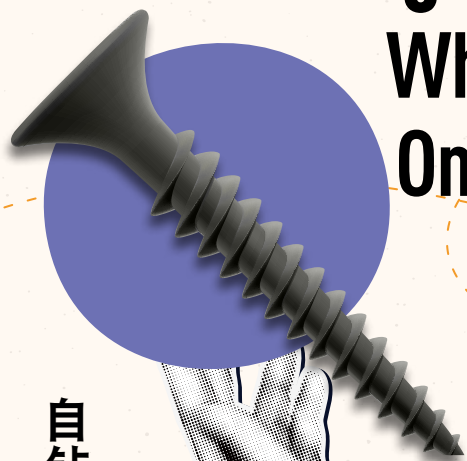


Self-Drilling Versus Self-Tapping Screws

When do You Employ One Over the Other?



自钻与自攻螺丝的正确使用时机

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Article by Laurence Claus

Have you ever headed over to the local big box home improvement store to pick up some screws for a construction project only to arrive and be flustered by the wide assortment of choices you have? There in front of you is a wall of different options, many suggesting that they can be used for similar purposes. It gets even more confusing when you see that the screws boasting a solution for the application you wish to employ them in have very different designs. You inspect one choice and see that the threads taper all the way down to a very sharply pointed tip, while the box next to it has what looks like a short drill bit as a tip. Which is the right one for your application?

This article is going to explore the differences between drill screws and sharp tipped tapping screws. Now if we wanted to really be precise in our terminology, we would acquiesce to the discovery that both of these types of screws are considered tapping screws. In fact, a tapping screw is nothing more than a screw which generates its own internal thread. Both sharp tipped tapping screws like Type AB or Wood Screws with a Type 17 point and Drill Screws generate their own internal thread pathway, and, thus, are technically considered tapping screws. However, for the purpose of this article and comparison, let us agree to consider them for the uniquely different products they are, with advantages and disadvantages to addressing the needs and requirements of different applications. To do this we must first build a little context about each type of screw.

Tapping Screws



Predrilled hole required

Self-tapping screws come in two varieties. There are versions that are intended to form or displace the material they are threading into and there are cutting versions that cut away material to form the internal threads. Both varieties work along a similar principle, a special feature or thread design acts to create mating internal threads. Thread forming varieties are continuous thread forms and rely on geometry to flow or redistribute the parent material into the internal thread form. Cutting screws, on the other hand, have grooves or slots that provide knife-like sharp edges that cut a thread path in the parent material.

The earliest tapping screws were derived from designs intended for wood or sheet metal. These screws generally lack tight tolerances and often have large thread profile angles to provide the requisite thread strength to remain intact as they exert stresses in the parent material. Unfortunately, these attributes limit these more rudimentary designs to be less precise and prone to a wider range of performance variation, often making them unreliable in certain materials or application settings.

Thread forming varieties usually require some form of pilot hole. Although some softer materials, like wood, or very thin material, like sheet metal, may be able to accommodate a sharp tipped tapping screw that pierces the parent material without a pilot hole, most will not perform properly without one. Even though these screws sometimes work without a pilot hole, they

often must have one. For example, entering a hard, tight grained wood like oak without a pilot hole often has catastrophic outcomes when the stresses are too great and the wood splits. Likewise, if the sheet thickness gets too big, the tapping screw is unable to pierce it and installation goes nowhere. Thus, it is safe to say that **outside a very narrow band of thin metal or soft wood, these screws require pilot holes to be successful.**



Tapping Screws are well suited for:

- **soft parent materials**
- **thin metal sheets**
- **uses with a pre-drilled pilot hole**

For the purpose of this article, tapping screws of this type will be ones that have thread profiles near 60°, sharp points, and, in some cases, thread cutting features which augment their performance. These are loosely described as “sheet metal screws”, “wood screws”, “general purpose construction screws”, “decking screws” and “drywall screws”.

Drill Screws



Unlike Tapping Screws which normally require a pilot hole or rely on a sharp point to pierce materials, **Drill Screws have a short drill point (think like a short drill bit) on the end. This drill tip is specifically sized to the screw diameter and will allow the drill screw to develop its own pilot hole. This gives drill screws the versatility to work in thicker metal.** Drill screws have also been developed for clearing wood members before tapping into the metal component. They accomplish this by adding two “wings” above the drill point tip, which ream a clearance hole (larger than the thread diameter) through the wooden component. When these wings reach the metal component, they break off avoiding any impact on the unthreaded pilot hole.

In construction applications where predrilled and tapped joint members are impractical, or time consuming, Drill Screws are an exceptionally versatile and helpful fastener product. Drill Screws can be easily assembled into and through a wide assortment of building materials without the need for a pilot hole or access to the back side of the joint.

Applications

The application opportunities for drill screws are abundant both for interior and exterior purposes. **Drill Screws are excellent resources on the interior, where they are commonly utilized to attach gypsum boards, wood members, and other metal components to metal structural members and studs.** Generally, the interior environment is controlled, and these screws are not subject to challenging or abusive environmental conditions. Drill Screws are also highly favored by installers of metal roofs and cladding. Drill Screws provide an easy way to pierce the metal roof or cladding sheets and the underlying steel structural components without the need for any predrilling of pilot or clearance holes. Unlike interior environments, however, the exterior of the building will be subject to whatever variable environmental conditions the climate zone is known for.

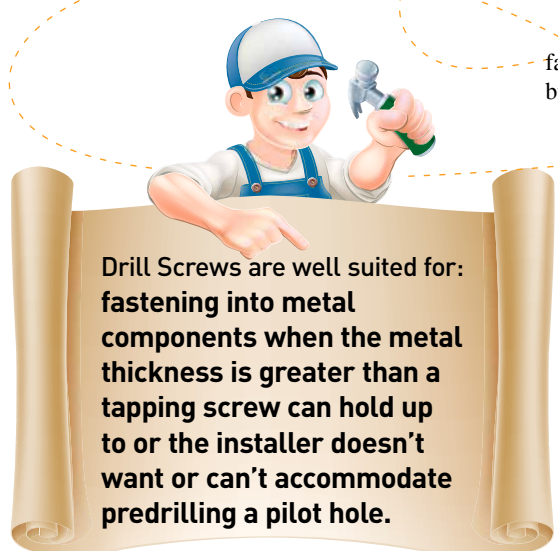
For Drill Screws, therefore, in exterior applications these often challenging and potentially harsh conditions present a real problem with corrosion. The most common corrosion site is the exposed head. Corrosion in this area can result in unsightly staining of the roofing or cladding materials, open up potential leak paths into the structure, trigger expensive maintenance campaigns, and generally detract from the building’s curb appeal. The head, however, is not the only place where these fasteners can corrode. They are also subject to shank corrosion in sections that may be exposed or are in contact with moist surrounding building materials and crevice corrosion. Like corrosion in the head, corrosion in the lower part of the fastener can result in staining of surroundings surfaces, reducing the mechanical strength of the fastener or joint, and increase the potential for environmentally induced stress corrosion cracking.

For these reasons, **exterior Drill Screws must be manufactured with protective coatings or from corrosion resistant materials.** Although protective coatings would provide a simple and, most likely, cost-effective means of protection, the reality is that they will only prolong the time until failure. In other words, failure is eventually a reality; it may just take a little longer to get there. As a result, using corrosion resistant Stainless Steel is a much better option. The problem with this “solution”, however, is that **although the stainless steel is usually able to be work hardened enough in the threaded section to allow the threads to withstand forces exerted during thread forming, it cannot be sufficiently strengthened on the drill tip to hold up to the drilling application. The solution to this problem is the Bi-metallic Drill Screw, which is a combination of a Stainless-Steel body and a hardened Carbon Steel drill point.**

Although Drill Screws are most commonly attributed to these construction applications, they are also prevalent in many industrial applications, specifically applications where either metal sheets or components are connected to structural frame members. These types of connections are abundant in HVAC equipment like furnaces and air conditioners and white goods like appliances. In fact, many of these products may contain several hundred drill screws.



Tapping screws can also be found all over the average construction site. General purpose construction screws and dry wall screws are used to connect all sorts of materials to thick wood members like studs, joists, rafters, and columns. These applications rarely require pilot hole drilling. However, when more precise or critical joining is required, like screws holding cabinet members together or hard wood species trim boards, pilot holes are required. Another common construction tapping screw are deck screws. These commonly possess a Type 17 point, which makes them the cutting variety. The point cuts a pilot hole keeping these screws from cracking deck boards or the structural members underneath. Finally, thin metal sheets used in HVAC ducting often use Sheet Metal Screws instead of drill screws. The application is



Drill Screws are well suited for: fastening into metal components when the metal thickness is greater than a tapping screw can hold up to or the installer doesn't want or can't accommodate predrilling a pilot hole.

faster and usually a little easier in the installation, but these only work within a narrow range of thin sheet sizes.

Like Drill Screws, Tapping Screws are commonly found in industrial applications. Thread rolling screws, a variety of thread forming screws, are used in just about every type of industrial application. Automobiles are especially rife with this sort of tapping screw. Type AB sheet metal screws are also abundant in many industrial applications. Like Drill Screws, they are common in HVAC and White Goods. These screws are used with thinner sheets than the Drill Screws used in the same applications.

Wrap-up

Both Tapping and Drill Screws have abundant uses over multiple applications and market segments. Although they have some overlap, for the most part, users select one over the other for the unique solutions they provide to the application. Tapping Screws are especially well suited to uses in soft parent materials, thin metal sheets, or with a pre-drilled pilot hole. Drill screws are especially well suited to fastening into metal components when the metal thickness is greater than a tapping screw can hold up to or the installer doesn't want or can't accommodate predrilling a pilot hole. Although the most common applications for both types of fasteners are in construction, they are also abundant in industrial applications making both popular and versatile fastener options. ■

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