

# How to coat with porcelain enamel

Evolution cover coats come as powders that get reconstituted with water (100:47) in a high-shear blender. The resulting enamel slip is put through a 60 to 100 mesh screen and applied with a wet spray gun onto a suitable metal substrate. It goes on top of a fired-enamel ground coat that can be applied either electrostatically or by wet spray. The cover-coated part is fired at temperatures from 1,480 to 1,570°F (804 to 854°C) for 2 to 3 min. The furnace must be at the proper firing temperature from the beginning, not ramping up. It's also important that parts be correctly spaced on hangers. Parts should be designed to hang with the longest dimension down to reduce warping.

All forming and assembly of the product takes place before finishing. There are no post-finishing steps, although panel controls or other decorations are sometimes added by screen printing. The fired thickness of the cover and ground coats is 5 to 6 mils (125 to 150 µm).

While most laundry and range OEMs have porcelain enamel coating lines, others make use of job shops such as **American Trim**, Erie, Pa. and **Porcelain Industries**, Dickson, Tenn. Application costs typically are com-

petitive with those of powder coating.

Substrates should be enameling grade, low-carbon steel that can withstand the process firing temperatures. Use of hot rolled or high-carbon steel generally results in a poor finish. Most major steel suppliers carry enameling steel.

To prevent warping during firing, steel should be at least 14 to 24 gauge, thicker for large parts. Any attachments should be made of the same material and two gauges lower than the base part. Flanges should also be used to make parts more rigid. Flanges on panels of 10 to 12 ft (3.05 to 3.66 m) should be at least 0.50 in. (12.7 mm) with a depth of 0.75 in. (19.05 mm). Try to avoid cut-outs and notches in flanges. They concentrate stresses on the flat area being reinforced, leading to hairline defects, cracks, and chipping. In place of flanges, long edges may be rolled to add rigidity. Open rolling is recommended to help clean the part, and rolls should have a minimum radius of 0.19 in. (4.82 mm) to prevent spalling of the coating.

In general, enamels tend to pull away from sharp edges and corners. Rounded corners let the coating adhere better and

minimize chipping. For two-coat enamels, the radius should be at least 0.19 in. (4.82 mm). Less than that could lead to mechanical failure in the fired coating. Embossing in a panel should also observe the minimum radius.

If the ground coat is to be applied electrostatically, it's important to avoid creating Faraday cage areas or corners that can keep the powder enamel from sticking. Observing minimum radius requirements and making tabs less than 0.50 in. long will prevent Faraday cage defects.

Screw or bolt holes must be large enough to avoid formation of enamel bridges. Hole dimensions should be 0.062 in. (15.75 mm) larger than the bolt to compensate for enamel buildup, or the hole may need reaming. Where appearance is critical, the holes should be dimpled to reduce or hide sharp edge burn-off.

More detailed information, including guidelines for one-coat aluminum enamels, is available in the technical manual *PEI-101: Design & Fabrication of Metal of Porcelain Enamel*. This and other technical manuals, coaters, and other suppliers can be found on the Porcelain Enamel Institute Web site ([www.porcelainenamel.com](http://www.porcelainenamel.com)).