

## FASTENER FINISH GUIDE

**Anodizing** - An acid dip provides aluminum (and aluminum only) parts with a frosty, etched appearance. It offers excellent corrosion resistance, and parts can be color dipped after being anodized.

**Black Oxide** - This is a black conversion finish mainly used over steel parts for aesthetic purposes as the coatings have a deep glossy appearance. A chemical treatment gives ferrous metal and stainless-steel parts the black finish. The finish does not add thickness to parts, nor does it provide corrosion resistance. However, parts usually undergo an oil dip after being treated, and the oil dip does provide a fair amount of corrosion resistance. Salt Spray protection approaches 24 hours (ASTM-B117) depending on the sealant used.

- Mildly improved corrosion and abrasion resistance
- Reduces reflective properties
- Complies with military specifications
- Good plating for a decorative appearance (i.e. fasteners used in indoor furniture applications)

**Cadmium** - Any metal can be electroplated with cadmium. The bright or dull silver-grey plating gives parts excellent corrosion resistance. The plating is often used on parts for marine and aviation applications. On the downside, the process is costly and potentially hazardous to the environment.

- A good finish, especially for wet environments

**Chromate** - This is a secondary dipping process used on zinc or cadmium-plated fasteners. It increases corrosion resistance and can be colored. Standard clear chromate leaves a bluish-white hue; other colors may also be chosen, such as yellow, olive drab or black.

**Chromium/Chrome Plating** - A highly decorative and very hard silver finish achieved by an electroplating process which applies three or four layers of metal; copper, nickel and chromium. Depending on the surface preparation (polishing) and the final chrome thickness, the finish can range from satin to a high luster mirror-like surface. Properties of chrome plating include superior appearance and superior abrasion resistance. This hard, lustrous bright blue or white finish provides wear and corrosion resistance on all metals but it is expensive.

- A good finish, useful against physical wear & erosion
- Improved aesthetics
- More durable than zinc
- Improved corrosion resistance
- Hard chrome can be utilized to minimize friction and increase abrasion resistance

**Nickel** - This hard, stable, and relatively expensive finish leaves a silver color on all metals and good corrosion protection. However, it can be difficult to apply. As an electro-deposit, this coating is used primarily when a decorative bright silver finish is desired. If high hardness and good chemical resistance are required, parts are often coated with electroless nickel. This has the advantage of being able to build thickness evenly on both the inside and outside of a part. Other than E-coating, electroless nickel is one of the only coatings that will achieve total coverage. Other properties include excellent chemical resistance in a hard, durable finish. More decorative than zinc plating but does not provide sacrificial protection.

- Considered good finish

**Passivating** - This process is carried out by dipping stainless steel parts in nitric acid. The acid removes iron particles and brightens the finish. It also produces a passive corrosion-resistant finish.

**Phosphate and Oil** - This low-cost coating combines zinc or manganese phosphate with a rust-inhibiting oil dip. It leaves parts with a charcoal grey or black finish.

- Considered a moderate finish, useful against physical wear

**Plain** - This bare metal surface has no finish for improving appearance or corrosion resistance, which is very low if the material is steel. Often the surface has been oiled, which improves lubricity.

- Can be used indoors or in outdoor environments where corrosion protection is not an issue

**Zinc Plating** - It is the most commonly used plating and works on all metals. It leaves a white to blue-grey finish and it cost little to apply. Zinc is a common sacrificial coating used in finishing steel parts to provide protection from red rust. Applied electrolytically to a typical thickness of 200 – 300 micro inches (.0002" - .0003"). The zinc plating protects the underlying steel by formation of a "galvanic cell", which results in the zinc corroding preferentially to the steel. Red rust will not start forming until all zinc has been converted to white rust (zinc oxide). Normally zinc plating is used for indoor applications but can also be used as a base for painting. By itself a 200 – 300 micro inch zinc plating will probably get no more than 12 hours of Salt Spray protection per ASTM-B117. With a clear chromate topcoat this is increased to 24-36 hours, while a yellow chromate top coating can achieve protection up to approximately 96 hours. Even though it is mostly used as a functional coating, zinc plating does have some decorative appeal.

- Generally considered a very good finish
- Moderate appearance, excellent abrasion resistance and excellent paint adhesion
- Not suitable for extreme environments
- Improved corrosion resistance

**Zinc, Electroplating** - Any metal can be electroplated with zinc. It is one of the most widely used plating finishes, providing an attractive, low-cost finish. Chromate is typically added to increase corrosion resistance and, if desired, add color.

**Zinc/Trivalent Zinc Chromate Plating** - Provides a bright silver/blue like finish, with the added benefit of ROHS Compliance. This chromate conversion coating is a type of coating used to passivate aluminum, zinc, cadmium, copper, silver, magnesium, and tin alloys. It is primarily used as a corrosion inhibitor, primer, decorative finish and it can retain electrical conductivity. Trivalent chromate is an iridescent conversion that can exhibit different hues. This is considered normal when applying iridescent conversions.

**Zinc/Yellow Zinc Plating** - As above, with yellow dichromate passivate, greatly improving corrosion resistance. Salt Spray protection (ASTM-B117) is approximately 96 hours.

**Zinc/Black Zinc Plating** - As above with black silver nitrate passivate, giving a matte black appearance and similar corrosion resistance to yellow zinc plating.

**Zinc Plate, Chromate Plus Sealer** – Used by manufacturers such as Southco as a standard finish. A metallic (inorganic) sacrificial finish which provides excellent corrosion protection. "Sacrificial" means that the plating will corrode instead of the base material. This finish will protect even if the finish is scratched through to the base material. Most applications provide corrosion resistance averaging 500 hours of salt spray, per ASTM B117 or ISO 9227, and 5 cycles of moist sulphur-dioxide testing (ASTM G-87) without evidence of red rust for parts plated approximately .013mm (.0005") thick. This finish has a lubricious surface, which is more uniform and consistent, both visually and in terms of its mechanical properties. This finish also exceeds zinc-plating specifications as outlined by ASTM B633, BS 1706, DIN 50961 and AS1789.

**Zinc, Hot Dipped** - Metal parts are galvanized by being dipped in pure molten zinc. It leaves a dull grey finish that protects against corrosion. It also adds a thick, irregular coating, so the size of parts may need to be adjusted to compensate.

- Considered a very good finish
- Adds corrosion resistance
- Ideal for harsh environments

**Zinc, Mechanical** - Parts are tumbled in zinc powder, and the peening action of the tumbling embeds powdered zinc into the surface of the part. This creates a thicker and somewhat irregular coating compared to electroplating. Parts must be sized appropriately to allow for the thickness of the coating.