DIY Tutorial—How to Build and True Wheels

By RadicalBrad

This tutorial will show you how to remove all of the spokes in a wheel and then reinstall them in the common 3-cross lacing pattern. It will also demonstrate some of the techniques used to true the wheel after it has been put back together. To follow along, you will need a wheel of any diameter with 36 spokes and a sharp flat head screwdriver.

The 3-cross lacing pattern is the most commonly used wheel lacing pattern, and it will yield a strong wheel that will work well on both a 2 wheel cycle as well as a trike or quadcycle. Building a wheel from scratch is not a difficult job; it just requires some careful counting and patience.

Your first try may take several hours, but once you memorize the lacing pattern, you will be able to build up your own wheels in less than an hour from start to finish. Learning to lace your own wheels is both cost effective and fun, so grab a wheel, lean back, and enjoy this tutorial.

The bicycle hub consists of a central axle, 2 bearing cups, a set of ball bearings, and 2 discs called the hub flanges (A). The number of spokes are divided equally between both flanges so that a 36

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spoke wheel will have flanges that contain 18 holes each. On each flange, spokes are installed in alternate directions so that the spoke head is either facing you (B) or facing away from you (C). To install a spoke so that the head is facing you (B), you push the spoke through the hole in the flange. To install a spoke so that the head is not facing you (C), you pull the spoke through the flange towards you.

Spokes are threaded at the ends so that the spoke nipples (A) can be threaded onto the spoke like a nut, tightening or loosening the tension on the spoke between the hub flange and the rim. The spoke nipples are slotted at the top so that they can be turned with a flat head screwdriver. Spoke nipples also have flat sides so they can be turned with a spoke wrench, but we will not be using this method in this tutorial. The valve hole (B) is the hole in the rim that allows the inner tube valve stem to fit into. This will be used as a reference point while working around the entire rim on
“Well, I wasn’t sure about buying plans over the Internet, but you put my mind at ease. Well laid out instructions and easy to follow.” ~ Barry T., Australia

Our laser cut Hub Flange Discs will make it easier for you to build your own delta trike wheels and save you time on your project. This Hub Flange Disc is made with 24 spoke holes so that you can build wheels directly onto any 3/4” axle using rims with 48 spokes.

The Hub Flange Discs are made of steel and are approximately 1/8 inch thick as required by the plans. Spoke holes are 7/64” in diameter so that standard bicycles spokes can be used.

All hub flange discs are sold as a set of four identical discs.

Our Hub Flange Discs come in several varieties with various spoke hole counts and axle hole diameters. Each of our DIY plans offer a recommended axle size and spoke count, but you can certainly change this to suit your design needs or parts availability. For instance, the Aurora Trike can be built using rims with 36 spokes rather than 48 spokes, or the DeltaWolf can be made using a 3/4 inch axle rather than a 5/8 inch axle. Please make sure that you order the correct Hub Flange Disc size for your project.

To keep costs to a minimum, our Hub Flange Discs are laser cut from flat sheet metal. Each disc will have a small imperfection on the outer edge and inner edge where the laser started cutting out the disc. There is also a mill scale on the surface of the metal that will need to be removed using sandpaper or a sanding disc. Neither of these imperfections will compromise the strength of the disc, and once they are built onto your hubs and painted, the imperfections will be unnoticeable.

The surfaces of the Hub Flange Discs are coated with a mill scale at the factory to help protect

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the metal from oxidation. This coating easily be removed using a sanding disc to prepare the part for painting. The laser cut edges are also somewhat sharp, so they need to be smoothed off using the sanding disc by running it lightly around the edge once.

Once the mill scale has been removed from the Hub Flange Discs, the spoke holes will need to be beveled slightly to remove the sharp edges around the holes. This is done so that the spoke exiting the flange is not cut by the sharp edges of the hole. To bevel the spoke holes, use a 3/16 inch drill bit and push lightly into the hole until a small bevel is made.

The beveled spoke holes are shown here after running pressing lightly with the 3/16 inch drill bit to remove the sharp edges. The Hub Flange Disc is now ready to be welded to your delta trike axle.

Remember, our Hub Flange Discs are sold as a set of four matching discs, and there are several versions available, so please choose the correct number of spoke holes and axle diameter for your project. These discs are manufactured to keep costs to a minimum, so you will need to bevel the spoke holes and prep the surface for painting, an operation that will only take a few minutes per disc.

All of our DIY Delta Trike Plans make use of these Hub Flange Discs, which allow you to lace a rim directly to the rear axle. By integrating the flanges directly onto the axles, you’ll save some money instead of needing to have complex and expensive machined hub parts made. Our trike plans also include instructions on how to make these parts from scratch, as well as a drawing that can be sent to a machine shop in case you want to make your own hub flanges.

Our goal is to offer parts that save you both time and money when building your own DIY bike or trike project. For more details and to order, visit the AtomicZombie store.

We want to see pictures of your workshop!

Whether it’s indoors or outdoors, big or small — show us where you build your bike projects.

Go to the AZ forum and join us.
From the Builders Gallery

An attempt at a 20s style board racer inspired low rider with a minimalist theme. It’s more comfortable to ride than the saddle height would suggest.

Winter closing in & still missing paint & a few details, but ridable. Thanks to all fellow zombies for the help & encouragement and to Brad & Kat for creating this terrific site.

The best presents are handmade.

AZTV

Find us on Facebook

Join our Fan Page.

“Howdy AZ folks! Your website and newsletters have really gotten me excited about modifying some bikes. Here’s a picture of a cargo bike that I made recently that has become a hit in our village and is used for transporting lots of stuff. Keep up the good work. We’re watching the progress from over here in West Africa (The Gambia)! Erik Brohaugh”
More than 30 informative bike building tutorials, plus videos. Absolutely free!

Topics include:

- Wheel Building
- Simple SWB Recumbent
- Wheel Part Salvaging
- Basic Fishmouth Cutting
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- Cranks And Pedals
- Bottom Brackets
- Derailleurs
- Rake and Trail

- Brakes
- Head Tubes
- Tall Bikes
- Bike Chains
- Bicycle Autopsy
- Granny’s Nightmare Chopper
- Goosenecks
- Freewheels
- Mountain Bike Tandem
- Bearings
- Underseat Steering for DeltaWolf

A friend challenged me to build a bike out of an old Kenmore dryer, so I did.

I built this out of 12 old bikes, an old sofa, a BBQ grill and an old picnic table, plus some EMT.

You can upload your own bike pictures to the gallery! Go to the AZ forum and join us.
Atomic Zombie axle adapters & hub flanges for your bike projects

By Brad Graham, AtomicZombie.com

We ship orders on Wednesdays. We will be adding more to our inventory in response to the demand, including spokes, bearings, chains, and many other common bicycle parts that are used on every project.

Here is a description of the parts we now have for sale and which plans they belong to.

Some of the Delta Trike parts we offer:

The disc brake axle adapter will allow you to install a standard bicycle disc brake onto a 5/8 or 3/4 inch diameter steel axle. The part will be drilled and tapped for standard disc brake rotor mounting and will include a set screw for connection to the axle.

The threaded freewheel axle adapter will allow a Shimano type screw-on freewheel to be affixed to a 5/8 or 3/4 inch diameter steel axle. This part will include a set screw for connection to the axle.

The Hub flange set will

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Projects that require axle adapters and flanges.

allow a wheel to be laced directly to a 5/8 or 3/4 inch diameter steel axle. These steel parts are sold in pairs and will include 18 or 24 drilled spoke holes for 36 or 48 hole rims.

All of our DIY trike and quadcycle plans use one or more of these parts, and you certainly use these parts to design your own unique vehicles based on our plans or from scratch. Having these parts available means that you can shave days off your build time or possibly weeks if you have to wait in line at the machine shop for your parts to be made.

Because we will be making these in quantities, we can manufacture them for less than what a machine shop would charge for a single unit. All of our parts are tested to fit on the axle and freewheel, so there will be no guesswork or problems when it comes time to install them.

Our freewheel and brake adapter will allow standard bicycle components to be adapted to any 5/8 or 3/4 axle so that transmission and braking can be included. A threaded freewheel will screw on to the adapter and a standard bicycle disc brake rotor will bolt onto the included flange.

With these two components mounted to the axle, you can use a standard bicycle rear derailleur to add speeds and a standard
mechanical bicycle disc brake to offer solid stopping power.

All of our plans that include two rear wheels make use of one or more of these freewheel and disc brake adapters. With our freewheel and disc brake adapters, you can add a pedal transmission to practically anything with an axle.

All of our future delta trike and quad plans will use 3/4 inch axles. If you are interested in purchasing any of the parts or need more detailed information, please visit AtomicZombie.com.

We are working with shipping companies to offer parts for sale outside of North America. Please be patient. We are trying our best to find affordable options for our international bike building friends.

Stay tuned to the forum, newsletter, Facebook and AZ site for announcements on when the hub flanges will be available for sale in late August. All of our custom parts are proudly made in North America and designed to fit as advertised.

**Currently we only ship to Canada and USA**, but can send worldwide for larger orders. Contact us for more info.

All parts are currently in stock, and orders are shipped every Wednesday.
each spoke.

Spokes are under a great deal of tension, so you need to remove them only a little bit at a time in order to avoid damaging the spokes and the rim. If you tried to remove only a few spokes right away, the neighboring spokes would have to deal with a lot of added tension, and may have their threads damaged or even snap tight off at the head. Another problem with removing the spokes unevenly is that the rim will become distorted. If this happens too much, it may be permanently bent. For these reasons, you must remove the spokes only a little at a time by turning each spoke nipple once in the counter clockwise rotation.

While working around the rim, always start at the valve hole on the first spoke and then work around the rim until you end at the valve hole on the last spoke. Loosen each spoke nipple one turn in the counter clockwise rotation, moving to the next spoke until you have ended up back at the valve hole where you begun. Loosening spokes this way will prevent your spokes
or rim from being damaged. Work around the rim multiple times until all of the spoke nipples are loose enough to be turned by hand. At this point, there is no risk of warping the rim.

When the spoke nipples are loose enough to be turned by hand, place the rim over a bucket or large can so that you can easily work your way around the rim. At this point, you can take the spoke nipples completely out in any order as there is no risk of warping the rim or damaging spoke threads with very little tension on the spokes.

If you turn the spoke nipples using your fingers along the sides, then they can be removed in a few seconds. Spoke nipples are removed by turning them in the counter clockwise rotation until they are completely removed from the spoke threads. If some of the spoke threads have corroded slightly, then you will need to use your screwdriver to turn them the rest of the way out. Take note of badly rusted spokes or nipples as they should not be used again to build a wheel.

With all of the spoke nipples removed from the spoke threads, you can pull the hub away from the rim, leaving a huge mess of disorganized spokes sticking out of the hub in all directions. To quickly remove all of the spokes from the hub flanges, hold it upright and then let all of the spokes drop through the holes by setting them in the upright position. Once the first 18 spokes are removed, flip over the hub and drop out the

The rest of this tutorial is on the AtomicZombie main site under Tutorials.
My DeltaRunner build

I’ve gotten way too many projects going on. This build has been sitting in the corner and while I wait for some parts to come in and save for some tires for the Viking, I decided I’d better get busy with this build, mainly so I can get the rear wheels ready for spokes. Since I need to order some spokes for the Viking/Warrior, I figured it would be best to order all spokes and pay for shipping only once.

Today, I went out to the garage not planning to spend much time there, but ended up being out there most of the afternoon. It started with my 5 and 2 year old going out with me which means I won’t be able to grind or weld. So, I started on getting the hubs ready by cutting out the pattern.


Easy FrontRunner build

Managed to get another 1.5 hours garage time today. Got the down tube and lower boom welded up and smoothed out. Also, finished weld filling the rear fork to boom connection looking good. Next is the tabs to connect the front and rear booms, then the all important head tube fit and getting the correct angle. Having struggled in the past in not having enough hands to hold everything, I have got a couple of ideas I would like to try out.

First idea is welding a temporary stub to the front of the head tube to be able to clamp this to a temporary frame/jig.


We want to see pictures of your workshop!

Whether it’s indoors or outdoors, big or small — show us where you build your bike projects.

Go to the AZ forum and join us.

From our Facebook Fan Page:

“Hello from the Philippines. Me and my brother like your choppers.”
Which LWB for touring?

I’m seriously considering one of a few AZ LWB offerings for use on next year’s DALMAC. While the Spirit SWB was a fantastic experience this year, I’m thinking that a homebuilt LWB might fare even better on the tour for me, so I’ve narrowed it down to a few plans:

1) The WildKat - This one is the best looking in my opinion, and a friend already has the plans and some of the tubing from an unfinished build that he will donate to me. It would also be very easy to add a rear storage rack, a touring necessity.


Brazing expansion joints?

I want to braze racks onto a MTB frame. And I was thinking that an expansion joint will need some kind of strap around the tube that the new tube is connected to. Maybe someone can tell me what is and is not possible in brazing a bike?

Also, what kind of equipment I need, I don’t really want to spend $250 or more.


New guy from Brampton

Hey guys and gals. New guy checking in from Brampton.

I’m mostly a car gear head, but I’ve just began to dabble in the bicycle hacking.

After seeing some really cool bike builds on here, I wanted to try my hand at one. I’ve been wanting to build a 4 wheel cargo bike for my girl friend since she has a few paper routes that she’s had since high school.

"Thank you for the wheel building how-to. It is very useful and well put together.

~ Jan H., Sweden

From the Builders Gallery

The crank is 5 inches forward. That is the same as a 60 degree seat tube, except that I can use a front derailleur (not usable on a 60 degree seat tube). I made the handle bars.

The youngest gets picked up every day from school on this (picture is about 3 years old). It's painted black and yellow now.

A project I built for the neighborhood kids for a city festival.

From the Saginaw, MI, Cinco de Mayo parade.

You can upload your own bike pictures to the gallery. New pictures are added every day.

Help us reach our goal of 5,000 images by Dec. 31, 2012. Go to the AZ forum and join us.