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# Ask Joe Powder

## Keep It Clean

**Q** Greetings Joe Powder, I have a question about galvanized steel. I want to apply powder coating on galvanized steel. How can I do surface treatment before powder coating? Do I need to apply a primer?

Thank you,  
Özgür T.

**A** Hello Özgür, Allow me to help. Galvanized quality can vary and the age of the galvanizing is a factor to be considered. Cleaning is always a requirement. Alkaline cleaners are most common and a thorough, clean rinse is necessary. Alternately you can use a solvent (acetone, MEK, IPA, etc.). Care must be taken to keep changing rags as they get dirty. It's a good idea to blast the surface lightly with a suitable media. It's important to use clean media as if it is dirty you are only imbedding contamination into the surface.

Certainly, if the galvanized surface is more than a few days old I recommend blasting to remove oxides. A zinc phosphate (expensive) pretreatment works well, but may be too costly. I also highly recommend preheating the substrate before powder coating it. This will "degas" the zinc coating and avoid pinholes in the final film.

Using a good anti-gassing powder may allow you to avoid the preheating step. One thing is for sure—no primer is needed or advised. Ensure that you apply a good continuous layer of powder on all surfaces. Also make sure that you bake the coating thoroughly. Check the supplier's technical data sheet for the recommended baking conditions and make sure the metal reaches the temperature (not just the oven air). Galvanized substrates are very commonly powder coated. If you do it right you will have a finish that should last for years. One last thing—use the right powder coating chemistry for the environment in which it will be placed.

— Joe Powder

## Firing on All Cylinders

**Q** Hey Joe, I need your suggestions on a "Challenge for Powder Coating of Hydraulic Cylinders (Actuators)—Application—Cranes/Lifting Application." We manufacture hydraulic cylinders, these specific models ranging in stroke length from 0.8 m to 3.8 m.

Process flow is: raw material (tubes) → cutting → machining port holes and internal threading → honing (0.4 micron RA) → port welding to tubes, bracket welding (MIG) → powder coating on outer surface → assembly → testing.

The real challenge we have faced is rust on the inner surface of the cylinder. Due to high temperature during baking, the inner surface is getting rusty. We apply Haritant (rust preventive oil) which results in a rejection/rework of barrels since design doesn't allow even a minor rust. We also cannot hone again due to close tolerance limits as well as the powder coated outer surface gets dent marks. It seems rust preventive oil at inner surface is unable withstand high temperature (approx. 392°F [200°C]) during the baking process. The powder coating vendor suggested using oil that can withstand the temperature, but we could not source such oil (at least not at local markets).

How can I solve this problem? Do you have any ideas? We would appreciate your suggestions.

With best regards,  
Ashutosh G.

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**A** Dear Ashutosh,  
Yours is an interesting application and problem, indeed. I understand your need to prevent rust from developing on the interior of the hydraulic cylinders you produce. It may seem natural to use an oil-based rust preventative to meet this requirement; however, I see a number of problems with this approach. Oil is anathema to a defect-free finishing system. The reason is the difference in surface tension vs. nearly every organic coating technology. Oil causes cratering in a paint film. In addition, your curing process appears to exceed the thermal stability of the oils you have tried.

I recommend that you investigate the use of inorganic cleaners and surface preps to replace the oils that seem unsuitable. I would seriously consider an alkali cleaner followed by a rinse and then an iron phosphate pretreatment. This should give the cylinder the requisite corrosion resistance and offer adequate thermal stability in the powder curing oven. Iron phosphate metal pretreatment leaves a very thin, amorphous layer that shouldn't be a problem with the tight tolerances common for hydraulic cylinders.

— Joe Powder

## May I Borrow That Spec?

**Q** Hi Joe,  
What is the best way to specify the performance of powder coating on steel. With aluminum, I can use AAMA 2604. Is there something similar for steel?

Thank you,  
Dennis H.



Outdoor steel structures such as cranes require outdoor durable powders. Comprehensive finishing specifications are hard to find.

Photo courtesy PCR Group

**A** Hi Dennis,  
I have been asked this question many times. As you know it is rather easy to find an exterior architectural specification for powder coatings applied to aluminum. The AAMA, Qualicoat and GSB specifications are perfect finishing guidelines for the architect, fabricator and coater

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to meet the durability requirements for a specific end use.

The task is not so easy for specifying powder coatings for steel substrates. What I have found is the need to borrow specifications from organizations that cater more to liquid paint technology than to powder coatings. Our colleagues at the Society for Protective Coatings (SSPC) have good specifications for exterior grade liquid paints. Their SSPC Paint Specification No. 36 Two-Component Weatherable Aliphatic Polyurethane Topcoats specifies coatings for three different levels of durability. Specifically they delineate the following:

- SSPC Environmental Zones
- 1A (interior, normally dry)
- 1B (exterior, normally dry)
- 2A (frequently wet by fresh water, excluding immersion)
- 2B (frequently wet by salt water, excluding immersion)
- 3B (chemical exposure, neutral)
- 3C (chemical exposure, alkaline)

In addition, the National Association of Architectural Metal Manufacturers (NAAMA) and the National Ornamental and Miscellaneous Metals Association (NOMMA) have published the Metal Finishes Manual for Architectural and Metal Products. This manual focuses on a variety of coating technologies, including powders (see [www.nomma-northeast.org/wp-content/.../NAAMM-NOMMA-Finishes-Manual.pdf](http://www.nomma-northeast.org/wp-content/.../NAAMM-NOMMA-Finishes-Manual.pdf)).

Both resources are scant on any metal preparation specifications beyond galvanizing, blasting and the use of primers. Specifying metal preparation will require another guide, perhaps directly from a chemical pretreatment vendor.

Someday the industry will provide a comprehensive architectural specification for powder coating performance on ferrous metal surfaces. Perhaps we should join a committee at one of these associations and get to work on it.

— Joe Powder

Joe Powder is our technical editor, Kevin Biller. Please send your questions and comments to Joe Powder at [askjoepowder@yahoo.com](mailto:askjoepowder@yahoo.com).

**Editor's Note:** Letters to and responses from Joe Powder have been edited for space and style.

## Not Your Average Joe...

Each issue, we take the padlock off the PCI® Test-Lab door for a few minutes so our favorite technical editor and "powder guru" Joe Powder can run in the yard. When he's not gnawing on a rawhide bone, he loves to answer readers' questions. Go ahead and send him one at [askjoepowder@yahoo.com](mailto:askjoepowder@yahoo.com)... he doesn't bite. Maybe it'll end up in the next issue!