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# Choosing between rivets, bolts and screws

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**F**asteners play a critical role in joining materials across various industries, from aerospace to construction. Choosing the right fastener is crucial to the integrity and longevity of a project. Rivets, bolts and screws each have unique characteristics that make them suitable for specific applications. There are many factors to take into account when it comes to choosing riveting versus bolting or exploring screws and rivets as an option.

## What are the differences between rivets and bolts?

Understanding the distinctions between rivets and bolts is essential for selecting the appropriate fastening method for a project. Both are used to join materials but differ greatly in design, installation and functionality.

As engineers will know, rivets are unthreaded fasteners with a head on one end and a tail that is deformed upon installation to form a second head, creating a permanent joint. Once installed, rivets are difficult to remove without destroying the rivet itself or potentially damaging the materials.

Riveting requires inserting the rivet into aligned holes in the materials and deforming the tail end to secure the joint. This often necessitates specialised tools such as a rivet gun. Rivets offer excellent shear strength, making them ideal for applications where forces are applied perpendicular to the axis of the fastener. They are ideal for applications that require long-lasting vibration resistant connections. Rivets are commonly used in aerospace, shipbuilding and electronics; applications where permanent joints and weight reduction are priorities.

There are a number of different types of rivet. Solid rivets are the strongest, often matching the strength of other similar sized and same material mechanical threaded fasteners. Blind rivets, also known as pop rivets, are ideal for projects with limited access to one side of the workpiece. This can simplify the installation process and save time. In addition, semi-tubular rivets are a compromise between solid and blind rivets, offering a balance of strength and ease of installation. Finally, there are drive rivets. These are designed for quick installation with basic tools such as a hammer.





The aerospace industry relies heavily on rivets, particularly solid rivets, to ensure the structural integrity of aircraft. Jumbo jets, for example, use thousands of rivets in their construction. The main reason is that rivets offer an excellent strength to weight ratio, which is crucial for aircraft design. They also offer fatigue resistance, able to withstand repeated stress cycles, making them adaptable to the constant pressurisation and depressurisation of aircraft cabins.

Rivets also provide a lightweight and structural connection that is essential for keeping the fuselage panels aligned and flat. When used in conjunction with sealant adhesives, rivets play a crucial role in maintaining cabin pressures at high altitudes. In addition, riveted joints allow for easy visual inspection too. This is essential for facilitating regular maintenance and safety checks required in the aviation industry.

### What are the benefits of using bolts?

Bolts are threaded fasteners used with nuts (or threaded holes) to clamp materials together. They create a non-permanent joint that can be disassembled and reassembled as needed. As engineers know, bolting involves inserting the bolt through the material's aligned holes and tightening it into a threaded hole or installing a nut onto the threaded end. This process typically requires only basic tools like wrenches but often requires access to both sides of a joint if nuts are used.

There are a number of types of bolt to suit different applications. Hex bolts are the most common type, featuring a six-sided head for easy tightening. An alternative is carriage bolts, which are designed with a smooth, rounded head and a square neck to prevent rotation during tightening. Flange bolts incorporate a wide flange under the head to distribute load over a larger area and, finally, eye bolts feature a loop at one end, ideal for attaching ropes or cables.

In the automotive industry, for example, both rivets and bolts are used, with engineers often preferring rivets for body panels and bolts for engine components. In the machinery industry, bolts are far more commonly used, as they allow for easier assembly and potential future modifications. Similarly, in the electronics sector, blind rivets are used because of their compact size and one-sided installation capability.

Bolts are renowned for providing superior tensile strength due to the clamping force achieved when the nut and bolt are tightened, which is beneficial for applications where forces attempt to pull the joint apart. Bolted joints allow for easy disassembly and reassembly, providing flexibility for adjustments and maintenance.

The key difference between rivets and bolts lies in their permanence and the type of strength they offer. Rivets create permanent, shear-resistant joints, while bolts provide adjustable joints that are stronger in tension.

### Advantages of rivets over bolts

Choosing the right fastener is essential for the durability and efficiency of any assembly. Rivets are typically lighter in weight than bolts, which is a significant advantage in industries where weight reduction is critical, such as aerospace. Using rivets can therefore contribute to greater fuel efficiency and performance by reducing the weight of the assembled structure. External rivets on aeroplanes also create less drag than headed fasteners, contributing to fuel efficiency.

Rivets create permanent joints that are resistant to tampering and vibration. Once installed, a rivet holds materials together securely without the risk of them loosening over time, which can be a great benefit in structures subjected to constant movement, vibration or dynamic loads.

Another advantage is that during installation, rivets somewhat expand to fill the holes in which they are placed, leading to a more uniform load distribution across the joint. This reduces stress concentrations and enhances the structural integrity of the assembly. In addition, rivets do not require threaded holes or additional hardware like nuts and washers, simplifying the design and reducing the number of components. This can lead to cost savings in both materials and labour in an assembly line.

If a project involves joining thin sheets or soft materials, then rivets can be incredibly effective, as tapping threads for bolts is impractical or could weaken the material. They provide strong fastening properties without compromising the integrity of delicate panels. These advantages of rivets over bolts make them a compelling choice for applications requiring permanent, secure and lightweight joints. However, there are disadvantages to choosing to use rivets.

Firstly, they can be very difficult to remove without causing damage, as removal often requires drilling them out. This makes maintenance or repairs challenging compared to bolts, which can be easily removed and reinstalled. This can lead to increased costs and waste in projects that require disassembly and reassembly.

Installing rivets often requires specialised tools, such as a rivet gun and a certain level of mechanical skill. This can increase the complexity and cost of a project compared to using standard hand tools for bolts or screws.



Rivets generally offer less tensile strength than bolts, making them less suitable for applications where the joint is subjected to pulling forces. Bolts can provide a stronger clamping force due to their threaded design, whereas rivets provide very little clamping force in comparison unless they are installed hot.

In addition, rivets may not be suitable for use with very thick materials, as they must be long enough to pass through and properly deform. Bolts, on the other hand, are more adaptable to varying material thicknesses.

A regularly posed question is “Are rivets stronger than screws?” and there isn’t a simple answer as this depends on the type of forces acting on the joint and the specific project application. Rivets typically offer an improved shear strength-to-weight ratio, which means they can better withstand forces applied perpendicular to the axis of the fastener, making them ideal for structures like aircraft panels and metal frameworks. On the other hand, screws generally provide greater tensile strength, allowing them to resist forces that try to pull the joint apart along the axis of the fastener.

Whether rivets are better than screws very much depends on the application. Bear in mind that rivets create permanent, shear-resistant joints, while bolts provide adjustable, tensile resistant joints.

Material compatibility is also an important consideration. When joining dissimilar metals, consider the potential for galvanic corrosion. Rivets or bolts made from compatible materials or with appropriate coatings may be necessary. In applications with significant temperature fluctuations, it is important to consider the thermal expansion properties of both the fastener and the joined materials. They should expand within the same parameters to prevent deformation or stress fractures over time.

Another factor to consider is matching the strength of the fastener to the strength of the materials being joined to avoid failure points. When it comes to costs, in general terms, rivets are less expensive per unit than bolts. However, specialist riveting tools are required for installation, which adds to the cost, compared to basic bolt installation tools.

Installation times are a significant factor in many projects. Tapping and installing threaded fasteners can be more labour intensive, potentially increasing installation costs. In terms of speed, blind rivet

installation is often seen as being quicker, which can result in reduced overall labour costs.

While rivets are effective for permanent joints, there are several alternatives to rivets that may better suit certain projects, especially when adjustability or disassembly is required. When considering alternatives to rivets, engineers need to take into account; the need for disassembly, load requirements, material compatibility and installation constraints, to name but a few.

Bolts used in conjunction with nuts create strong joints that can be easily disassembled. Replacing rivets with bolts is beneficial when maintenance or future modifications are anticipated, they also provide higher tensile strength and adjustability.

Self-tapping screws can also be used as alternatives to rivets, especially in sheet metals and softer materials where tapping machine threads may not be possible. They allow for easy installation and removal, making them ideal for assemblies requiring minor access or adjustments.

As well as this, a self-tapping screw can be used if a project needs a removable fastener that allows for disassembly and adjustment. These also offer higher tensile strength and can create their own threads in materials like metal or plastic without the need for pre-tapped holes. However, a self-drilling screw may be a better option which will offer all of the benefits of self-tapping, with the additional benefits of not needing any holes in a workpiece, saving on time.

Choosing between rivets, bolts or screws requires careful consideration of various factors, including the specific application, material properties, environmental conditions and long-term maintenance requirements. While rivets excel in creating permanent, vibration-resistant joints ideal for applications like aircraft construction, bolts offer versatility and the ability to create detachable connections crucial in many engineering and construction projects.

By understanding the strengths and limitations of each fastener type, engineers and designers can make informed decisions that ensure the safety, efficiency, and longevity of their projects. As technology continues to advance, we can expect to see even more innovative fastening solutions that push the boundaries of what’s possible in joining materials across industries.