

WHITE PAPER



Powder Coating: A Post Fabrication Option for Metal Surfaces

Overview:

When an architect or designer thinks of painted architectural finishes on metal panels, the first thought often goes to fluoropolymer finishes that meet the performance criteria of the FGIA/AAMA finish standards. Typically, these finishes are coil coated or spray applied PVDF (polyvinylidene fluoride) or FEVE (fluoroethylene vinyl ether). Depending on the application and specification requirements, there is an alternative finish application method that can be used: Powder Coating.



While not applicable in all cases, powder coating provides an acceptable alternate application method that can meet all the performance criteria associated to coil coating while covering every exposed surface.

Discussion:

What is the difference between coil coated or spray applied coating and powder coating?

Most designers are familiar with coated finishes, either coil or spray, which are either coil coated or spray applied as a liquid and exposed to a raised temperature to cure the finish, which evolves off the solvents and solidifies the finish. While meeting the performance requirements of the FGIA/AAMA finish standards (2603, 2604, or 2605), the finish is a thermoplastic material which means that increased temperatures during product use may soften or otherwise affect the finish to some degree. The material is often cut to size or fabricated in some way that creates edges that are no longer covered by the finish. Panel cuts, perforations, and even fastener holes are examples of areas where the base metal may be exposed to the negative effects of the environment.

A powder coat finish is applied to a panel after the part has been fabricated. Every surface, even thin edges are covered with the powder coating which is held in place by an electrostatic charge. The coated part is passed through equipment that raises the finish temperature to a level where the powder melts forming a smooth continuous coating on every surface and around all bends. Upon cooling, the finish acts like a thermoset material and the reapplication of heat does not soften the finish or make it change state in any way.

What are the performance aspects of powder coating?

Powder coating is available using several different resin platforms providing for a wide variety in gloss levels and appearances (metallic flake, mica flake, etc.) Several different powder coating manufacturers can provide a finish that is compliant with the performance requirements and testing of the FGIA/AAMA finish standards including impact, chemical, and UV resistance. There is over 10 years of field test and exposure data for powder coat finishes that support the use of powder coating in architectural applications.

What are the limiting factors of a powder coat finish?

There are limitations to the use of powder coated finishes on certain substrates. Probably the biggest limiting factor to the use of powder finishes involves the hardness of the finish when cured. Where typical coil coated or spray applied finishes are thermoplastic with a pencil hardness of F, powder coated finishes are thermoset and have a pencil hardness of 4H (significantly higher than an F rating). This increased hardness is beneficial for resistance to scratching, but limits the amount of flexibility for the finish itself.



Coil coating and spray applied finishes may also experience limited adhesion or finish cracking when the material is folded on a 0.20” radius (FGIA/AAMA 2605 Appendix for coil finished products requirement) where powder coated materials are only required to show no loss of adhesion or finish cracking when bent to a 0.25” radius. While generally not showing any adhesion or cracking issues in normal exposure, the limited radius capability for powder coating means that additional fabrication after powder coating is limited.

Powder coating is a post fabrication finish and generally limited to materials be able to withstand the elevated curing temperatures seen during the finish process. Products such as aluminum extrusions, aluminum sheet/plate, and steel sheet/plate are prime candidates for powder coating (after product fabrication is complete). Products like MCM and IMP are not candidates for powder coating due to the impact of curing temperatures on the different types of plastic cores or to maintain the flatness of the finished products.

Finally, mainly due to conveyance of the part being coated, typical length limitations are approximately 20 feet. The coater should be contacted for specific size limitations.

Why consider a powder coating finish?

Aside from meeting the typical finish performance requirements, the hard surface of powder coating resists abrasion and scratches that are often experienced in architectural applications. Added benefits include that no primer, viscosity, or mixing control are required in the coating/curing process and that minimal VOCs are created during the application/curing process which makes powder coating an attractive environmental alternative.

Reduced VOCs is not the only environmental benefit since powder coating can be specifically formulated without several environmental “substances of interest” including:

- Triglycidyl isocyanurates (TGIC)
- Perfluorooctanoic acid (PFOA)
- Fluorosurfactants
- Hazardous air pollutants
- Other items identified on the Living Building Challenge (LBC) Red List

Summary

Powder coated finishes have been around for many years and the current pallet of color and finish choices includes options that meet accepted architectural standards. Powder coated finishes also offer some genuine value in the areas of scratch resistance and protection of the panel material from harmful environmental exposure issues. It is critical to keep in mind that the powder coating finishing process is generally a post-fabrication operation and that there are a limited number of facilities that can provide a factory-controlled quality finish.

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