

technical bulletin

WHY SCRUB TESTING DOES NOT MEASURE SCUFF-RESISTANCE

Summary:

Scrub is a very blunt and subjective test for paint film integrity; and although it is very useful in the lab in helping



choose between alternative paint resins and ingredients, it is not readily translated into a real world paint performance attribute; measuring a paint film's resistance to abrasion erosion makes sense only up to a point.

• It is usually a surprise for most people to learn that there is more than one scrub test method; and it usually comes as a surprise that scrub test standards come with the caveat that the test is not very accurate even when used as intended. For example, for paint film abrasive erosion; this is why there are several scrub methods including quite a few that do not report scrub cycles.

Most scrub tests use an abrasive brush and cleaner to measure erosion or what it

takes to erode the paint film.

- Scrub testing is not about removing stains or cleaning the paint surface the way "scrub" is understood outside of the lab.
- Scrub testing is also NOT about removing scuffmarks from a painted surface.
- There is no official test for removing scuffmarks, and this is why we use demo boards for SCUFF-X[®].
- ASTM Scrub testing does not measure the film resistance to being damaged since the test only reports what it takes for the film to be completely eroded away.
- Even for interior paints other than SCUFF-X[®] we prefer to report a minimum cycle count if absolutely needed, e.g., our Benjamin Moore Green Promise[®] products have an ASTM scrub resistance higher than 400 cycles per Green Seal[™] GS-11 requirements; and even that may be overkill in a lot of cases.
- There are test methods including European and international scrub standards that limit the scrub cycle count to 200 cycles for abrasive erosion assessment.
- For those who still think a higher scrub count is always better, consider that ASTM sets the error margin at about 58% between labs; plus alkyd paints for example have inherently poor scrub resistance although they usually dry harder and are easier to clean than latex.



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SCRUB-RESISTANCE VS. SCUFF-RESISTANCE



Since the launch of SCUFF-X[®], the question about scrub-resistance and scuff-resistance has come up constantly. Specifically as to how SCUFF-X[®] is different from competitive products that tout and use scrub-resistance as their key selling point. To be 100% clear, scrub testing and scrub-resistance have nothing to do with the scuff-resistance technology introduced with SCUFF-X[®]. This is the main reason why **we do not provide scrub cycles for SCUFF-X[®]** the way our competitors do.

Scrub-resistance is a test that measures what it takes to totally remove a paint film from the painted surface; so nothing in that test relates to scuffresistance (what happens to the surface of the paint). Since scrub test only measures the end-point when the film is gone, it is an extrapolation at best.

Some additional things to point out:

- Scrub testing was never designed to measure scuff-resistance or to remove scuff marks. Scrub testing is a destructive test which actually damages the painted surface and it only measures what it takes to remove the paint from the painted surface.
- Scrub is very useful in the lab when it comes to formulation work because it helps determine which ingredients (when taken together), will give enough film integrity, but there's a point that after which it becomes total overkill and meaningless; and it is often misapplied in real life especially for premium paints.
- Scrub-resistance testing has no link to scuff-resistance. On the other hand, scuff-resistance is all about keeping the painted surface unmarked as opposed to scrub, which is all about removing the paint and does not measure anything about what happens to the painted surface.
- SCUFF-X[®] is about what it claims, meaning real life superior and demonstrable scuff-resistant properties and ease of removal of minimal scuff marks.



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SCUFF-X® VS. THE COMPETITION



Competitive products with higher scrub cycles like ScuffMaster Scrubtough (two-component polyurethane) and Sherwin William's pre-catalyzed epoxies have even higher scrub cycles (up to 12,000). Even though those products are tough, scrubbable and durable, the reality is that they are NOT RESISTANT TO SCUFFING.

SCUFF-X[®] is the first scuff-resistant paint, because it uses proprietary patent-pending technology that resists scuffing in the toughest high-traffic commercial environments. Competitive product's key selling point is they are highly scrubbable, but even with the high-scrub cycles, the tougher scuffmarks, could not be removed without damaging the paint finish. Finally, those products require constant maintenance, cleaning, touch-ups or ultimately re-painting.

The technology used for SCUFF-X[®] is so innovative and different from any other coating used for high-traffic areas that the effectiveness of the scuff-resistance technology prevents scuffing in the first place. Even when SCUFF-X[®] gets minimal scuffing, in most cases just a simple soap and water cleanup is needed (see attached).

With a product like SCUFF-X[®], the scrub cycles are not needed, because the paint is resisting most of the scuffing before it begins. So one could ask, what good does it do for a paint to have 2,000 or even 12,000 scrub cycles if you would need to repaint after 50 cycles or less (emphasis on less) anyway because the scrub test itself damages the paint film in the first place?

Many Sources of Confusion about using Scrub Resistance

Merriam-Webster definition of scrub:

- To rub (something) hard with a rough object or substance and often with soap in order to clean it.
 - $\circ~$ The act of rubbing something hard with a rough object or substance and often with soap in order to clean it: the act of scrubbing something usually singular
 - He gave the pan a good *scrub*. [=he scrubbed the pan]
- A powerful cleanser that is used to clean the skin
 - A face scrub.



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Layman's and dictionary's definition of scrub have little in common with ASTM scrub; see ASTM definition and descriptions below. This is the start of the confusion.

- ASTM Scrub is not about removing stains or dirt or scuff marks
 - ASTM scrub has little in common with what most people in the real world understand scrub to mean, and the coatings industry in general has done a poor job clarifying the difference
 - There are separate ASTM tests for stain removal
- There are more several scrub test methods for paints, and they add to the confusion
 - ASTM D2486 is the original scrub test method for paints
 - It measures the "resistance of different paints to erosion" when subjected to a wet abrasive scrub pad; "The coated panel is then scrubbed with a bristle brush and an abrasive scrub medium until the paint film is removed in one continuous thin line across the shim." It is important to point out that the film gets damaged intentionally during ASTM Scrub, but the damage is not taken into account as only the end point of total removal of the film counts.

o ASTM D2486 actually has Method A and Method B

- The reason is because ASTM acknowledges that the scrub count in Method A is not reliable even when used in proper context:
 - ASTM D2486 paragraph 4.3: "Test Method A measures scrub resistance by the traditional cycles-to-failure concept. Poor correlation in scrub testing can be attributable to among other things, variations in the stiffness of the brush bristles, condition of washability tester, application and drying conditions. In an attempt to improve reproducibility, Test Method B has been developed."
- Most people think ASTM D2486 Method A, which measures a scrub count to total film removal is the only ASTM scrub method, but
- Method B requires a control paint, and the results are not a cycle count but a percentage of the control scrub count
- o ASTM D4213 is another scrub test variant meant to address inherent issues with scrub testing
 - It requires testing the test paint on the same machine and at the same time next to a control panel:

ASTM D4213 paragraph 4.2: "The precision of scrub resistance measurements in absolute physical values, such as Test Methods D2486 cycles-to-failure or this test method, microlitres per 100 cycles, is poor due to the relatively large effect of subtle and difficult-to-control variables in test conditions. The test method described herein minimizes this problem by using a standard calibration panel as an integral part of each scrubbing operation and relating its weight loss to that of the paint film under test to establish the latter's scrub resistance."

 Results are reported not in scrub cycles by as a percentage plus the reference panel must be noted in the results





• MPI[®] (Master Painters Institute) Scrub test

- MPI scrub test is a modified version of ASTM D2486 whereby they only use a soft sponge and no abrasive cleaners; unlike ASTM D2486 the MPI scrub test is stopped after a given number of cycles to determine film damage; results are given as pass/fail
- o Green Seal[™] GS-11 and Benjamin Moore's Green Promise[®] scrub test
 - Green Seal[™] GS-11 uses ASTM D2486, but the requirement is for the film not to totally erode after 400 cycles; our Benjamin Moore's Green Promise products meet this requirement
- EU (European Union) and ISO (International Standard Organization) EN 13300 and ISO 11998 scrub test method (since we are an international company)
 - The requirements are based on 200 abrasive cycles and a also on a cleanability test for interior paint classification into 5 categories:

"The Ecolabel fitness for use criteria require that wall paints (according to EN 13300) for which claims are made (whether on the product or in related marketing material) that they are washable, cleanable or brushable shall have a wet scrub resistance as measured by EN 13300 and EN ISO 11998 of Class 2 or better (not exceeding 20 microns after 200 cycles)."

Class $1 < 5\mu m$ removed at 200 cycles Class $2 \ge 5\mu m$ and $< 20\mu m$ removed at 200 cycles Class $3 \ge 20\mu m$ and $< 70\mu m$ removed at 200 cycles Class $4 < 70\mu m$ removed at 40 cycles Class $5 \ge 70\mu m$ removed at 40 cycles Key: 25 micron is about 1 mil

The EU and ISO tests do not value absolute numbers of scrub cycle count but rather on minimum thresholds and ranges for film integrity assessment, and this is lacking in ASTM D2486 scrub testing.



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