

6/2024

**To: All current and prospective customers**

**Re: Appearance of Product for PEM and PROFIL Brands from PennEngineering—Terms and Conditions**

**Current and Prospective Customers,**

**PennEngineering strives to provide the utmost quality in all products we manufacture and sell. In this area we also include the appearance of parts to print specifications and customer desire. As we manufacture our products in multiple locations around the world and in a batch-to-batch methodology there will, at times, be a level of variation in appearance. To this end we offer the following Terms and Conditions statement regarding our products.**

Positional Statement (Terms and Conditions):

**"Slight variation in appearance, such as color, shine, brightness etc. is caused by process variation and has no impact on fit, form, or function."**

In support of this statement, we offer the following industry standards with explanations as required:

**Ford: WX100**

**GM: GMW 4700**

**Stellantis: PS 8956, PS 50031, PS 50036**

**ASTMB633 (Zinc Electroplating):**

The coating shall not be stained or discolored. However, slight discoloration that results from rinsing or slight discoloration that results from any drying or baking operation to relieve hydrogen embrittlement, shall not be cause for rejection. On articles in which a visible contact mark is unavoidable its position shall be that chosen by the purchaser. The electroplated article shall be clean and free of damage.

**ASTM F1941 (Zinc and Cadmium):**

The coating metal deposit shall be bright or semi-bright unless otherwise specified by the purchaser, smooth, fine grained, adherent and uniform in appearance.

Slight discoloration that results from baking, drying, or electrode contact during rack-plating, or all of these, as well as slight staining that results from rinsing shall not be cause for rejection.

**GMW 3044 (Zinc Electroplate on Iron and Steel):**

The *as-received* appearance and color hue shall be as agreed upon between the purchaser and supplier using approved color and hue engineering standards when available. In the case of zinc plus passivation coating listed herein, a clean, commercial finish is required; range of color, iridescence, opaqueness, and sheen are normally not critical unless otherwise specified by the purchaser. In the case of bright zinc plus clear finishes listed herein, a clear bright appearance (also referred to as colorless, blue-bright and clear silver-white) is required. Specified colors shall be uniform, tightly adherent, hard and dry.

**ASTM B689 (Nickel Plating):**

Imperfections and variations in appearance in the coating that arise from surface conditions of the basis metal (scratches, pores, roll marks, inclusions, etc.) and that persist in the finish despite the observance of good metal finishing practices shall not be cause for rejection **(Note 7).**

**Note 7** – Applied finishes generally perform better in service when the substrate over which they are applied is smooth and free of torn metal, inclusions, pores, and other defects. It is recommended that the specification covering the unfinished product provide limits for these defects. A metal finisher can often remove defects through special treatments, such as grinding, polishing, abrasive blasting, chemical treatments, and electropolishing. However, these are not normal in the treatment steps preceding the application of the finish. **When they are desired, they must be stated in the purchase order**

**ISO 4042 (Electroplated Coating Systems)**

Non-homogenous color shall not be cause of rejection, unless otherwise agreed between the manufacturer and customer at the time of order (PO).

**General Notations:**

*PennEngineering takes a number of steps to ensure that all parts are plated on all surfaces.*

It should be noted that are three major causes of varying appearance on different surfaces of a part that has been barrel electroplated.

* + First, the final appearance is affected by the surface finish of the base metal. This is because electroplating in the typical thickness applied to fasteners does not level the surface texture. Typical thickness is .0003 inch or 8 microns.

* Second, the thickness deposited by electroplating is not always the same on all surfaces. This results from variations in current density which are caused by part geometry.
* In general, external surfaces will have the greatest thickness and internal surfaces, particularly the bottom surfaces in small diameter, deep, blind holes will have the least thickness. This can affect corrosion performance.
* In general thickness variation does not cause customer issues with appearance except in the case of internal threads. Plating chemistries also contain additive known as “brighteners” in addition to the leveling additives mentioned above.
* Third, during the barrel plating operation parts are continuously contacted by other moving parts as the barrel rotates. This provides a burnishing action, particularly on external corners. Typically, this does cause appearance issues with the electrodeposited metal prior to supplementary treatment.

Other factors:

* + To service our global customers, PennEngineering produces parts at multiple locations worldwide, four locations in the US, one in Ireland, one in Germany, one in Malaysia, one in Taiwan and three in China. Using our most popular plating of zinc and clear chromate as an example, this finish may be produced on any one of our plating lines, some of which are internal to Penn Engineering facilities and others which are in subcontractor’s facilities.

**General Notes:**

***PennEngineering posits the following for consideration when developing appearance criteria as part of the quoting and PO process.***

* ASTM—Appearance as Communication
  + Table 1: Texture, Structure and State
    - Reference this ASTM article when developing a customer specific requirement for appearance issues that are non-performance related or impacting.
  + Desirability is comprised of:
    - (Face Validity)-visual credibility
    - (Social Coding)-Group Endorsed Values
    - (Operation)-The degree to which the application, use and function is understood.
    - (Sensory)-Sensory satisfaction to the user.

For any and all inquiries or feedback regarding these terms and conditions please contact myself, or the respective sales/applications representative for your company so that we may work together to ensure your satisfaction with our products.

Thanks in Advance,

Rocky Pinheiro, Ph.D.

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