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TECHNICAL BULLETIN: Metallic and Mica Applications

This document addresses the normal colour variation of **Metallic** and **Pearlescent** finishes.

The aluminum flake used in metallic coatings and mica pigments used in pearlescent coatings are termed "reflective" pigments. Their random orientation within a paint film creates a glitter effect by reflecting or bouncing off incoming light in different directions.

Aluminum flakes, aligned in the horizontal plane, perpendicular to the viewer's eye, reflect back all of the light giving the colour a brighter more silver appearance. As the flake's angle in the horizontal plane changes, less light is reflected back to the viewer's eye and the colour appears darker. Substrate shape also contributes to this effect. This is termed metallic "flopper 2-tone travel". A painted round tube will reflect less light back to the viewer's eye than the same substrate in the flattened form. The tube will appear darker. Architects routinely use this principal to their advantage by designing buildings with angled panels or bevelled corners so accent shades can be created from one colour.

Pearlescent pigments produce effects that are intimately connected with optics and the interaction of light with matter. These unusual pigments are optical filters that reflect or transmit light falling upon them. Light interference depends on the ability of different wavelengths to be separated. Visible light can be reflected, refracted, transmitted, absorbed, or scattered, depending on the surface and the composition of matter it encounters. When the substrate's surface is perfectly smooth, "specular" reflection is achieved (exact angle of reflection). It is to be noted that because a mica pigment is "semi-transparent", some light will also be transmitted to the next reflecting layer. If the surface is not perfectly smooth, the light is "diffused" (reflecting from the surface at many different angles). Typical production parts do not offer a perfectly smooth surface. The degree of surface roughness determines the ratio between "specular" and "diffuse" reflection. This unique optical property of pearlescent pigments can give the surface 2 different colours when viewed at 2 different angles (i.e. "specular" and "diffuse").

Normal production line variability in film thickness and bake schedule, as well as overall substrate configuration play an important role in this pigment distribution; slightly varying overall colour. However, the degree of colour variation is usually within industry standards for commercial acceptability.

Because reflective flake orientation in the paint film is so critical to the final colour, we always add the following statement on labels attached to our coupon panels as distributed to the Architectural community: "This high metallic colour panel is lab prepared. Final colour approval should be made with application prepared production line samples." Production samples will usually be darker than lab panels.

Because of the colour sensitivity of coatings containing reflective pigments, PPG recommends the following.

- 1) The paint for the entire project should be limited to a single batch, regardless of the number of applicators.
- 2) If possible the entire project should be painted at one time. If this is not possible all adjacent materials should be painted in a single release (i.e. by elevation or by floor).
- 3) When comparing painted production parts from one run to the next (if the project is not done in a single release as per recommendation #2), parts should be compared to the previous run in natural light (outdoors)
- 4) All parties should understand that there is a possibility of some colour variation and should agree that colour variation discrepancies should be questioned before the material is installed on the building or before the building is complete.