SHERWIN WILLIAMS® | HIGH PERFORMANCE FLOORING

FLOOR EVALUATION GUIDELINES

Flooring problems on concrete from vapor emission, dew point, alkalinity, pH, etc., cause millions of dollars in repair and replacement costs annually. By recognizing potential problems, testing for and mitigating them, steps can be taken to ensure a long-lasting, successful flooring installation.

WHAT IS MOISTURE VAPOR EMISSION?

Water is added to turn cement, sand and aggregate into a concrete slab. There is a critical volume of water needed to "hydrate" the concrete and an excess volume of water used to make the concrete pourable and workable. It is this excess that can emit from the slab. Moisture is also a concern when the concrete slab has no vapor retarder installed, or the vapor retarder has been punctured.

HOW DOES MOISTURE MOVE THROUGH THE SLAB?

Capillary Moisture

Ground water touches the bottom of the concrete slab, and wicks into the concrete through microscopic bleeder water channels until it reaches the coating surface. As the water comes through the slab, it brings calcium/sodium salts with it; this can degrade the bond line and cause the coating to delaminate.

Osmotic Moisture

Actual water vapor transmission through the concrete slab condenses again at the bond line and causes the same problem as in the capillary moisture case. This can happen when the water table is far below the slab with an improperly installed or missing vapor retarder. Three conditions are needed for osmosis to occur: a semi-permeable membrane, which can be the polymer primer or the upper layers of the slab; a gradient of ionic activity (soluble salts, which are indigenous to concrete); and a source of moisture vapor. If any one of these three things is removed, osmosis cannot occur.

Hydrostatic

The surrounding water table is higher than the concrete slab on grade. Because water seeks its own level, it is forced through the slab under pressure. This type of water pressure is not the usual cause of coating failure.

The volume of moisture that can pass through a slab depends on the porosity of the slab. Porosity is a direct result of the water/cement ratio in the concrete mix design. As the water/cement ratio increases, the porosity of the concrete increases exponentially.

WHAT IS THE TRADITIONAL FAILURE MODE BECAUSE OF "MOISTURE" PROBLEMS?

There are two ways a polymeric floor can fail:

1. The floor system was never able to bond properly at the time of installation.
2. There were factors present at the time of installation to cause the bond to fail. Symptoms of failure on an already installed floor may include bubbles, blisters and/or delamination.

WHAT CAUSES A POLYMERIC FLOOR TO FAIL?

Specific ionic components of the surface chemistry of the slab (the top 0 - 3/16" [5mm]), past a certain threshold, can cause a failure to occur. Moisture failures such as capillary action, hydrostatic pressure and osmotic blistering can also occur.

Concrete defects resulting from alkaline-silicate reaction (ASR) or alkaline-aggregate reaction (AAR) within the slab may also contribute to floor failure. Sherwin-Williams High Performance Flooring recommends all concrete be tested for quality by a licensed petrographer.

HOW DO I TEST MY FLOOR?

Sherwin-Williams High Performance Flooring has developed a chart to assist you with identifying the moisture limits for each type of Sherwin-Williams flooring system. If you are planning to use our Epoxy or MMA, Sherwin-Williams recommends using in-situ Relative Humidity (RH) Testing per ASTM F-2170 as a quantitative test method. In-situ RH is the preferred method as it is not significantly impacted by ambient temperature and relative humidity conditions in the building, and thus likely to provide more accurate readings. Calcium chloride (CaCl) testing is not recommended for moisture testing as results will differ based on the environmental factors at time of testing.

In cases where a product can tolerate high levels of moisture such as Poly-Crete®, Hybri-Flex® or Resuprime MVP, Sherwin-Williams High Performance Flooring may recommend that cores be taken and analyzed to determine the levels of ionic components (salts) in the slab. Sherwin-Williams High Performance Flooring offers in-house core testing using ion-chromatography technology. Refer to the Sherwin-Williams High Performance Flooring Core Analysis Program on our website for more information.

Note: Test results from cores taken after osmotic blistering has already occurred may not be accurate due to the ionic components transferring from the substrate to the blisters.

SHERWIN-WILLIAMS HIGH PERFORMANCE FLOORING FLOOR MOISTURE LIMITATIONS

	RESUFLOR	ACCELERA	CRYLAFLOR	VENT-E	RESUPRIME MVP PRIMER	RESUPRIME MVP3 PRIMER	POLY-CRETE & HYBRI-FLEX
RH % MAXIMUM (ASTM F-2170) Recommended Test Method	80%	80%	85% (with bond test)	99%	99%*	99%*	99%*
CACL MAXIMUM LBS. PER 1,000 SF PER 24 HOURS (ASTM F-1869)	3	3	5 (with bond test)	N/A	20*	24*	20*

***Poly-Crete, Hybri-Flex and Resuprime MVP Primers**

Old Concrete (>1 yr. old)

Core analysis testing is recommended to rule out the potential for osmotic blistering caused by higher than normal levels (see next page) of soluble ion (salt) deposits at or near the surface. Refer to the Sherwin-Williams High Performance Flooring Core Analysis Program.

New Concrete (<1 yr. old)

Core testing is not required if NO concrete curing compounds, hardeners or densifiers were used. The use of any of these products may cause soluble ion (salt) deposits at or near the surface to exceed normal levels (see below), potentially producing conditions for osmotic blistering. In these cases, Sherwin-Williams recommends a core analysis to determine if these levels are suitable for an installation. Refer to the Sherwin-Williams High Performance Flooring Core Analysis Program.

The following data is based on testing of a concrete substrate profiled per G1 Concrete Surface Preparation Guidelines and free of any contaminants that could increase levels of the soluble ions listed. This data is to be used as a guide only. Please contact your local Sherwin-Williams High Performance Flooring Territory Sales Manager or the Sherwin-Williams High Performance Flooring Technical Service Department for a thorough analysis of your results.

NORMAL SOLUBLE ION LEVELS IN SUBSTRATE (PARTS PER MILLION)	
Sodium (Na)	~200-800 ppm
Potassium (K)	~200-800 ppm
Chloride (Cl)	~10-100 ppm
Sulfate (SO_4)	~1500-5500 ppm

PRE-INSTALLATION ACCEPTABLE SOLUBLE ION LEVELS IN SUBSTRATE BY PRODUCT (COMBINED NA, K, CL)	
Epoxy, Resuprime MVP, MMA, Accelera®	1600 ppm
Resuprime MVP3	2400 ppm
Poly-Crete® SLB, MD, HF (with topcoats) Hybri-Flex® E, M or A	3200 ppm
Vent-E	4800 ppm
Poly-Crete MD, HF (no topcoats)	4800 ppm
Resuflor® Aqua MCS	4800 ppm

In all cases, Sherwin-Williams High Performance Flooring products must be applied as per Sherwin-Williams High Performance Flooring Application Instructions on structurally sound and clean areas in which the concrete meets acceptable industry standards as defined in ACI Committee 201 Report, "Guide to Durable Concrete." Sherwin-Williams shall not be liable for bond failures caused by deficiencies in the substrate including, but not limited to, the presence of ionic compounds or soluble salts, alkali silicate reaction, alkali aggregate reaction, shale-pop, and other expansive reactions of aggregates and reinforcements. Sherwin-Williams recommends all concrete be tested for quality by a licensed petrographer.