

Cladding Tiles 1

Frost resistance

Dennis Ruabon cladding tiles are manufactured to comply with the requirements for tiles subjected to extremes of temperature.

The British/European standards include a frost resistance test, which is described in ISO 1045 - 12. The method involves testing a minimum of 1 square metre of tiles by impregnation with water and freeze/thaw cycling between +5°C and -5°C. A minimum of 100 such cycles without damage is required for classification as frost resistant.

Ruabon Group A1 cladding tiles exhibit no signs of damage after 100 cycles of the above test and are classified as frost resistant. In general terms frost resistance is related to water absorption and the following table may be used as a guide.

Water Absorption	Frost resistance
≤ 3%	Frost resistant
3 – 4%	Probably resistant
> 4%	Unlikely to be resistant

Chemical Resistance

ISO 10545 - 13 requires all products to be tested against a range of acids and alkalis, a variety of household cleaners and swimming pool chemicals. The test solutions used in the ISO Standard are:

Ammonium Chloride solution (110g/l)

Sodium Hypochlorite solution (20mg/l)

Hydrochloric Acid (3%V/V and 18%V/V)

Lactic Acid (5%V/V)

Citric Acid (10%V/V)

Potassium Hydroxide solution (30 and 200g/l)

All Ruabon cladding tiles meet the requirements, although if in prolonged contact there may be a very slight attack from the potassium hydroxide solution. In general concentrated acids such as sulphuric, hydrochloric, acetic and lactic, and alkalis such as sodium and potassium

hydroxides, attack Ruabon products extremely slowly at room temperature. Corrosion, if any, would normally take place at such a slow rate that it would not significantly alter the life of the installation. In the case of strong alkalis there may be some discolouration of the tile after prolonged contact.

Ruabon tiles, in common with other ceramic materials, would not normally be specified for environments where they would be in prolonged contact with fluoride chemicals, especially hydrofluoric acid. In addition to the chemical resistance properties of cladding tiles consideration must be given to the proposed completed installation, taking into account the fixing products to be used.

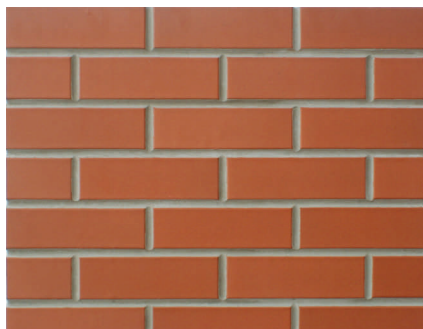
Staining resistance

In the new International standard, as in BS 6431, unglazed tiles are not required to demonstrate staining resistance. However, a test method is to be included which can be used to indicate the ease of cleaning of quarry tiles.

The test requires the tiles to be subjected to a range of staining agents.

- Chrome green (or a red stain) in light oil (tracing stain)
- Iodine in alcoholic solution (chemical/oxidising stain)
- Olive oil (filming stain)

Each staining agent is applied in turn to the surface of a tile, then attempts are made to remove the stain from the tile using a range of standard cleaning regimes.



The severity of the cleaning regime required to remove the stain classifies the tile into a grade of between 1 to 5 (5 being the easiest to clean and 1 the hardest).

The cleaning regimes are applied in the order shown until the stain is removed:

Class 5. Flowing hot water and hand wiped

Class 4. Hand cleaning using a weak cleaning agent and non-abrasive materials

Class 3. Mechanical cleaning using concentrated cleaning agents and abrasives

Class 2. 24-hour immersion in a suitable solvent (not used on tracing stains)

Class 1. Irreversible damage of the proper surface of the tile

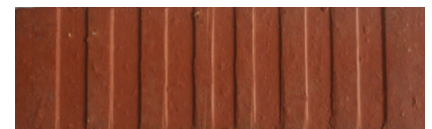
Dennis Ruabon cladding tiles demonstrate Class 5 ease of cleaning.

Anti-scumming agents added during the clay milling process ensures that any soluble salts present are prevented from rising to the surface which eliminates any unsightly efflorescence.

Durability

Manufactured to exacting floor tile standards, Ruabon cladding tiles far exceed the technical properties of traditional brick slips.

Compressive strength is exceptional - in excess of 140 N/mm. Remarkable resistance to deep abrasion guarantees that they will not be affected by even the most extreme climatic conditions.



Underside fixing ribs provide secure and permanent adhesion. Chamfered edges on the face provides a superior finish and ease of fixing and finishing of joints.

Cladding Tiles 2

Comparison of British/European/International Standards related to Dennis Ruabon values

Technical property	ISO 10545 Requirement	Ruabon Tiles Typical value
Water absorption ISO 10545 - 3	A1 $\leq 3\%$	$\sim 2.8\%$
Modulus of rupture ISO 10545 - 4	Group A1 $Av \text{ m } 23\text{N}/\text{mm}^2$	Group A1 $Av \text{ m } 23\text{N}/\text{mm}^2$
Abrasion resistance ISO 10545 - 4	Group A1 $< 275\text{mm}^3$ Group A11a $< 393\text{mm}^3$	100mm ³ 100mm ³
Scratch hardness EN 101	No requirement	>7 Moh's scale
Moisture expansion ISO 10545 - 10	Not finalised	Negligible
Linear thermal expansion ISO 10545 - 8	Not finalised	$< 5 \times 10^{-6} \text{ } ^\circ\text{C}$
Thermal conductivity	No requirement	$1\text{wm } ^\circ\text{C}$
Thermal shock resistance ISO 10545 - 9	Required	Pass
Frost resistance ISO 10545 - 12	100 freeze thaw cycles	100 cycles
Chemical resistance ISO 10545 - 13 (a) Household chemicals & pool cleaning salts – Sodium Hypochlorite & Ammonium Chloride (b) Low concentration acids & alkalis – Hydrochloric Acid 3% v/v & Citric Acid sol. (c) High concentration acids & alkalis – Hydrochloric Acid 18% v/v, Lactic Acid 5% v/v & Potassium Hydroxide sol.	Manufacturer to state classification Manufacturer to state classification Manufacturer to state classification	Class UA (no visible effect) Class ULA (no visible effect) Class UHA (no visible effect)
Compressive Strength	Manufacturer to state	143N/mm ²
Staining resistance ISO 10545 - 14	Manufacturer to state classification class 1 – 5 1 = not resistant 5 = highly resistant	Class 5

Technical properties of extruded cladding tiles

Not to be confused with brick slips, Ruabon Cladding Tiles are purpose made to an extremely high specification.

Manufactured from pure Welsh Etruria Marl clay, they are frost and stain resistant. They will not fade or discolour, and are unaffected by extremes of weather.

All Dennis Ruabon cladding tiles are manufactured to achieve technical properties which comply with the highest requirements of BS EN 14411: Group A1.

The technical requirements of the current British/European standards are detailed in table shown together with the typical Ruabon values obtained through independent testing.

It can be seen that Dennis Ruabon cladding tiles meet the more stringent, higher classification of the new ISO standard.

All Ruabon 1st quality products are required to undergo rigorous independent audit tests, which are carried out at the laboratories of British Ceramic Research.

All products are manufactured under a British Standards assessed quality system approved to BS EN ISO 9001:2000.

