

TITLE: POWDER COATING NEWLY GALVANIZED STEEL SURFACES

SCOPE: This specification covers the surface preparation, application and repair of powder coating material over hot dipped galvanized steel surfaces.

Materials:

Galvanizing:

All materials to powder coated shall be galvanized in accordance with ASTM A 123. Only the dry-kettle (pre-fluxing) process shall be used. The material shall not be water or chromate quenched. Galvanized materials to be powder coated shall be air cooled only. An American Galvanizers Association trained Master Galvanizer shall be on the premises during the hot dipped galvanizing process.

Powder:

Powder coating material shall be a thermosetting, durable, TGIC polyester powder of a degassing grade. Such coating powder must be recommended by its manufacturer for use over hot dipped galvanizing. The coating powder's particle size distribution shall be recommended by its manufacturer to produce the best results for powder coating components under this specification.

Surface Preparation

The zinc surface shall be prepared for powder coat application using a multistage system employing appropriate cleaners and imparting a phosphate conversion coat to provide an appropriate substrate for the powder coat material. During the cleaning process, water rinses shall be used as appropriate between stages to clean the items and prepare them for the subsequent stages. Water for the rinses, unless specified elsewhere shall be potable with a hardness not to be more than 250 ppm as CaCO₃ and a combined chloride and sulfate level less than 100 ppm.

Surface Defects:

All drainage spikes, tears, high spots, protrusions or other surface defects shall be removed using hand or power tools. The zinc shall be removed until it is level with the surrounding area. Such operations shall not remove the galvanized coating below the thickness allowed by ASTM A 123. Thickness of the galvanizing shall be verified using a properly calibrated magnetic thickness gauge as per ASTM E 376. Any item falling below the required zinc thickness, before or after removal of any high spots, shall be repaired in accordance with Practice A 780.

Surface Cleaning:

The galvanized surface shall be clean and free of oils and grease before they are powder coated. These shall be removed by use of an aqueous alkaline solution and/or hand or power tool cleaning. Subsequent to alkaline/power cleaning, trace zinc oxide will be removed by a mild acidic solution.

- An alkaline solution, pH in the range of 11 to 12 may be used to remove traces of oil, grease, or dirt. The alkaline solution shall not have a pH exceeding 13. After cleaning the piece shall be rinsed thoroughly in water under pressure.
- Hand or power tool cleaning may be used to clean light deposits of zinc reaction products such as wet storage stain, as specified to SSPC Surface Preparation Specification 2 or 3 as appropriate.
- An acidic solution with a pH of 3.5 to 4.5 shall be sprayed onto the item to remove residual zinc oxide.

Surface Profiling:

The galvanized surface shall be profiled to promote proper powder coating adhesion. This shall be accomplished by applying a phosphate treatment to create a protective crystalline phosphate conversion coating on the zinc surface. The coating shall have a coating weight between 20 to 70 mg/ft².

Final Rinse:

To ensure the most optimum performance possible, a final rinse of de-mineralized water shall be applied as a final rinse prior to pre-baking. This stage will remove any un-reacted phosphate and other contaminants.

Powder Coat Application

Pre-baking:

Following phosphating all items to be powder coated shall be placed in an oven capable of maintaining a temperature of 500°F. Specimens shall be baked at a temperature 25°F above the normal cure temperature for the powder that will be employed. The specimens shall remain in the oven for a minimum of 20 minutes after having equalized to the temperature of the oven to remove any residual moisture from the preparation phase, and insure expulsion of any entrapped gases or moisture. Typically, specimens are pre-baked for one hour.

Powder Coat Application:

Polyester powder shall be applied through electrostatic/tribomatic application guns. The powder shall be applied in multiple coats. The first coat shall have a thickness of 1.5 to 3 mils. Each intermediate coat shall be partially cured at a temperature of 350°F to insure adhesion. Subsequent coats shall be then applied in 1.5 to 3 mil increments to bring the specimen to its final (cured) thickness as required by the customer specification. In no case will the final (cured) thickness be less than 5 mils.

Cure:

The powder coating shall be cured by heating the coated specimens to a temperature and duration specified by the powder coat material manufacturer to insure sufficient curing of the powder coating material. The resulting coating shall be uniform in color and free of pinholes, blisters, and other surface defects. Correct cure shall be checked by a solvent rub test.

Properties of Cured Coating

Minimum film thickness	: TGIC	5.0 mils (120µm)
Direct impact	: ASTM D 2794	160 in./lb (9.0 m/kg)
Reverse impact	: ASTM D 2794	160 in./lb (9.0 m/kg)
Pencil hardness (scratch/gouge)	: ASTM D 383	2H
Flexibility (Mandrel test)	: ASTM D 522	1/8 in. (3m mm)
Minimum adhesion	: ASTM D 3359	5A,5B (100% crosshatch)
Salt spray	: ASTM B 117	+ 1000 hrs < 2mm

Repair of Powder Coated Material

- Damage shall be defined as exposed galvanized coating.
- Damaged coatings less than ½ of 1% of the surface area shall be acceptable for repair. Damage greater than that amount shall be recoated. Final finish shall be damage free FOB the plant.
- Coatings to be repaired shall be touched up as recommended by the galvanizer and the powder coating supplier. Touch up and/or field repair can be accomplished using either powder coating material or paint. Typically acrylic based paint as recommended by the powder coating material manufacturer, applied either by spray or brushed on liquid is used for touch up and repair of the powder coating.