

Technical Information Bulletin (TIB): Coating Properties and Test Methods

GENERAL INFORMATION

The purpose of this TIB is to discuss and clarify the various properties and test methods available for the evaluation of resinous materials. There are quite a few options available. Normally manufacturers choose the ones that will present their products in the best light. In this TIB, we will attempt to relate properties and test methods to real world performance. We will build a framework to determine which are relevant to you and your choice of material.

ADDITIONAL RESOURCES

Wolverine Coatings Corporation (WCC) has developed this bulletin along with other technical information to help all interested parties, from specifiers to applicators to owners, have a better understanding of the considerations, materials, and techniques required for proper installation. Consult all relevant information before using WCC materials.

WCCTechnical Information Bulletins TIB: N/A

WCCTechnical Detail Drawings TDD: N/A

WCCTechnical Data Sheets TDS: N/A

WCC Safety Data Sheets SDS: N/A

SAFETY

Prior to commencing work, carefully read and follow all SDS, technical data sheets, and any instruction manuals for products and equipment used during installation. Following the safety regulations of jobsite, local, state, and federal authorities is the responsibility of the installation company, general contractor, and/or facility owner.

Concrete dust is a source of silica particles and other hazardous materials that can cause silicosis and other illnesses. Proper safety equipment and methods are the responsibility of the installation company, general contractor, and/or facility owner.

DISCLAIMER

This Document does not purport to address all applicability and safety concerns, if any, associated with its use. It is the responsibility of the user to determine applicability of the information and to establish appropriate safety practices.

SOLID (CURED) PHASE PROPERTIES

	ASTM D523	Gloss is a measurement of the 'perceptible shininess' of a substrate. It is measured using a special tool called a Gloss Meter that calculates the value of specular reflectance measured in GU (Gloss Units). A Gloss Meter shines light on the substrate at a specific angle (typically 20°, 60°, or 85°) and then measures that light on the opposite side at the same angle (specular reflectance). When the emitted light is diffracted the reflected path changes angle and is not returned to the other side which will yield a lower GU number. The more light is reflected to the observer at the same angle the higher the gloss reading in GU (gloss units) and the more 'perceptible shininess' the human will see. The perception of gloss is dependent on the smoothness of the substrate to be coated, the thickness of the applied coating, and the final smoothness of the coated surface. While there is not a specific standard for naming gloss levels the following is a good general guideline: Flat (1–9 GU), Low Sheen (10–25 GU), Eggshell (26–40 GU), Semi Gloss (41–69 GU), Gloss (70–89 GU), High Gloss (>89 GU).
	ASTM D1544	Gardner Color is determined by comparing a test vial of a transparent liquid to standardized vials which contain known colors. The Gardner Liquid Color Standards (known colors) consist of 18 vials of transparent liquid numbered from 1 to 18. The lower number vials are very light color with number 1 being water clear. As the Gardner Color Standard number increases the color moves through yellow (5-10), amber (11-14), browns (15-17), and finally to transparent black (18). This is a subjective test.
	ASTM D790	Flexural Modulus measures the stiffness (ratio of stress to strain) of a cured coating. Higher modulus yields a stiffer coating that will transmit stresses and strains more directly through the coating surface to the bond line. Low modulus materials will insulate the bond line much like flexible building foundations utilized in earthquake prone areas protect the rigid building from damage caused by movement. See also Flexural Strength.

SOLID (CURED) PHASE PROPERTIES (CONTINUED)

- ASTM D790 Flexural Strength is measured using a 3 point (or sometimes even a 4 point) bend test. The test defines the amount of stress applied to a material at the point that it moves from a bend to a break (ruptures). The stress (3 point test) is defined as , where is the force applied at the fracture point, is the distance (length) between the support spans, is the width of the specimen, and is the thickness of the specimen. Flexural Strength was not able to be determined on BondTite 1101. An independent laboratory confirmed that this material is highly flexible even at high thicknesses (1/2 inch) and even after being aged. Since the material would never break even at multiple thicknesses and configurations a value could not be determined (even in 15 tests). See also Flexural Modulus.
- ASTM D695 Compressive properties include modulus of elasticity, yield stress, deformation beyond yield point, and compressive strength (unless the material merely flattens but does not fracture). A sample is placed between two plates that are compressed together at a uniform rate. The maximum load at the break point is recorded as well as stress/strain data. When a material does not break the numbers are highly subjective.

LIQUID PHASE PROPERTIES

ASTM D638 Elongation is the measure of the ability of a material to stretch. Higher elongation combined with high flexural strength allows a coating to take more punishment from movement without failure. Primers with low elongation are more brittle and can break underneath your coatings system and will eventually result in peeling.

- ASTM D2240 Hardness describes the ability of a material to resist indentation. Hardness is measured using a Durometer which employs a needle that is impressed into the coating. The farther the needle impregnates the coating the lower the measured hardness. Many people mistakenly associate hardness with abrasion (or wear) resistance. While hardness can increase wear resistance of some materials it can also decrease it when a coating is so hard that it becomes brittle (like glass, a very hard but brittle material).
- **ASTM D4060** Taber Abrasion is a test to determine a coating's resistance to wear. Resistance to abrasion is defined as the ability of a material to withstand mechanical action (rubbing, scraping, or erosion). A coated test panel is allowed to cure (dry) and then weighed. The panel is placed on the Taber Abraser. A 1000 gram load is placed on each grinding wheel on the machine and then the wheels are allowed to rest on the coating surface. The machine turns the test panel for 1000 cycles as the grinding wheels abrade the coating. The wheels are resurfaced at the beginning of each test and after 500 cycles. After 1000 cycles the test panel is weighed and the difference between the starting weight and the final weight is recorded. Many companies skew their test results by varying the test parameters. Sometimes you will see only 500 cycles instead of 1000. Many times the weight on the wheels is diminished. Or, a less abrasive wheel is used. For this test to be valid there must be 1000g weights, 1000 cycles, and CS-17 grade wheels must be used.
- ASTM D4541 Bond Strength is a measure of the force required to pull a coating off of a substrate. Many epoxy primers will have higher bond strength to concrete than the tensile strength of the concrete. This means that the concrete will break before the primer can disbond (break). However, the deeper the primer is allowed to penetrate, the more force it will take to break the concrete since the concrete must break further beneath the surface. The combination of low viscosity and low surface tension allow BondTite 1101 to penetrate as much as possible.
- ASTM D5420 Impact Resistance measures the amount of energy a material can absorb without breaking, fracturing, or disbonding. A coating is applied over a steel panel and placed in a Gardner Impact Tester. The falling weight of the tester is dropped at various distances until the coating fractures or breaks. A hit directly to the face of the coating is know as a "Direct" test while a hit to the back of the substrate (steel panel) is considered to be "Indirect". The resistance is expressed in 'Inch Pounds' of force where a higher number is better. The maximum amount of force that can be measured is 320 inch pounds.

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SAFETY

For your safety, all required personal protection equipment should be used when operating machinery or handling chemicals. Concrete dust is a source of silica particles and other hazardous materials that can cause silicosis and other illnesses. Proper safety equipment and methods are the responsibility of the installation company, general contractor, and/or facility owner.

WARRANTY

Wolverine Coatings Corporation warrants its products to be free from defects in material and workmanship. Wolverine Coatings Corporation's sole obligation and Buyer's exclusive remedy in connection with the products shall be limited, at Wolverine Coatings option, to either replacement of products not conforming to this Warranty or credit to the Buyer's account in the invoiced amount of the nonconforming products. Any claim under this warranty must be made by the Buyer to Wolverine Coatings in writing within five (5) days of Buyer's discovery of the claimed defect, but in no event later than the expiration of the applicable shelf life, or one year from the ship date, whichever is earlier. Buyer's failure to notify Wolverine Coatings of such nonconformance as required herein shall bar Buyer from recovery under this warranty.

Wolverine Coatings makes no other warranties about the product. No other warranties, whether expressed, implied, or statutory, such as warranties of merchantability or fitness for a particular purpose, shall apply.

Any recommendation or suggestion relating to the use of the products made by Wolverine Coatings, whether in its technical literature, or in response to specific inquiry or otherwise, is based on data believed to be reliable; however, the products and information are intended for use by Buyers having requisite skill and knowhow in the industry, and therefore it is for the Buyer to satisfy itself of the suitability of the products for its own particular use and it shall be deemed that Buyer has done so, at its sole discretion and risk. Variation in environment, changes in procedure of use, or extrapolation of data may cause unsatisfactory results.

LIMITATION OF LIABILITY

Wolverine Coatings Corporation's liability on any claims based upon Wolverine Coatings Corporation's negligence or strict liability, for any loss or damage arising out of, connected with, or resulting from the use of the products, shall in no case exceed the purchase price allocable to the products or parts thereof which give rise to the claim. In no event shall Wolverine Coatings Corporation be liable for consequential or incidental damages.

LITERATURE REVISION

Published literature is subject to change without notice. Wolverine Coatings Corporation is constantly formulating innovative products, new technologies, and practices. Please check www.wolverinecoatings.com for the latest product data sheets.



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