Slip Resistance 3.11

Why is slip resistance important?

Slips, trips and falls are one of the leading causes of injury that occur every year. Making a floor slip resistant aids in providing a **safe working area** and reduces the risk of such injuries occurring.

What standards does my floor need to meet?

Depending on the flooring application, different degrees of slip resistance are required. **HB 197 – An Introductory Guide to the Slip Resistance of Pedestrian Surface Materials** (published by Standards Australia and the CSIRO), is a handbook that provides some recommendations on the **minimum** degree of slip resistance required for common locations and areas of application. It is important to determine the minimum slip resistance required before a coating system is specified.

How is Slip Resistance Measured?

There are **5** different **approved methods** of measuring slip resistance which are covered in detail in **AS/NZS 4586 – Slip Resistance Classification of New Pedestrian Surface Materials:**

- *Wet Pendulum*
- *Wet Pendulum and Dry Floor Friction*
- *Dry Floor Friction*
- *Wet/Barefoot Ramp*
- *Oil-wet Ramp*

There is **no direct correlation** between the results obtained from each method; however more slip resistant surfaces should obtain higher ratings across all methods used.

The **two most common methods** are briefly described below:

Oil-Wet Ramp Test

The **oil-wet ramp test** is used to determine the **highest angle** of a surface that can be achieved before a person slips. Slip resistance of the surface is assigned an **R rating**, from the **lowest (R9)** to the **highest (R13)**. Due to the specialised footwear and viscous contaminant used, the oil-wet ramp test is more representative of **specialised flooring applications** such as commercial kitchens and industrial areas. This rating system is the one more commonly referred to in **coating system specifications**.

AS/NZS 4586 Classification					
Rating (Lowest → Highest)					
Oil-wet Ramp Test*	R9	R10	R11	R12	R13

*There is no direct correlation between ratings obtained from each method.

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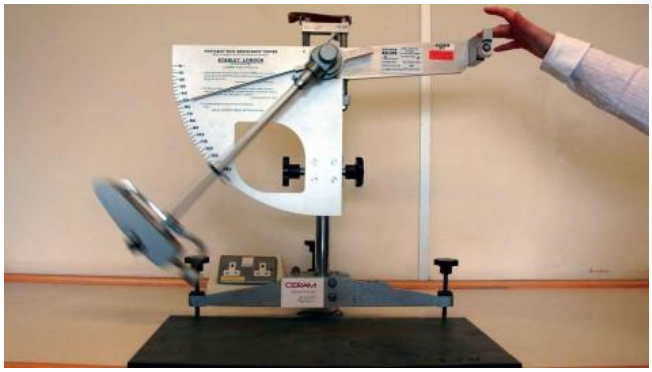
Wet Pendulum

The **wet pendulum** slip resistance test uses a **portable device** that measures the resistance created by a wet surface. The result is expressed as a British Pendulum Number (BPN) which is then assigned a slip resistance classification from the **lowest (Z)** through to the **highest (V)**. The wet pendulum test is therefore more generally used for determining slip resistance of pedestrian surface materials in public areas where water is a likely contaminant. Other common uses of the wet pendulum test include **laboratory testing** and **on-site testing**.



AS/NZS 4586 Classification					
Rating (Lowest → Highest)					
Wet Pendulum*	Z	Y	X	W	V

*There is no direct correlation between ratings obtained from each method.

On-Site Testing

The **appearance** and **performance** of the finished coating is dependant on the **application technique** and **characteristics** of the surface being coated. Independent **on-site testing** of the surface may also be required to obtain more accurate slip ratings of the specific coated surface and to ensure that the **required ratings have been achieved**. On-site testing using the wet pendulum method is covered in **AS/NZS 4663 – Slip Resistance Measurement of Existing Pedestrian Surfaces.**

How is slip resistance achieved?

The addition of slip resistant aggregate in flooring coatings is an effective way of achieving a **hard, long-wearing, heavy duty, non-slip floor** in both wet and dry conditions.

The **most common** slip resistant aggregates are:

Stir-In Aggregate:

Stir in aggregate is added to previously mixed and thinned paint using a power mixer and brisk stirring. Once the aggregate is **uniformly distributed** throughout the paint, application can then occur.

Conventional types of stir in aggregates can be **difficult** to incorporate and hence maintaining a uniform distribution may be challenging. **Periodic mixing** of the product is essential to aid distribution throughout the wet paint. The use of stir in aggregate may make it easier to achieve a more uniform distribution of aggregate throughout the coating **compared** to broadcasting aggregate.

Stir-in aggregates must only be used in the **finish/top coat** of the coating system. Any **additional coats** over the layer containing the aggregate will **compromise** the slip resistance of the coating.

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Broadcast Aggregate:

The slip resistant aggregate is **broadcast by hand** onto the wet coat. Once the coating has dried, any excess or loose aggregate is brushed away and then **sealed** with a following coat, sandwiching the aggregate between the two coats. The broadcast aggregate must only used when **sandwiched between the final two coating layers**. Any subsequent coats may compromise the slip resistance of the coating.

Due to the **manual distribution** of the broadcast aggregate it can be difficult to obtain a uniform result across the entire coating. It is important to practise broadcasting the aggregate evenly before undertaking a flooring job. The broadcasting technique allows the use of coarser grades of aggregate and hence **higher slip resistance ratings** can be achieved for **heavy duty applications.**

The addition of aggregate can add important features to a floor however it is important to be aware of its drawbacks. Slip resistant floors have a tendency to **hold dirt more easily** and may also be **harder to clean.** Coarser grades of aggregate will have a higher compromise on the cleanability of the floor. A **balance** of slip resistance and cleanability must be established.

Which slip resistant additive do I use?

When choosing a slip resistance additive there are a number of different **properties** that should be considered. These can include **aggregate type, shape, hardness and size.**

Slip resistant additives can be made from a number of materials, including **sand, aluminium oxide, silica, garnet, pumice etc.** Although cheap, sand, garnet and pumice **crush and wear down** to rounded particles which may **reduce their effectiveness** as non-slip aggregates. Aluminium oxide is **very hard and angular** in shape making it an ideal material for achieving slip resistance for **high performance and hard wearing applications.** Angular shaped aggregates are more effective than round shaped aggregates as they **protrude** from the surface of the coating.

Slip resistant aggregates can be obtained in a **range of sizes** from fine through to coarse. The choice of aggregate can depend on the type of coating and also on the degree of slip resistance required. **Finer grades** of aggregate are conventionally used in **thinner coatings**, where coarser grades have a tendency to ball up. **Coarser grades** are more suitable for **thicker coatings,** where the finer grades would get lost in the coating hence reducing their effectiveness. Coarser grades are generally more suitable for achieving high levels of slip resistance.

For more information regarding slip resistance refer to **Dulux® Protective Coatings Tech Note 3.11.1**

For more technical advice, please contact the Dulux® Protective Coatings Technical Consultant in your state.