An Introductory Guide To T-Slot Fastening Options

Fasteners  Plates
T-Nuts    Brackets
Bolts     Connectors
Anchors   and much more...
FASTENERS OVERVIEW

The variety of fasteners for T-slotted aluminum profiles is immense, and 80/20 is no exception with over 20 types and 400 variations. But for this article, we are going to focus on the most popular types of fasteners. Learn about their attributes and how to use them, and you’ll be off to a great start on your path towards becoming a professional T-slot extrusion builder.

Some key things to keep in mind when selecting a fastener:

• Functionality of the fastener
• Strength of fastener
• Machining requirements to use fastener
• Cost of fastener & machining

In this overview, we will cover popular fastener types using multiple aspects of usage, so you can compare fastening options while you learn them. Before moving on to the in-depth explanations of individual fasteners, study the pictures and names on page 3 to familiarize yourself with the names and general look of each fastener type.

Bolts & T-nuts: While bolts and T-nuts can be used to fasten bars together, they are mostly used to mount items to the t-slotted frame. The number and variety of bolts and T-nuts is very large, so we have included a basic overview of T-nut fastening options beginning on Page 12.

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While the methods to connecting aluminum bars together are endless, specific connectors have been developed over time to offer convenience, flexibility and strength to frames. The chart below outlines the strengths of specific fasteners for direct, cantilevered and torsional force. As you can see, end fasteners and anchor fasteners offer substantial up/down, in/out strengths, while plates offer the best torsional or twisting strength. Although the test results below were conducted on a 1515-Lite profile, the results are similar for most bar types. If the application you are designing for will be subject to both direct/cantilevered and torsional loads, then a combination of fasteners and plates is probably warranted. During the design phase of any framing project, it is vitally important to know what the frame will be subject to in terms of weight and forces. Once you know that, you are on your way to picking the right bars and fasteners for your 80/20 framing project.

<table>
<thead>
<tr>
<th>Connector Type</th>
<th>Hardware Costs</th>
<th>Machining Costs</th>
<th>Total Costs</th>
<th>Visibility</th>
<th>Flexibility</th>
<th>Strength</th>
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<tbody>
<tr>
<td>2 Hole Inside Corner Bracket</td>
<td>$4.15</td>
<td>NONE</td>
<td>$4.15</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>2 Hole Joining Strip</td>
<td>$4.65</td>
<td>NONE</td>
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<td>●</td>
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<tr>
<td>Hidden Corner Connectors</td>
<td>$5.15</td>
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<td>$5.15</td>
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<td>End Fastener</td>
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<td>$3.90</td>
<td>$5.50</td>
<td>● ● ● ●</td>
<td>●</td>
<td>● ● ● ●</td>
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<tr>
<td>2 Hole Inside Gusset</td>
<td>$5.50</td>
<td>NONE</td>
<td>$5.50</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Anchor Fastener</td>
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<td>$2.60</td>
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<td>● ● ● ●</td>
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<td>● ● ● ●</td>
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<tr>
<td>90° Inside Corner Connector</td>
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<td>$6.30</td>
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<td>●</td>
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<tr>
<td>4 Hole Inside Corner Bracket</td>
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<td>4 Hole Joining Strip</td>
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<td>NONE</td>
<td>$7.35</td>
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<td>●</td>
</tr>
<tr>
<td>4 Hole Inside Gusset</td>
<td>$8.65</td>
<td>NONE</td>
<td>$8.65</td>
<td>●</td>
<td>●</td>
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<tr>
<td>Central Connector</td>
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<td>$4.20</td>
<td>$8.75</td>
<td>● ● ● ●</td>
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<td>● ● ● ●</td>
</tr>
<tr>
<td>6 Hole Joining Plate</td>
<td>$9.45</td>
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<tr>
<td>Miter Connector</td>
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<td>$5.00</td>
<td>$9.50</td>
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<td>● ● ● ●</td>
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<tr>
<td>Butt Fastener</td>
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<td>$5.20</td>
<td>$12.85</td>
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<td>9 Hole 90° Joining Plate</td>
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All prices quoted are authentic 80/20 product MSRP's
Common Mistakes

1. Cannot Access The Fastener
Many designers forget to ask where a frame will be built or modified. If the frame is going to be assembled or mounted near a wall, you may have difficulty accessing a fastener that requires a tool to engage from the wall side of the frame. Connectors like anchor fasteners are convenient because they are easily connected without side access, and they are adjustable. End fasteners, central connectors and some plates may require access to all sides of the frame during construction. So be careful that you design a frame that cannot be easily built.

2. Fastener Complexity
If you use a lot of different types of fasteners on a frame that will be assembled and disassembled on occasion, you may be setting yourself up for failure. Unless you make meticulous notes when you build your frame, you may forget how to put it together as time passes. Using similar connectors and fasteners throughout the frame makes understanding how the frame was designed easier later in life. Many different fasteners may also require more types of tools, potentially leading to problems. While using different fasteners for different requirements is the right thing to do, too many fastener variations leads to overly complicated designs, and ultimately makes modifying or disassembling the frame more difficult.

3. Frame Not Strong
In order to maximize your frame’s strength, you must tighten fasteners adequately. As exact torque-tension relationships are affected by numerous factors, many manufacturers do not provide specific torque recommendations. However, 80/20 does provide general recommendations. 80/20 fasteners will need between 8 and 28 Ft-lbs. of torque to tighten adequately. Many builders tighten until they hear one or two clear “creaks” that often occur as the drop-lock feature of 80/20’s T-slotted aluminum profiles engage (see page 6 for more information about torque and the drop-lock feature).

4. Frame Not Straight
Assembling your frame true and straight will improve its strength and look. If you use 80/20’s standard profile, it includes the Align-a-grooves surface that helps immensely when aligning or connecting two bars. Some builders use a “square” to help ensure their corners and frames are true before they do the final tightening of the fasteners.

5. On-Site Building Perils
Building frames on-site can be risky if everything is not well thought-out. Professional 80/20 distributors that have full-service build teams have all of the machining equipment and inventory to deal with any possible design flaws or issues that can happen during a build, but often do-it-yourselfers will not have those luxuries in the field. While having a drill with you to create an access hole when needed is prudent and so is having extra nuts and bolts, bringing along the ability to cut bars, bore anchor holes or tap center holes may be well beyond most builders while in the field. So before you decide to build something on-site, think about whether building it and bringing it makes more sense - especially if you are having a professional assembly team build it for you at a full-service facility. Even if you are building it yourself, you may be better off building most of the frames in your shop before heading over to the final destination, just in case.

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Hardware Finishes

Fasteners and connectors come in several colors/finishes, so make sure when you are purchasing them you order the color/finish you want or need. Some color/finishes have specific properties that make them more advantageous for certain applications, so look at this overview below to better understand what fastener colors and finishes mean to your framing project.

Black Zinc
Black corrosion-resistant coating. Common on many fasteners, bolts and T-nuts. Less expensive than stainless steel.

Bright Zinc
Silver-colored corrosion-resistant coating. Common on many fasteners, bolts and T-nuts. Less expensive than stainless steel.

Stainless Steel
Corrosion-resistant steel that is not a coating, but steel with chromium added.

Lacquer
Coating added to cast aluminum parts to give a more even and shiny appearance.

Blue
Colored zinc coating usually added to metric fasteners to distinguish them from fractional parts with standard zinc coatings. Similar characteristics to zinc coatings.

Zinc
Zinc coatings prevent corrosion of the protected metal by forming a barrier, and by acting as a sacrificial anode if this barrier is compromised. When exposed to the atmosphere, zinc reacts with oxygen to form zinc oxide, which further reacts with water molecules in the air to form zinc hydroxide. Finally, zinc hydroxide reacts with carbon dioxide in the atmosphere to yield a thin, impermeable, tenacious and quite insoluble dull gray layer of zinc carbonate which adheres extremely well to the underlying zinc.

Stainless Steel
Stainless steel is defined as a ferrous alloy with a minimum of 10.5% chromium content. The name originates from the fact that stainless steel does not stain, corrode or rust as easily as ordinary steel. This material is also called corrosion-resistant steel when it is not detailed exactly to its alloy type and grade. Stainless steels have higher resistance to oxidization (rust) and corrosion in many natural and man made environments. Stainless steel comes in many different types. 80/20 stainless steel products are usually 18-8 Stainless Steel.

Advantages of Zinc
• Less expensive
• Less likely to bind/stick over time

Advantages of Stainless Steel
• More corrosive resistant
• Can be polished to a bright finish
• Harder
Assembly Instructions

**END FASTENERS**
*(Access Hole & End Tap Required)*

**Anchor Fasteners**
*(Counterbore Machining Required)*

**JOINING PLATES**
*(NO Machining Required)*

**90° INSIDE CORNER CONNECTOR**
*(No Machining Required)*

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**Learn More**

Want to learn more about T-slotted aluminum extrusion, more about 80/20 products, more about how to do things, or ready to buy some bars and fasteners and start building? If you are in southern California, you can arrange for a free Demonstration Van visit to your location to demonstrate the amazing 80/20 product line of T-slotted aluminum extrusion.

If you are not in southern California, don’t worry. We can still help you get started using 80/20 extrusions or we can design and build the entire project for you. F&L Industrial Solutions offers full design and build services in addition to the sales of 80/20 products.

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1-858-602-1500
Introduction to T-nut & Bolt Fasteners

80/20® has the largest assortment of fasteners available in the industry! We stock over 20 types, featuring over 400 variations and combinations for your applications. 80/20 fasteners are made of high-quality materials and hold tight tolerances. Variations include fasteners that load from the profile end or the profile side, fractional or metric, and black zinc, bright zinc or stainless steel material.

**Slide-In Economy T-Nuts**: single economy T-nuts are available with the thread centered or offset to best fit your application requirements. Offset T-nuts are ideal for making clean end connections without compromising strength. Centered T-nuts work well for connections made in the center of a profile or with a joining plate. Economy T-nuts are also available in double and triple configurations.

Standard **Slide-In T-Nuts**, made of 1215 carbon steel, are high-strength, low-cost fasteners that load from the profile end. They can be customized up to 36 inches in length for any application.

**Drop-in T-Nut** fasteners are a cost-effective, modular choice for most mounting needs. If the profile ends are captivated, drop-in fasteners can be placed directly in the T-slot, then rotated for secure placement.

**End Fasteners** provide a strong, square, hidden joint in a fixed location that simplifies assembly. When ordering applications with end fasteners, be sure to specify tapping and access hole machining services for your profiles.

**Self-Aligned T-Nuts** have a raised section that extends up into the T-slot opening. This feature will center the threaded hole of the T-nut in the T-slot, prevent rotation and allow for longer thread dimensions. **Note**: Make certain the “neck” does not extend past the face of the T-slot profile, interfering with the connection.

**Roll-In T-Nuts with Flex Handle, Set Screw, Ball Spring or Spring Leaf** load from the profile side, allowing add-ons to your application without dismantling the frame. Roll-in T-nuts with a flex handle, ball spring, set screw or spring leaf hold the T-nut in place for easy positioning. The flex handle makes removal of the drop-in simple.

**Slide-In Economy T-Slot Studs**, loaded from the end of a profile, are the strongest fastener available from 80/20® for use with joining plates. By engaging the Drop-Lock feature, they provide a vibration-proof connection when properly tightened. The square key on the shoulder of the bolt prevents the stud from turning when an application is subjected to vibration.

**Drop-in T-Slot Studs** load from the profile end or into the profile side. If the profile ends are captivated, drop-in fasteners can be placed directly in the T-slot, then rotated for secure placement.

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DIY Project Showcase - Bike Keg

My girlfriend, now wife, gave me a sweet stretched beach cruiser one year for Christmas. Cruising around Mission Bay and Pacific Beach I started to wonder how to get some of my homebrewed beer do the beach but do it in style. One of the problems is that the bottling stage has come and gone, it’s nothing but kegs now. So I thought, why not make a bike trailer that can hold a keg on ice, a CO2 tank, have a cup dispenser, and top it all off with a chrome tower? I didn’t have a welder and wanted something that was lighter than steel, so 80/20 was the only logical answer. The only tools that are needed was a chop saw, drill, drill bit, tap, tape measure, common sense, and some patience. The trickiest part was to triple check the layout and cut list to make sure everything would fit perfectly. The frame was made entirely out of 80/20 1” square material. Once the frame was done I stood on it to check it out. It’s incredible how strong it was and it had absolutely no flex at all. Every inch of the 80/20 was square and flat. Between the brackets that are available, and how well the center hole can be tapped for a ¼-20 bolt, assembly was smooth and easy. Mounting the diamond plate was easy and even mounting the round surface of the cup dispenser wasn’t a challenge. The only sad part of the story is that the city outlawed drinking on the beach about 2 weeks before it was complete.

Here are some specs:
- 80/20 1” square extrusion (10/10)
- Slide in T nuts
- ¼”-20 stainless allen button head bolts
- Insulated keg compartment with petcock drain
- Separate CO2 tank compartment with grommet pass through holes to keg compartment
- Open compartment in rear
- 30 cup spring load cup dispenser
- 2 ½” chrome tap tower

Photos and story submitted by Keith Simpson of San Diego

Show Us Your Project
Send us photos and a brief description of your 80/20 project and you might be featured in an upcoming edition of EBN!

Send To: info@fandl8020.com
New F&L Online Store Coming in May

In response to strong customer demand, F&L Industrial Solutions is proud to announce that it will be opening a new online store in late May (next month). The new online store will make ordering 80/20 bars and parts possible 24 hours a day, 7 days a week - and it will be much easier than other websites that exist today. The new store will allow shoppers to order custom sized bars!

The new online store is scheduled to open at the end of May. All subscribers to EBN will be notified when the actual opening date arrives. So make sure you have signed up for the free EBN subscription.

You can access the new store from our main website at www.fandl8020.com.

Upcoming Events

Del Mar Electronics DMEDS & Design Show
Visit Us At Booth #704
Exposition & Seminar Program
May 6th, 2015 - 10 AM - 5 PM
May 7th, 2015 - 10 AM - 3 PM
Del Mar Fairgrounds, San Diego, CA