



TECH TALK

COMMON FASTENER MATERIALS

Material Selection: Things to Consider

When selecting a material for fasteners the user takes into consideration the application, cost, features, corrosion resistance, strength, and availability.

There are many materials used to make fasteners, but the ones specific to Dottie include: Carbon Steel, Medium Carbon Steel, 18-8 Stainless Steel, 316 Stainless Steel, Solid Brass, Silicon Bronze, and Nylon.



Carbon Steel & Medium Carbon Steel

Carbon Steel is used for general applications, or for applications where corrosion resistance is not a requirement. They are manufactured to the ASTM A307 Grade A standard and have a tensile strength of 60,000 PSI.

When higher strength is needed, Grade 5 fasteners may be used. They are made from heat treated Medium Carbon Steel and are twice as strong as Low Carbon Steel fasteners.

Carbon steel, as used for fasteners, is classified as iron with about .08 - .40% carbon and small amounts of other elements controlled at the

maximum. Higher carbon steels can be heat treated to provide higher strength and hardness.

Carbon steel is susceptible to rust and corrosion, therefore they are usually provided with an electroplated zinc coating. For outdoor and wet applications, a hot-dipped galvanized zinc coating is provided.

18-8 Stainless Steel & 316 Stainless Steel

When better corrosion resistance is needed stainless-steel fasteners are used. Generally, the stainless-steel alloy is called "18-8" stainless steel. This means the alloy is similar to low carbon steel with the addition of approximately 18% chromium and 8% nickel. The most common stainless-steel fastener alloys are 302 and 304.

For better corrosion resistance in environments such as sea water or marine applications, 316 stainless steel is used. It contains molybdenum for enhanced corrosion resistance thus increasing the lifespan of the fastener.

While stainless steel fasteners do not generally come with a coating, a process called passivation will prevent any surface contamination from creating rust spots. When required, passivation must be requested by the user.

Installation Tips!

- When any lubricant or wax is used with stainless steel fasteners the torque value should be lowered to prevent breaking the fastener on installation.
- 18-8 Stainless-steel fasteners are considered non-magnetic, but some may be mildly magnetic.

- Stainless Steel fasteners cost more than steel fasteners, and 316 stainless-steel is more expensive than 18-8.

Solid Brass

Composed of two-thirds copper and one third zinc, brass fasteners are used in marine, plumbing, electronic and non-magnetic applications. They are softer than steel and stainless steel and have good electrical conductivity and corrosion resistance.

Brass is available in several different alloys; however, the most common ones are 270, 360, and Commercial. Brass Alloy 270 contains 65% copper and 35% zinc and features a tensile strength of 70,000 PSI and a yield strength of 45,000 PSI. Brass Alloy 360 contains 61.5% copper, 35.5% zinc, and 3% lead and features a tensile strength of 50,000 PSI and a yield strength of 30,000 PSI. Lastly, Commercial Brass contains 55-65% copper, 35-42% zinc, and may contain 0.05-3.5% lead.

Silicon Bronze

Silicon Bronze fasteners are typically composed of 95-98% copper, a small amount of silicon, and other alloys such as zinc, tin, iron, and manganese. Silicone bronze fasteners have a tensile strength of 70,000 PSI. They are the ideal choice for harsh environments such as salt water, high heat, power plants, and corrosive environments and are naturally non-magnetic. They are a good conductor of electricity, making them the ideal choice for grounding and are used for aesthetic and practical applications.

Interestingly, the color and appearance of these fasteners may vary on shipment depending on the level of silicon, zinc and other elements in the fastener.

Nylon Fastener

Nylon fasteners are a light weight, chemical resistance fastener used in applications where harsh chemicals or acids are used. They are very low strength fasteners and are not suitable

for high temperatures and should not be used above 185°F.

Most common nuts, bolts and washers are available in nylon. However, the most popular nylon fastener is cable ties and wire managements items. They are not rated for tensile strength, but typical nylon materials have a tensile strength of only 10,000 - 12,000 psi.