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# SLIP RESISTANCE VALUES: RUBBER CRUMB / SILICA / POLYPROPYLENE PARTICLES

## INTRODUCTION

As a guide for product selection, this report consolidates all slip resistance testing done since May 2007 (results prior to this have been discarded due to minor product changes.) It shows the differences between black and white rubber crumb particles and silica particles of different shapes.

Since aromatic and aliphatic resin binders have similar hardnesses, the slip resistance values (SRV's) are influenced mainly by the particles used such that aromatic and aliphatic products with the same colour rubber have the same SRV.

Testing is done under dry and wet conditions, where wet conditions cause varying decreases in slip resistance depending on the type and shape of the particles used.

## DETAILS

Testing was independently done using a portable rubber slip tester designed by the Transport research Laboratory (TRL) of the UK, called the standard Slider 96 (previously 4S).

The Slider 96 pendulum value is related to the potential for slip as follows:

| Slider 96 Pendulum Value | Potential for Slip |
|---|---|
| 25 and below | High |
| 25 to 35 | Moderate |
| 35 to 65 | Low |
| Above 65 | Extremely Low |

The above criteria apply under both dry and wet conditions such that the minimum SRV that is deemed suitable for flooring for general pedestrian use is 35 under wet conditions.

## RESULTS

### 1. Rubber and rubber with silica sand

The Slip Resistance Values for Protectakote and Protectakote UVR were initially measured in **dry** conditions as being:

| white rubber | black rubber |
|---|---|
| 55 | 56 |

In the **wet** this fell to:

| white rubber | black rubber |
|---|---|
| 33 | 38 |

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The SRV for white rubber products was thus found to be too low for non-slip flooring in wet conditions. Black rubber products on the other hand just made the grade.

The addition of Saftigrip silica (200g per litre) with a maximum particle size of 380 microns improves the SRV's as demonstrated by the following result for white rubber:

**white rubber with Saftigrip**

| **dry** | **wet** |
|---|---|
| 66 | 50 |

Thus the white rubber products, which don't have sufficient slip resistance in wet conditions, can be improved where necessary by the addition of rough silica sand at the level of 200g/l.

## 2. Round silica particles

The particles used in Safekote and Marinekote are hollow man-made spheres of silica with a maximum particle size of 300 microns. This coating produced the following SRV's with and without the addition of Saftigrip at the level of 200g per litre:

**round silica spheres (Safekote and Marinekote)**

| **dry** | **wet** |
|---|---|
| 69 | 60 |

**round silica spheres (Safekote and Marinekote) with Saftigrip**

| **dry** | **wet** |
|---|---|
| 75 | 70 |

## 3. Round polypropylene particles

The clear non-slip coating: Protectakote UVR Transparent PP uses polypropylene beads with a maximum particle size of 840 microns (20 mesh.) The SRV's were:

**Round polypropylene particles**

| **dry** | **wet** |
|---|---|
| 61 | 50 |

## DISCUSSION

The above results show that Zest's products with crumbed rubber profiling fall into the 'low potential for slip' category in dry conditions. These products include Protectakote/Durabak/Protech and Herculiner Black regular aromatic products as well as Protectakote UVR/Durabak-18/Protech UVR and Herculiner aliphatic products.

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When wet conditions predominate, the darker colours of the above, which use black rubber, remain in the 'low' potential for slip class but with a lower SRV.

The pendulum values of the lighter colours of the above, which use white rubber, fall further in wet conditions and drop a classification to become 'moderate potential for slip.'

The addition of Saftigrip rough silica sand with an maximum particle size of 380 microns improve the SRV's dramatically such that all colours fall into the 'Extremely low' potential for slip category in dry conditions and the 'Low' potential for slip category in wet conditions.

Thus if wet conditions are the norm, the addition of Saftigrip is essential for these products, especially with the lighter colours using white rubber which would not meet the minimum requirements for flooring without it.

Safekote and Marinekote with their small round silica spheres meet the minimum requirements in both wet and dry conditions. Wet conditions do cause a drop in category from 'Extremely low' to just 'Low' however. When Saftigrip is added to Safekote or Marinekote, they remain in the 'Extremely low' category in the wet.

Lastly, polypropylene particles produced an SRV in the 'Low' potential for slip category in dry conditions. The drop in SRV in wet conditions was not sufficient to drop it a category.

## CONCLUSIONS

The slip resistance of all of these products can be improved by the addition of Saftigrip coarse silica sand with a maximum particle size of 380 microns. Without this 'end-user' additive the best dry slip resistance is provided by Safekote and Marinekote followed by UVR Transparent PP. Both of these products use hard, round spherical particles. These results indicate that smaller particles provide better slip resistance.

The softer rubber particles meet the requirements for non-slip flooring, however their slip resistance decreases dramatically in wet conditions. The lighter products that use white rubber fall below the minimum requirement in the wet while the darker products using black rubber remain just above the minimum requirement. It is therefore recommended that all rubber crumb profiled products take an addition of Saftigrip silica sand if they will be used in predominantly wet areas.

The percentage of the various particles used in these various coatings surely also plays a role, and future testing of the surface roughness value may provide more information on this feature.

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