

**FROM:** Product Engineering **DATE:** December 29, 2014  
**SUBJECT:** Forged Steel Valves and Fittings; Phosphate Coating Surface Protection; Comprehensive Version  
**KEYWORDS:** Carbon Alloy Steel  
**PERMISSIONS:** External

**Overview**

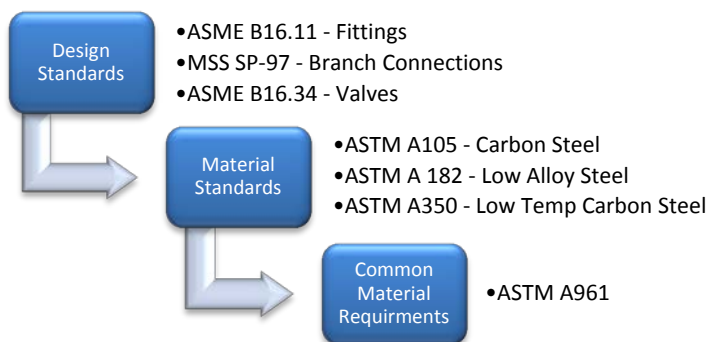
New “Corrosion Protective Coating” requirements have been implemented into the 2014 active standard (latest version) of ASTM A961. ASTM A961 - 14 requires carbon and low alloy steel materials for flanges, fittings and valves to be furnished with a corrosion protective coating. The new requirements are effective as of the standard’s publication date (November, 2014).

Phosphate coatings meet the ASTM A961 – 14 requirements for the corrosion protection of carbon and alloy steel. For over 40 years, Bonney Forge has provided phosphate coated carbon and alloy steel parts as a standard, which provides superior corrosion resistance for carbon and alloy steel products.

Some manufacturers of fittings and valves do not provide corrosion protection in the form of phosphate coatings. Rather, they utilize manufacturing oils to prevent the carbon and low alloy steel products from corroding. This is unacceptable under the 2014 edition of ASTM A961.

**Requirements of Industry Standards**

The product design standards (e.g. ASME B16.11 Fittings, MSS SP-97 Branch Connections, and ASME B16.34 / API 602 Valves) reference the ASTM material standards (e.g. ASTM A105, A182 and A350). These ASTM material standards all require ASTM A961, which covers common requirements for manufacture, heat treatment, mechanical testing, etc. The hierarchy of standards is shown below:



New “Corrosion Protective Coating” requirements have been implemented into the 2014 active standard (latest version) of ASTM A961. ASTM A961 now requires carbon and low alloy steel materials for flanges, fittings and valves to be furnished with a corrosion protective coating. Because of the hierarchy of standards, the new corrosion protective coating requirement is invoked in all products manufactured to the material and design standards. The new requirements are effective as of the standard’s publication date (November, 2014).

### **Bonney Forge Products Include Phosphate Coating as a Standard**

Bonney Forge has supplied fittings and valves with phosphate coatings as a standard for over 40 years. Some of the key benefits are:

- Meets ASTM A961 – 14 requirements
- Increased indoor shelf life and extended outdoor atmospheric corrosion protection.
- Overall clean products. Minimal shavings, metal particles, chips, and rust.
- Overall improved product appearance. Minimal oily finish and oil contamination.
- Reduces friction between threads during threading and prevents galling.

### **Non-Compliant Alternatives to Phosphate Coating:**

Manufacturers utilizing an oil process will add an oil dip as the final step in the process. Some manufacturers may even simply use the residual cutting oils applied during machining steps as the surface protectant. Either method is unacceptable per ASTM A961 – 14.

Below are the results of a seven-day test where both phosphate coated and oil coated parts were exposed to an outdoor environment. The part on the left was oil coated, and the part on the right was phosphate coated. The oil coated part exhibited a significant amount of rust on all surfaces including critical thread surfaces. The phosphate coated part exhibited no significant signs of corrosion.



An additional issue with oil coating is the impact to the storage areas. Distributors and end-users have complained that oils from oil-coated parts can seep out of boxes and onto floors and storage racks. This can be a safety issue that can cause continuous clean up and slip hazards for shop personnel.

**About Phosphate Coating:**

Phosphate coatings fall into two main categories: manganese-base and zinc-base. The best coating for use in the pipe, valve, and fitting industry is heavy zinc-base phosphate coating followed by a thin dry-to-touch oil coating. Phosphate coatings applied by Bonney Forge are zinc-based in most applications. Manganese-base coatings are only used where a thinner coating is needed to prevent fit-up and sealing issues, primarily in valves that use O-ring seals and where fit-up after coating is a concern.

Phosphate coating is a dark colored chemical conversion coating in which a steel part is immersed in a hot phosphoric acid solution followed by a dry-to-touch water soluble rust inhibiting coating. The application of phosphate coating is applied using the following general process steps:

1. Cleaning – The steel parts are immersed in a cleaning solution that removes any dirt and machining oils that may be on the surface of the steel part.
2. Phosphating – The steel parts are immediately submerged in a phosphate solution. The chemical reaction of the solution with the steel surfaces produces a thin, highly uniform, micro-porous layer of a complex zinc/manganese/iron phosphate.
3. Supplemental Coating - The phosphate coated part is then subsequently immersed in a dry-to-touch water soluble rust inhibiting oil that saturates the porous phosphate coating to provide additional corrosion protection.

Please contact Bonney Forge for more information on phosphate coatings or any questions related to the above information.

Sincerely,



Paul Heald  
Vice President of Product Engineering & China Operations  
Ext. 3386  
pheald@bonneyforge.com

