; which will influence the brittleness/ softness and water absorption, both which are key indicators of material frost resistant strength.

Frost Resistance is based on the BS standard regulated Frost Resistance Flexural Strength test, in which a sample piece of the material will pass through at least 56 cycles of being cooled to below freezing and then thawed. This is designed to simulate wintertime temperature changes. This temperature change causes the stone tiles to expand and contract, which can cause damage to softer/more porous materials.

Often a material strength test is undertaken following this to determine if the material has been weakened, or alternatively a visual inspection after the cycles of testing will determine if there has been any damage to the material, and this is noted on a scale of one to five.

We review these tests to determine whether the material is suitable for use in a UK climate based on our experience of natural stone paving.

Of course, in some areas the temperature will annually drop below freeing more times than the stone has been tested for. This does not mean that the material will denature beyond this point, and many natural stones are suitable for many more cycles than this. However, as an industry standard, it is accepted that at least 56 cycles of testing is sufficient to uncover any material weaknesses.

Another important consideration is that the freezing cycle of the test only freeze-tests the material when dry. Water adds considerably greater stress to the material when the temperature goes below freezing, as this expands inside any natural microscopic faults and fissures in the material and pushes these open, a process known as freeze-thaw weathering. Some finishes applied to external Natural Stones to give enhanced anti-slip properties can make the material more open grain, exaggerating and worsening the effects of this process.

What will help to prevent weathering?

1. Correct Installation
Several things will influence the rate at which stone will weather; but one of the main reasons for this is due to installation. Faulty installation can severely weaken the tiles and cause accelerated or exaggerated weathering.

For further detail, please see our External Paving Installation Guide, but below are a few pertinent points that concern helping to prevent weathering.

It is very important that natural stone paving is laid to a fall/falls, around a 1 in 80 gradient is the normal industry standard- That means that for every 80cm the area to be tiled should fall by 1cm. This is so that water does not pool on the surface. Rainwater is mildly acidic, so it will corrode natural stone which is alkaline; also standing water can cause accelerated frost damage if the temperatures fall below freezing. The fall may vary dependent on the size of the area but a fall of 1 in 80 is the optimum level.

When laying the slabs it is important to remember to butter a full coat of adhesive to the back of the tile, as well as onto the screed, using a 10mm notched trowel. If laying onto a compacted sub-base with 30-50mm cement mortar, then make sure to prime the back of the tile with SBR prior to laying and tamping into the mortar bed. Again, ensure full coverage on the back of the tile. Never use the dot and dab method, as this will weaken the adhesive and leave the tile more exposed to freeze-thaw issues. Often this method can cause staining on the surface of the tile too.

2. Using Sealant
When a stone is lab frost tested its tested in its natural state, so sealing is not going to stop weathering from frost but we do recommend applying a coat of sealant to your natural stone paving, as this will help prevent against water and dirt penetration with an invisible barrier, shielding the stone from the main causes of weathering. We recommend our Sarsen Home Stain Block or Sarsen Home Stain Block Eco, or similar natural stone sealants.

If sealant is not applied, weathering is effectively accelerated; and you can expect to see a change much sooner. Also we advise to reseal every one to five years, depending on how it is looking. If water is seeping into the natural stone tiles rather than draining away due to the fall of the paving, then this could indicate that more sealant is required.

3. Care & Maintenance
Please note that pressure washing is not advised on natural stone paving and can damage the surface of the tiles and open the grain of the stone exposing it to much more rapid weathering. It also will eat away the protective sealant coat if one has been applied.

We advise using a specialist stone cleaning with a product like our Sarsen Home Paving Cleaner that can be applied with a sprayer and hosed down after it has been given the required time to activate.

Perfectly Imperfect Stone

Sometimes even the most carefully installed, maintained, frost tested natural stone will weather in unexpected and dramatic ways. This is likely due to material weaknesses - being a product of mother nature, natural stone is not a consistent product; and may contain pockets of weaker material.

In some materials, an abundance of certain minerals or fossils may cause weaknesses, whilst in others a stone may contain less compacted, softer areas which are more susceptible to freeze-thaw weathering. One point to watch out for is delamination, which occurs in natural stones that are comprised of layers- this is especially common in slates and sandstones. If water gets between these layers and freezes, then sometimes an entire area may break away from the tile. This should not affect the durability of the tile below, and is generally a very rare occurrence.

Generally notably weak batches of tiles are rejected in production; but occasionally a batch may slip through with no visible weaknesses. Due to the unpredictable nature of stone, this is natural and unfortunately unavoidable.