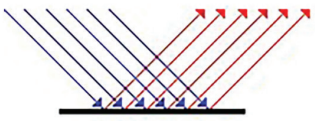
TECHNICAL BULLETIN

Gloss, Lighting & Texture Effects on Color Perception

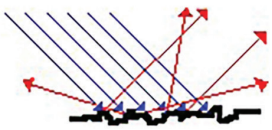
Gloss and Color Perception

When it comes to paint, sheen refers to the level of glossiness or shininess of the painted surface. Different sheen levels in the same color may appear lighter or darker when compared side by side. This phenomenon occurs due to the way light interacts with the surface and the angle at which the light is reflected to your eye. The higher the sheen, the more directly and uniformly the light is reflected to your eye, creating a higher degree of specular reflection. Simply put, the light reflects off the surface at a more predictable angle giving the appearance of a different color versus flatter paints. Additionally, higher sheen paints can enhance the perception of shadows and highlights due to their reflective properties. This can create more contrast and depth, making the color appear different versus lower sheens.

On the other hand, paints with lower sheen levels have a more diffused reflection of light due to their pigment package and formulation. When viewed under magnification, the surface of a flat paint will appear rough and irregular. When light reflects off a flatter sheen, the light is scattered in multiple directions rather than bouncing off uniformly. As a result, the lower sheen paint appears less reflective in comparison to higher sheen paints.



Specular Reflection (smooth surfaces)



Diffuse Reflection (rough surfaces)

It is important to note that the perceived difference in color between sheen levels may also depend on the lighting conditions in the room. The angle and intensity of light can influence the way the sheen reflects and how the color is perceived by the human eye.

Consider the images below; **Figure A** is the same color (Black) depicted across different sheen levels. The numerical value above each sheen represents the gloss percentage on a 60° meter. The sheen value 5.0 represents a typical flat paint, with each of the greater numerical values representing a higher gloss reading. Though the colors are the same, they appear different due to the varying sheen levels and reflection of light to the eye. Once the same image **(Figure B)** is tilted to a steeper angle, the colors appear much more similar. This is due to the light and gloss reflecting to your eye at a similar, predictable angle making the colors appear visually closer in appearance.

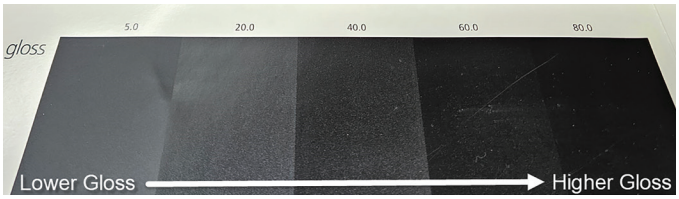


Figure A

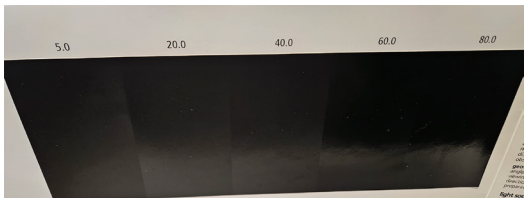


Figure B

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Lighting and Color

Nothing changes the perception of color more than light. It is important that you assess colors under the predominant lighting conditions for your projects to fully understand how the color will appear.

Illuminant Metamerism is a phenomenon in color perception where the same color is visually different under varied lighting conditions.

To understand metamerism, we need to consider how humans perceive color. Our perception of color is based on the interaction between light, objects, and our visual system. When light falls on an object, it interacts with its surface; some light wavelengths are absorbed while others are reflected. The reflected light then enters our eyes, and our visual system processes it to perceive color. Different light sources emit light at different wavelengths and have varying spectral distributions which can influence color perception.

Direct Sunlight is considered the most ideal light source because it provides the truest interpretation of color and provides the best balance between warm (yellow shades) and cool (blue shades) extremes. Artificial lighting can be separated into either warm or cool light. Incandescent and halogen lights enhance reds and yellows warming up a space. Fluorescent and energy-saving lighting enhances blues and greens.

For example, consider a side-by-side comparison of two distinct colors shown under “sunlight” **(Figure C)** and under a “cool white fluorescent” **(Figure D)**. Although the color samples are the same drawdown, each appears visually different. This is because daylight has a different spectral distribution compared to artificial lighting, and the two objects reflect different combinations of wavelengths under each lighting condition. Simply put, our perception of color changes as the light source changes.

Figure C

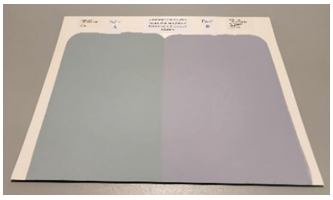

Figure D

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Texture and color

Does the surface texture affect how we see color? The answer is an absolute yes! Smoother areas within a surface tend to have a more uniform reflection of light, which can make colors appear to look different than areas where there may be a slight texture difference. The light reflects off the smoother surface at a more consistent, predictable angle while rough or textured areas of the surface scatters light in different directions, causing a more diffused reflection. This diffusion can lead to a loss of vibrancy and can make the color of the surface in the more textured areas appear duller, or less saturated. This becomes even more apparent on large, interior or exterior surfaces such as the exterior of a tilt-up building or an interior corridor or hallway. If there are any varying surface textures in the concrete of the tilt-up or the interior hallway, the human eye will perceive this as lighter or darker areas of the surface.

Color variation on the surface can also be influenced by the paint application technique. If the paint is applied by roller in an up and down motion, as it dries there can be minute differences in the roller stipple that results in the appearance of different shades in the finish. To avoid this phenomenon, when rolling a surface, finish rolling in the same direction will minimize visual shade differences caused by an up and down roller pattern.

Figure E

To easily understand how texture or roller application influences color perception, consider a uniform color of carpet on a floor **(Figure E)**. When the carpet fibers are spread in opposite directions, the same color fibers appear to be different, either lighter or darker. This is because the angle of the fiber, or texture differences are reflected differently thus appearing as two distinct colors.

It is important to note that the impact of surface texture on color perception can vary depending on the specific lighting conditions or time of day. Different angles and intensities of light can interact differently with textured surfaces, further influencing how colors are perceived. Plain and simple, the gloss level of the surface, types and intensity of lighting and texture will alter how we perceive color in the environment.