Ask the Experts sponsored by Gema

Your questions answered by PCI member experts.

You have questions, we have answers. In each issue of PCT*, our extensive network of powder coating experts provides information to help you with your powder coating challenges. Let us know what's keeping you awake at night, and we'll do our best to help you get a good night's sleep!*

A HAZy Situation

We design and build frames and weldments for our equipment. After they are fabricated, they are sent to our powder coating department. For the most part, the appearance and performance of the parts after coating meets our quality standards. However, I am having an issue where my powder coat will have good adhesion everywhere on the part except for the welds. What can I change to have good adhesion on the welds also?

The weld bead and area around the weld, known as the heat affected zone (HAZ), typically contain a variety of inorganic soils that may create a barrier layer between the substrate and subsequent coating, either conversion coating or paint. This barrier inhibits the adhesion of the paint to the substrate. The inorganic soils on the weld bead are typically weld slag (flux) or weld filler elements found in the weld wire/rod, such as silicon, manganese, or copper. These soils should be removed using manual or automated mechanical abrasion. The typical mechanical methods used are grinding, sanding, blasting, or brushing/scraping.

In the HAZ area of the substrate, adjacent to the weld bead, the heat of the welding operation changes the properties of the substrate. The primary inorganic soil in this HAZ is weld scale. Weld scale is an oxide layer created from exposure of the heated substrate to the surrounding oxygen containing environment. This scale can be removed using mechanical (same as for the weld bead area mentioned above) or chemical methods. The chemical method typically utilizes an acidic pickle solution; however, neutral pH pickle products are now available in the marketplace. The pickle can be applied via spray or immersion and is typically integrated into the surface treatment operation. There are also thixotropic or gel products available that can be applied by non-atomizing, low-pressure spray or by brush in manual operations.

Respect the Spec

I am a landscape architect and installation contractor and am looking for quality assurance references in my specifications for powder coating steel and aluminum products such as fencing, railings, and other products used for landscaping. These products must withstand UV light, salt spray, rain, and dust particles. They are expected to perform for many years after installation. Are there any industry standards that powder coating suppliers and applicators can utilize during the coating process?

The industry standard for architectural coatings is provided by the Fenestration & Glazing Industry Association (FGIA) which was previously known as the American Architectural Manufacturers Association (AAMA). FGIA has three standards depending on the performance and length of warranty required for the application. The powder manufacturer will provide a warranty of a given time frame if the coating is applied by a certified coater. The standards are as follows:

- AAMA 2603-21–Pigmented Organic Coatings is for standard polyester coatings which typically are used on interior applications where they don't encounter harsh weathering or corrosive environments. The coating performance must be for at least one year, but most powder coating applications will exceed this.
- AAMA 2604-21–High Performance Coatings typically utilizes superdurable polyester powders used on external architectural products such as window and door frames, railings, fencing, etc. These products will have a five- or 10-year warranty.
- AAMA 2605-21–Superior Performing Coatings uses PVDF or fluoropolymer coatings for the highest level of performance on exterior products. Using this standard will provide a 10-to-20-year warranty. However, they may even exceed even this.

More information on these standards is provided in the *PCI Architectural Specification Comparison* document found on the PCI website (www.powdercoating.org/ArchitUse).

Blast Off

I am hoping you might be able to help me or point me in the right direction. I am seeing a particular defect reoccur and could use some fresh insight. The defect shown in the photo is occurring on all areas of the square tubing part.

The substrate is A36 carbon steel. It comes in clean condition, but we do a white blast. At present, these frames are not exposed to grease, oil or other hydrocarbons, or silicone. It could be in the center of the tubing like you see in the picture provided; it could be on the shoulder. The defect can and does appear in various locations on the part.

When you get up close, it looks as though the coating is "pulling away" from the substrate. There is something between the substrate and the coating. I could use help, is this something you can assist me with?

Without knowing additional details this defect looks like it is the result of some sort of hydrocarbon or graphite dust that has not been removed before coating. Typically, there are two common types of problems that could cause this:

- Some sort of entrainment (entrapment of one substance by another substance) during/after the blasting. You would have to view this closely to see if this residue was present prior to the powder application.
- The second is common when transporting or stacking bare metal to metal after blasting where there may be some type of rubbing and vibration forces. This can generate a graphite-like dust. As an example, this has been seen in parts that were shipped without careful packaging and rubbed together during transport.

In either case the dust residue will not flow out with the powder during the cure process and often manifests with this type of a defect. If the parts are hung directly on the line and blasted with no transport, you should look for residue and either clean/wash or blow very carefully with clean air. If blasted clean and stacked afterward for transport to the coating process, then some protection or alternate handling may be required.

You might also check to see if there is something on the surface that is not being removed and the blast may be embedding it deeper into the metal. A suggestion would be to chemically clean a few parts, then blast and powder coat them to see if any of the defects show up. One final consideration applies if you are reclaiming the blast material. If there is contamination in the reclaim, there will be defects. Try replacing the blast media to see if this eliminates the issue.

Too Much Cake

I am the coatings department manager at a metal fabrication company. We powder coat radius and bent material that can be as large as 48 x 144 inches. We are hanging these parts using hooks that are then connected to a piece of channel strut on our cart. Over time, that channel is getting caked up with powder and when we roll our cart from the booth to the oven, bits of powder break off and hit our product causing defects. Do you have a suggestion of how to keep this clean so this does not happen? And would placing a charge on the cart while we ground directly to the part with a nonconductive material in between help "repel" or at least reduce the amount of powder getting onto our cart?

What you are experiencing is very common. Powder will build up cured layers and then flake off. There have been attempts to develop a coating that repels the excess powder coating, but so far nothing has been created that really works well, or if it showed potential, was very expensive. The best practice is to have extra carts so they can be swapped, and one set cleaned (either in-house or outsourced) while the other set is used in production. In addition to the quality problems, if you let the powder build up you can impact the grounding required to safely perform the electrostatic operation. The National Fire Protection Association (NFPA) requires less than one meg-ohm resistance.

As to your question about placing a separate charge on the channel, this would not be recommended as having different electrical charges can cause several issues of concern, such as sparking, which creates a fire hazard.

Mission Control

We have an existing powder coating booth and wish to add a powder gun control panel. How can I install this and still meet the NFPA 33 standards for a panel in a booth without having to create an explosion proof enclosure?

You are correct that you must install the booth to meet the National Fire Protection Association NFPA 33 standard. Typically, the electrical control panel is mounted on a shelf outside the booth with a door that includes a clear plexiglass or glass window to allow the operator to access the panel to change gun settings. This meets the NFPA requirements and still allows for the hopper, gun, box feeder, and any other non-electrical components to remain in the booth during the spray operations. It is also important to utilize a qualified electrician who understands all applicable codes to ensure the installation is done properly.

Have a question for our powder coating experts? Send it to asktheexperts@powdercoating.org.