

Slip Resistance 1

General

Dennis Ruabon Tiles is actively involved in the development of slip resistance testing methodology and is the UK manufacturing representative on the EC Consortium Sixth Framework programme, SlipStd, which is committed to development of slip resistant standard surfaces.

Slip resistance can be defined as:-

“The propensity of a flooring surface in combination with the foot and the surface conditions to resist the foot from sliding”.



The slip potential of flooring can be influenced by many factors. The main considerations are:

- The nature of the footwear, for example whether rubber, leather or synthetic soled and, if applicable, whether intended for barefoot use.
- Whether the floor is wet or dry and the expected service conditions in use.
- Whether the floor is clean or dirty and if dirty, the nature of the contaminant.
- The speed at which a person is walking or running.
- The texture of the flooring material.
- Gradients and ramps and whether ascending or descending.

Consideration should be given at the design stage to the most arduous and demanding conditions likely to arise. It is also critical that a suitable cleaning regime is specified to ensure the tiled surface is maintained in optimum condition, free from any adverse contamination.

Standards and testing

The governing standard for ceramic floor tiles, BS EN 14411:2006 allows manufacturers to declare slip resistance values by any of four current European test methods. The absence of a single harmonised test method can therefore prove confusing when specifying tiles for a particular application.

Extensive research has been carried out in the UK by The Health & Safety Executive in conjunction with The UK Slip Resistance Group and British Standards. The preferred test methods and classification systems are based on coefficient of friction testing using the pendulum tester and surface microroughness meter.

Other accredited European test methods include the German Ramp tests DIN 51130 and DIN 51097 and the Sled Type Tortus test favoured in Italy.

Pendulum Testing

Also known as the British pendulum, portable skid resistance tester and TRRL pendulum it is designed to simulate the action of a slipping foot. Based on a simulated swinging heel which sweeps over a set area of flooring in a controlled manner, the slipperiness of the flooring has a direct and measurable effect on the pendulum test value (PTV) given (previously known as SRV).

The pendulum tester has advantages in that it can give reliable results in both wet and dry conditions and its portability means it can be used on site as well as in the laboratory. Research has confirmed the pendulum to be a reliable and accurate test, leading to its adoption as the standard HSE test method.



Surface microroughness

An indication of slipperiness in water-contaminated conditions may be simply obtained by measuring the surface roughness of tile surfaces. Research has shown that measurement of the Rz parameter allows slipperiness to be predicted for a range of materials. Rz is a measurement of total surface roughness, calculated as a mean of several peak-to-valley readings.

Ramp Test

DIN 51130 and DIN 51097 describe the German ramp tests used for shod and barefoot testing respectively. These tests involve a subject walking back and forth on a contaminated test panel. The inclination of the sample is gradually increased until the test subject slips. The average angle at which slip occurs is compared to a classification range known as ‘R’ ratings. HSE has reservations about this method as motor oil and safety boots are used for DIN 51330 which may not be typical of the actual intended use of the tiles.

There is also some concern over the ‘R’ rating system as there is a misconception that the ‘R’ scale runs from R1 to R13 where R1 is most slippery. In reality the scale runs from R9 to R13.



DIN ramp test

Tortus Test

A ‘sled type’ tester which powers itself across the surface measuring coefficient of friction (CoF) as it goes. UK research has shown this to give misleading results in wet conditions, even showing smooth floors to be less slippery when wet.

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Slip Resistance of Ruabon Tiles

Dennis Ruabon produces four distinct surface finishes enabling the designer to specify the most suitable type for any specific application. The accompanying tables detail specific technical performance achieved through independent testing.

- **Plain Tiles** are suitable for all normal applications including areas which are likely to be occasionally wet.

- **Quarrundum Tiles** (silicon carbide impregnated) possess extremely high levels of slip resistance in both wet and dry conditions and are highly recommended for demanding automotive and industrial applications where contamination from a variety of liquids is common. They are also extremely effective in commercial kitchens and for use on slopes and ramps.

They are also available in 25mm thick format for extremely heavy duty areas where loading and impact strength is required such as fire stations, garage workshops etc.

Studded Tiles are suitable for all bare-foot applications such as commercial showers, changing rooms and swimming



pool surrounds. The channels between the studs quickly drain away excess surface water ensuring adequate grip is maintained.

- **Paving Tiles** are perfectly suited to outdoor situations such as driveways and patios or where paved landscaping is desired. The drag face provides both good pedestrian slip resistance and vehicular skid resistance.

Pendulum (PTV) test classifications with Ruabon tile values by type:

Classification	(PTV)
High slip potential	0 - 24
Moderate slip potential	25 - 35
Low slip potential	> 35

Ruabon Tile Type	(PTV)
Plain	51
Quarrundum	65
Studded	58
Paving Tile	61

Surface roughness (Rz) classifications with Ruabon tile values by type:

Classification	Rz
High slip potential	< 10 um
Moderate slip potential	10 - 20 um
Low slip potential	> 20 um

Ruabon Tile Type	Rz
Plain	14
Quarrundum	32
Studded (shod)	12
Paving Tile	30

Dynamic coefficient of friction (DCOF) classifications with Ruabon tile values by type:

Classification	DCOF
Class 1 < 0.2 0.2 - 0.4	Dangerous Caution
Class 1 0.4 - 0.7 > 0.7	Safe Very Safe

Ruabon Tile Type	DCOF
Plain	0.65
Quarrundum	0.78
Studded (barefoot dcof)	0.81
Paving Tile	0.71

Ramp Test (R) - Motor Oil test classifications with Ruabon tile values by type:

Classification	Inc. Angle °
R9	6 - 10°
R10	10 - 19°
R11	19 - 27°
R12	27 - 35°
R13	> 35°

Ruabon Tile Type	R val. & Inc. Angle
Plain	R10 / 14°
Quarrundum	R13 / 36°
Studded	R12 / 31°
Paving Tile	R13 / 35°

Barefoot Ramp Test classifications with Ruabon tile values by type:

Classification	Inc. Angle °
A	12 - 17°
B	18 - 23°
C	> 24°

Ruabon Tile Type	Class & Inc. Angle
Plain	C > 24°
Quarrundum	C > 24°
Studded	C > 24°
Paving Tile	C > 24°

It is clear from the test data that Ruabon quarry tiles meet the very stringent requirements of the most demanding applications. A full range of fittings such as Ribbed Steptreads and Tactile Surfaces ensures that a full specification can be framed to cover all legislative requirements including those of The Disability Discrimination Act.

We are continually developing our range of slip resistant products and recommend regular visits to our website for updated information.