



## ANTI-STATIC FLOOR FINISH TECHNICAL APPLICATION BULLETIN

### Anti-Static Floor Finish Composition

The application and maintenance procedures and equipment for applying Stat-Coat, anti-static floor finish is basically the same as for standard floor finishes. Anti-static a/k/a electro-static discharge control (ESDC) floor finishes, however, have a different chemical structure which requires that special attention be paid to certain details when they are being applied and maintained.

To provide static dissipation, anti-static finishes like Stat Coat contain a special active ingredient. This active ingredient is not readily compatible with standard floor finish polymer chemistry. Producing a quality ESD finish requires that a finely tuned balance be achieved between having a sufficient concentration of the active ingredient to provide effective ESDC properties, while avoiding an unacceptable level of the side effects inherent when incorporating anti-static compounds into finishes. These side effects can include increased water sensitivity, reduced gloss, extended drying times and slipperiness. The cause of these side effects is the active ingredient's tendency to absorb humidity present in the environment into the finish film. These hydrophilic properties help anti-static floor finishes to dissipate static charges. The consideration is that factors that inhibit regular floor finishes from drying and curing, like cool floor temperatures, high air temperatures coupled with high humidity and heavy coat application, also effect anti-static floor finishes, but to a much greater extent. This means that additional care and time must be taken when applying anti-static floor finishes.

### Anti-Static Floor Finish Application Considerations

In order to achieve effective static dissipative properties, a sufficient amount of active ingredient must be present in the floor finish film. To obtain static dissipation on anti-static vinyl composition tile or anti-static epoxy floors, a minimum of two coats of Stat-Coat is necessary. On regular vinyl composition or other non anti-static flooring, a minimum of three coats of Stat-Coat is required. In order to function correctly, both immediately after application and over time, the anti-static active ingredient must effectively bond to the polymer chain. Once a floor finish is applied, film formation occurs in two phases.

The first phase involves the evaporation of the water from the finish. Most floor finishes, ESDC and regular, contain between 75% and 84% water, which must leave the finish film before the second curing phase can start. The second phase, sometimes referred to as the glass transition phase, occurs after the water has evaporated and the co-solvents/plasticizers have reached a high enough concentration to initiate cross-linking of the various polymers used to make up the finish. It is during this curing phase that the anti-static ingredient becomes bonded to the polymer chain.

During both of these phases there are a number of environmental conditions and application factors that impact both evaporation rates and the curing of the polymer.

1. **Air Circulation**-moving air holds more moisture than stagnant air, so although positive air circulation is beneficial under any circumstance it becomes critical in higher humidity conditions.
2. **Floor Temperature**-the optimum floor temperatures for effective evaporation and curing of both regular and ESDC finishes is 65-75° F. Floor temperatures at either extreme can have a significant negative impact. At less than 50° F many polymers will never achieve the glass transition phase, never cure and will display adhesion failure, powdering, lack of gloss and streaking and mop marks. At excessively high temperatures, greater than 85° F, floor finishes can flash dry at the interface between the floor and bottom of the finish film and may not adhere properly. When ever possible, adjustments should be made to the environmental controls

to bring floor temperatures a close to optimal as possible. If adjustments can't be made, cooler floor temperatures will require additional drying and curing time.

3. **Humidity**-humidity conditions are an important factor in the drying and curing of any finish, but can have a critical impact on the performance of ESDC finishes. The ideal application humidity level for ESDC finishes is 40% relative humidity or lower. 40% relative humidity is also the level at which ESDC finishes provide optimum static dissipative properties. As previously mentioned, the second curing phase of finishes starts when sufficient water has evaporated and the co-solvent/plasticizer levels reach a high enough concentration to initiate cross-linking of the polymers. The challenge with ESDC finishes is that this is also approximately the point at which the anti-static active ingredient reaches a high enough concentration to start absorbing atmospheric humidity. This creates a conflicting set of chemical reactions which results in ESDC finishes being much more sensitive to humidity levels and drying times than standard floor finishes. At humidity levels higher than 60% ESDC finishes can take an extraordinarily long time to cure, as much as 24 hours per coat, so when possible, it is best to simply avoid applying ESDC finishes under these circumstances.
4. **Drying Times**-most standard vinyl composition tile finishes will generally dry and have cured sufficiently to allow additional coats to be applied within 20-60 minutes depending on humidity conditions. Because of their chemistry ESDC finishes take substantially longer. Perma recommends that no more than 3 coats be applied in an 8-hour period, under positive drying conditions. A minimum of 2 and preferably 4 hours drying time should be allowed between coats. Adverse drying conditions will require allowing even longer drying times between coats.
5. **Coat Thickness**-due to ESDC finish's particular chemistry they should be applied as thinly as possible. Coverage rates should be approximately 2000 ft<sup>2</sup> to 2500 ft<sup>2</sup> per gallon. Heavy applications will take longer to dry and cure, and will increase the potential for experiencing short and longer term performance problems.

### **Symptoms of and Procedures for Correcting Mis-Application**

ESDC finishes are prone to displaying the same symptoms of incomplete drying and curing that regular floor finishes are. These symptoms include increased friction or drag when applying successive coats. Mop marks or streaking after the finish has dried but has been unable to cross link and cure, a lack of or inconsistent gloss characteristics and inconsistent adhesion that ultimately results in powdering of the finish off the floor.

A condition that is specific to ESDC finishes is directly related to the anti-static active ingredient they contain. This condition occurs when multiple coats of ESDC finishes are applied without sufficient time for the finish to cure and the anti-static ingredient to bond to the polymer chain. In these circumstances, the un-bonded active ingredient which has a lower specific gravity than the other floor finish components, floats to the surface and forms a greasy sometimes slippery feeling layer on the surface. Correcting this problem requires that the surface be scrubbed with a low speed (175-300 Rpm) buffing machine or automatic scrubber equipped with red buffing or blue cleaning pads and a solution of 8-10 ounces of Perma #137 Stat-Clean per gallon of warm or hot water. The solution that will now contain the dissolved anti-static ingredient should be vacuumed or mopped up. The floor should then be coated with a thin application of Perma #27 Stat-Coat and allowed to cure for 24 hours before being put back into service. This procedure will generally restore the film so that it complies with the EOS/ESD Association's S20/20 recommendations of a  $1 \times 10^7$  to  $1 \times 10^9$  Ohms/Cm<sup>2</sup> @ 40% relative humidity, resistivity specification. In extreme circumstances so much active ingredient may have migrated from the finish film and been removed by scrubbing that a second coat will be required to restore appropriate resistivity readings.

Allow 72 hours curing time after the last coat of finish before washing with Stat-Clean. Allow 5 days curing time before spray buffing or burnishing with Stat-Buffer.