

Slip Resistance

Do sealers affect slip resistance?

By Scott Worthington

Technical Article

For as long as I can remember there have been a number of stock questions asked about sealers. How long do they last, will they change the colour of the tile or stone? One of the most common is, will your [Aqua Mix penetrating sealer](#) make the sealed surface more slippery to walk on? This is an interesting question because the Aqua Mix position has always been that our penetrating sealers do not affect the slip resistance of the sealed surface. This is in contrast to some manufacturers who claim that their penetrating sealers in fact increase the slip resistance of the sealed surface. So I thought this was an interesting subject to look at to see if we can get to the bottom of what appears to be contradictory claims about similar technology.



To see if a penetrating sealer can affect slip resistance firstly you need to understand how they work. [Aqua Mix penetrating sealers](#) work by sitting just below the surface of the stone or tile where they cure into slightly different compounds and configurations depending on the active ingredient. Therefore unlike [surface coatings](#) they do not coat or sit on top of the surface. This means that the natural surface of the sealed stone or tile is left untouched and is the reason why Aqua Mix penetrating sealers do not affect the natural slip resistance of the surface. This statement by itself to be accurate obviously needs to be supported by hard scientific evidence and this is where the measurement of slip resistance plays its part.

Slip resistance in the tile and stone industries is measured mainly by measuring the coefficient of friction of a surface, commonly referred to as a surfaces' COF. Different countries have a variety of systems for measuring COF. Some use the Tortus test (most commonly used in the USA), some the Pendulum and others quantify slip resistance by using human walkers (ramp test). For the purpose of this discussion I will stick to the Tortus test that expresses COF as a decimal where 0.50 and above is seen as acceptable slip resistance and below 0.50 unacceptable. So to recap, if an Aqua Mix penetrating sealer is not going to adversely affect natural slip resistance then under testing it must not lower the COF result of the unsealed tile or stone. Conversely for the manufacturers that claim their penetrating sealers positively affect slip resistance the sealed COF should be higher than the natural result.

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Below are some wet Tortus test results on different surfaces for us to

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COEFFICIENT OF FRICTION (COF), WET		
Test Report		
Tested by:	J. George Sotter, P.E., Ph.D. Sotter Engineering Corporation	Page 1 of 2
Date Tested:	November 19, 2003	
Test Description:	The TORTUS dynamic slip resistance measuring instrument, utilizing a Four S rubber slider, was used for dry measurements. Wet measurements were taken with the TORTUS instrument using a trace (three drops per 250 milliliters of water) of Triton X-100 wetting agent in distilled water.	
Surface Tested:	Various Stones & Tiles	
Wet Surface Results		
<u>Stone/Tile</u>	<u>Treatment</u>	<u>COF</u>
Slate	Untreated	0.73
	Aqua Mix "Slate Sealer" ("Seal & Finish Low Sheen")	0.68
Limestone (Durango)	Untreated	0.71
	Aqua Mix "ProSolv 10 Sealer"	0.81
	"Stone Sealer"	0.78
	"Stone Sealer's Choice WB" ("Sealer's Choice 15 Gold")	0.79
Terra Cotta	Untreated	0.72
	"Floor Shine & Hardener"	0.47

The first thing to notice is the result of the [Aqua Mix Seal N Finish Low Sheen](#) a coating sealer. The coating sealer reduces the wet COF from 0.73 to 0.68, which is totally normal and understandable as you are now walking on a man made coating instead of the natural micro textured surface of the slate. The same is true of the [Aqua Mix Floor Shine and Hardener](#) applied over the terracotta tile. However the results of the three Aqua Mix penetrating sealers are completely the opposite. All three actually increase the COF – [Aqua Mix Sealers Choice Gold](#) 0.79, [Aqua Mix Penetrating Sealer](#) (labelled Stone Sealer in this test) 0.78, [Aqua Mix Pro-Solv](#) 0.81 with the untreated limestone at 0.71.

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These results would appear in some ways to contradict the Aqua Mix claim that our penetrating sealers do not affect the surface COF and instead back up some competitors claims that penetrating type sealers positively affect the COF and in doing so make a slippery surface less slippery. However the numbers and the reason for these increases need further investigation because in this case the numbers do not tell the total truth.

The application instructions for most penetrating sealers and definitely Aqua Mix ones are almost all the same. One or two thin coats that after a specified dwell time are then wiped dry so that no excess sealer is left on the surface. The sealer is then supposedly left to cure just underneath the natural surface. However it is physically impossible not to leave a small residue of sealer on the surface. Although when properly applied this sealer residue is not visible to the naked eye its presence can be detected by doing a simple water beading test on the surface. Firstly apply droplets of water onto the sealed surface and you will see high initial water beading. Then wipe dry and lightly scrub the surface with a white plastic pad. Reapply the water droplets and observe the level of water beading. What you will notice is that after scrubbing the beading or surface tension of the water is greatly relaxed. This is caused by the fact that the scrubbing has removed the small amount of sealer residue that was creating the initially high water beading. In other



Fig 1.



Fig 2.

Fig 1. Before the removal of invisible sealer residue, high water beading.

Fig 2 relaxed water beading due to removal of sealer residue

It is this very same sealer residue that we believe creates the apparent increase in the sealed surface COF. Once the sealer residue is removed the COF reduces back to that of the natural untreated surface. This helps to explain why some manufacturers claim their penetrating sealers increase the sealed surface COF. They are simply quoting the test numbers arrived at under the standard test method. However what this fails to acknowledge is that the sealer residue that creates this initially high and seemingly beneficial increase in slip resistance will quickly wear away under foot and vehicular traffic returning the surface COF back to its original state. Therefore the Aqua Mix claim that our penetrating sealers do not affect the surface COF (and certainly do not increase it) is an accurate one. It acknowledges the fact that the sealer residue will quickly be removed in service, fast returning the slip resistance (COF) of the surface to its natural state.