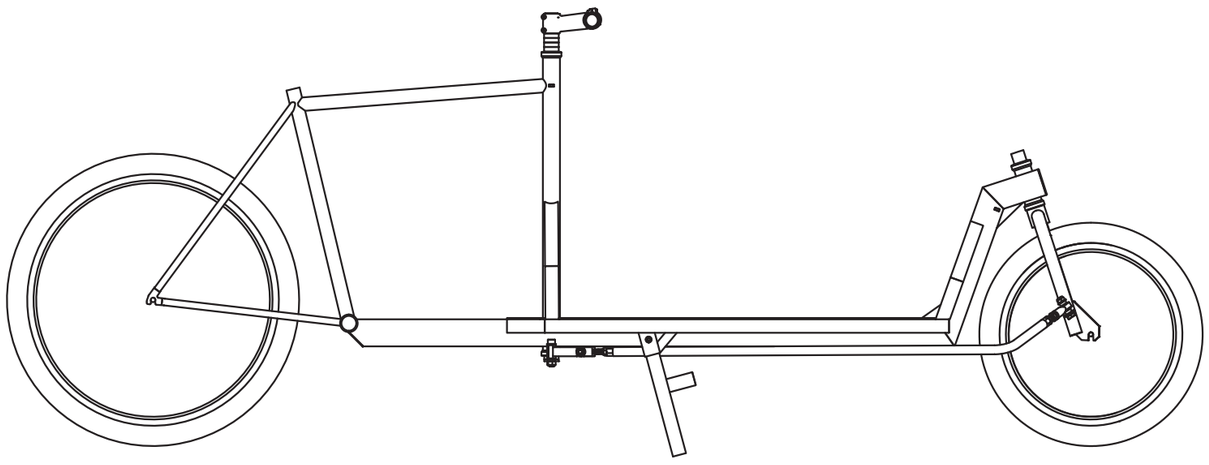
Long-John Cargo Bike
Plans/Building Info



Hi there! Thank you for purchasing my plans and supporting my Content!

This PDF contains plans, measurements and lots of general information that will help you build the cargo bike that I built in my YouTube Video. If you haven‘t seen the video, you should do that first, it works in conjuction with this PDF and it will make the following plans much easier to understand.
You can find the video on my YouTube Channel: **youtube.com/philvandelay**

The idea is to use the video to gain a general understanding of the building process, all the steps involved, and the order in which to build all the parts. This PDF will then provide all the detailed information like measurements and other tips. Therefore the PDF will not be a step-by-step tutorial - that‘s what the video is for.

Project: **Long-John Cargo Bike**

Introduction

General Stuff

Please note that I'm not an engineer, a trainer or a professional frame builder. This is not a definitive guide, more of a suggestion on how one could build their own cargo bike.

If you build and ride a self-made vehicle in traffic or anywhere else **you are doing so at your own risk.** I can't guarantee for your safety or that your bike will hold up because I'm not the one who built it, I'm just showing you how I do it. Please use your best judgement, be careful and use your bike according to the laws that apply in your country.

Also, I'm assuming that if you are using any kind of (power-)tool, you have made yourself familiar with the **safety procedures**, are using protective gear, and have taken the necessary steps to avoid injury; so I will spare you the safety lectures. Please use common sense and take care of yourself.

Since I'm from a metric country (Germany), aside from some small exceptions like imperial bicycle standards, these plans will be using the metric system and **all measurements will be in milimetres**, unless otherwise specified.

I strongly suggest you read this entire guide before you start working.

About the Bike

In case you are not familiar with cargo bikes, let's go over the basics on what we're building here: This is a two-wheeled front-loading cargo bike and this particular style (with the cargo area between the rider and the front wheel) is usually called a **Long-John.** This design has been around for a long time, the earliest Long-John bikes date back to the 1920s. It's an extremely popular design due to its versatility and large cargo capacity while still being relatively fast and easy to ride.

You can use this bike to move almost anything that fits onto the cargo bay: It can carry large objects, you can mount a box and move a months worth of groceries, you can bring an entire barbeque to the park or you can install child seats to ride your kids to school or even give an adult person or your dog a ride. It's up to you!

There are many similar production cargo bikes you can buy, the most popular being the „Bullitt" from a Danish Company called Larry vs. Harry. Unfortunately they are very expensive - usually starting at over 2.000€/$, which is why there are also countless different DIY versions of this type of bike.

There are many different ways to build a DIY Long-John. This design is what I personally came up with and have improved upon after different iterations

The main philosphy of this design is that I wanted it to be **easy and cheap to build** for the average home shop person who doesn't own a ton of professional equipment. It is made up of easy to find, cheap materials and you can build it with relatively common tools.

The other main aspect is that I wanted it to be **strong and reliable.** This bike can easily carry 100 Kilograms (220 pounds) in addition to the rider (I recommend not exceeding 120 kg as a rule of thumb). The limiting factor here is going to be the parts you use (mostly the wheels), rather than the frame.
Moving a person, a fridge, a washing machine or even a sofa should be no problem with some practice!

Build Time

To give you a *very rough estimate*, you can probably expect to work on this build somewhere around **40-100 hours.** So if you work on it 5 days a week, it will probably take you somewhere between one and three weeks to finish it. This might sound like a lot at first, but I can tell you from experience: if you're doing this for the first time, there will be lots of things to figure out, you will make mistakes (which is fine, you can fix them!) and generally everything will always take longer than you first thought. Just don't expect to finish this entire project in a day or two - take your time, don't rush it, concentrate, work carefully, do your best and your bike will come out great.
(Note that I didn't factor in the time it takes to gather all the necessary materials)

Cost

In terms of money, it is largely up to you. If you take your time to look for a good deal on a used donor bike and you maybe already have some usable parts and materials sitting around, the build can be as cheap as 200$/€ or less. This depends a lot on your location and the local prices for bikes, bike parts and materials. You can also go the other route and buy a really nice but more expensive donor bike with good quality parts - how much you want to spend here is your choice.

The other materials are mostly mild steel tubing and some small parts that you can find at most hardware stores. Depending on steel prices in your location, these things will most likely cost less than 200$/€ overall. For an average cheap-ish version of this build, you can expect somewhere between 300-500$/€ in overall cost.

Please understand that I can't offer a list with exact sources for materials and parts. Since this guide is for everyone and you probably don't live in the same place, it would be of little use to you if I told you where I buy these things. Finding sources for the needed parts is part of the work in this case, so it is up to you to figure out where to get everything (Google is your friend).

Project: **Long-John Cargo Bike**

Tools

Here‘s a quick overview on the most important tools for this build.
There are only a few tools you absolutely **need** and a lot of tools that are going to make the build **easier, faster or more accurate**, but that aren‘t a must have. You can substitute almost any tool with something cheaper or simpler if you are willing to do some extra work.

Of course you will need some basic hand tools such as wrenches, pliers, files, allen keys, a tape measure and so on, as well as a space to work, a workbench and ideally a bench vise. You will also need some bike specific tools to assemble/disassemble the bike parts - these things should be a given, so I‘m not covering them in detail here.

At the very least, the three major **must-have powertools** you will need are:

-Welding Machine

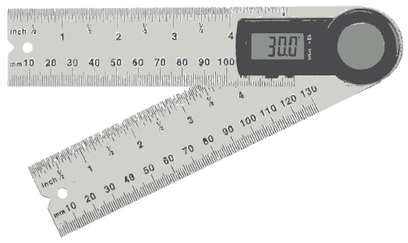
-Angle Grinder

-Powerdrill

That means you *can* complete this build with just these. Anything on top will make the work easier and produce nicer results, but it‘s not strictly needed!

Measuring

Apart from common measuring tools like tape measures there is one special tool I want to mention specifically: **A digital angle finder** is extremely useful for building bikes, to the point that I would call it a must have for this build.

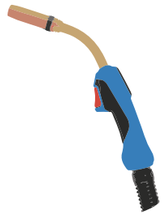


They are not expensive and will help you out a lot to get all the different mitre cuts and frame angles right.

Welding

The most important powertool you will need is a Welding Machine.
The three most common welding processes are **TIG Welding, MIG Welding** and **Stick Welding** and any of these can be used to weld the frame. Of course your results will vary based on the process, the quality of the machine, and your welding experience, but it is generally possible to weld the frame with all of these.

TIG Welding would be the best process to use because it is the most controllable and precise, which makes it great for thin materials and delicate welds, like you find on a bike frame. But it‘s not too common in most home/hobby shops, as a good TIG Welder is expensive and using it takes some practice. If you don‘t have a TIG Welder, don‘t worry!



MIG Welding would be the next best thing, it‘s common, versatile and easy to learn. If you use a MIG Welder you would want to get some thin gauge welding wire because the welds are relatively small and delicate and some of the tubing is quite thin. There is also a sub-type of MIG Welding called Flux Core Welding which follows the same principle but doesn‘t use gas.

Stick Welding also works if you use thin electrodes. The advantage of stick welding is that the machines are quite cheap, widely available and you don‘t need any additional gas. Overall it would probably be the most difficult to use for this project because it takes some skill to avoid burning holes when stick welding thin materials, but it is possible.

With any of these processes it would be a good idea to do some test welds on some scrap steel pieces with a similar thickness first to get the settings dialed in on your welder.

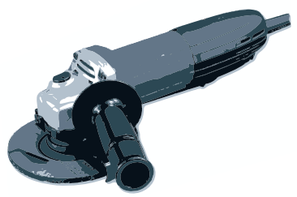
Project: **Long-John Cargo Bike**

Tools

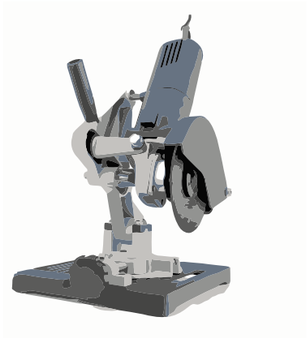
Metal Cutting

You will need some tools that allow you to cut steel tubing to size and also to cut different mitre angles as well as produce large, round holes. There‘s a huge variety of tools that allow you to do this with varying degrees of precision. Here are *some of the options* (you don‘t need all of these!)

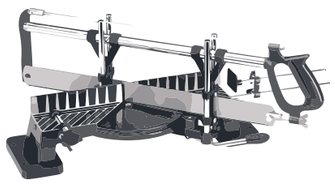
Metal Hacksaw
With some elbow grease and patience, most of the cutting can actually be done with a simple Metal Hacksaw. It requires some skill and serious dedication though, so I would suggest having at least an angle grinder for this job.



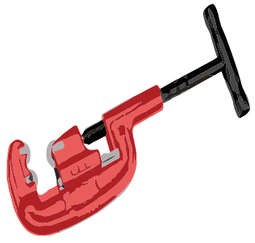
Angle Grinder
The most versatile tool for this build is an angle grinder. If you scribe/mark your cutting lines well and carefully use a cutoff disc, this can be enough to do all the cutting for the frame parts if you don‘t rush it and use files to refine and clean up your cuts. You can also use the grinder with a flap disc to notch out tubing (also called creating a „fishmouth“) to connect round pieces of tubing.



Angle Grinder Cutoff Stand
Another relatively cheap option is to use a cutoff stand for an angle grinder. These allow you to install your grinder into them and to fix pieces of tubing in a vise and guide the grinder down in a straight line to make it easier to cut angles precisely. Since they use an existing angle grinder, this is a relatively cheap method of getting straight cuts, but the cutting depth is limited.

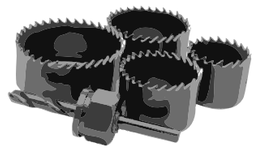


Hand Mitre Saw
These are usually used to cut wood but you can get metal blades for them. If you are willing to put in some work this is actually a good, cheap way to get accurate mitre cuts in steel tubing but it takes a while. I built my entire first cargo bike cutting everything with one of these.



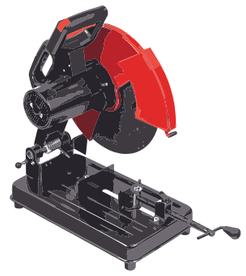
Pipe Cutter
For the purpose of this build, this would be a very handy tool to have. Pipe Cutters are relatively inexpensive hand tools that can easily produce very accurate cuts. Their advantage is that they produce a perfectly perpendicular cut on round tubes which can be hard to achieve if you‘re cutting by hand with a saw or grinder. This helps with the steering tubes.

Power Drill
One of the few must have tools - apart from drilling smaller holes with a twist drill you can also use this in conjunction with hole saws (see below) to cut out the various round holes/tubing notches need to fit the frames steering tubes.



Set of Bi-Metal Hole Saws
These are almost a must have - there are other methods of cutting large round holes into steel, but a hole saw is by far the easiest way. You can find sets with different diameters of these on Amazon, eBay and similar sites and they are not too expensive. I highly recommend investing in these if you don‘t have them. You can use them in a hand held powerdrill or a drill press. Make sure they are rated for cutting steel!

Drill Press
In Addition to a hand held power drill, a drill press would be very useful for this build. It can help you cut the aforementioned round cutouts for the tubing straight and accurately without much hassle and in conjunction with a vise, can also help to cut the angled notching cut on the donor frame.



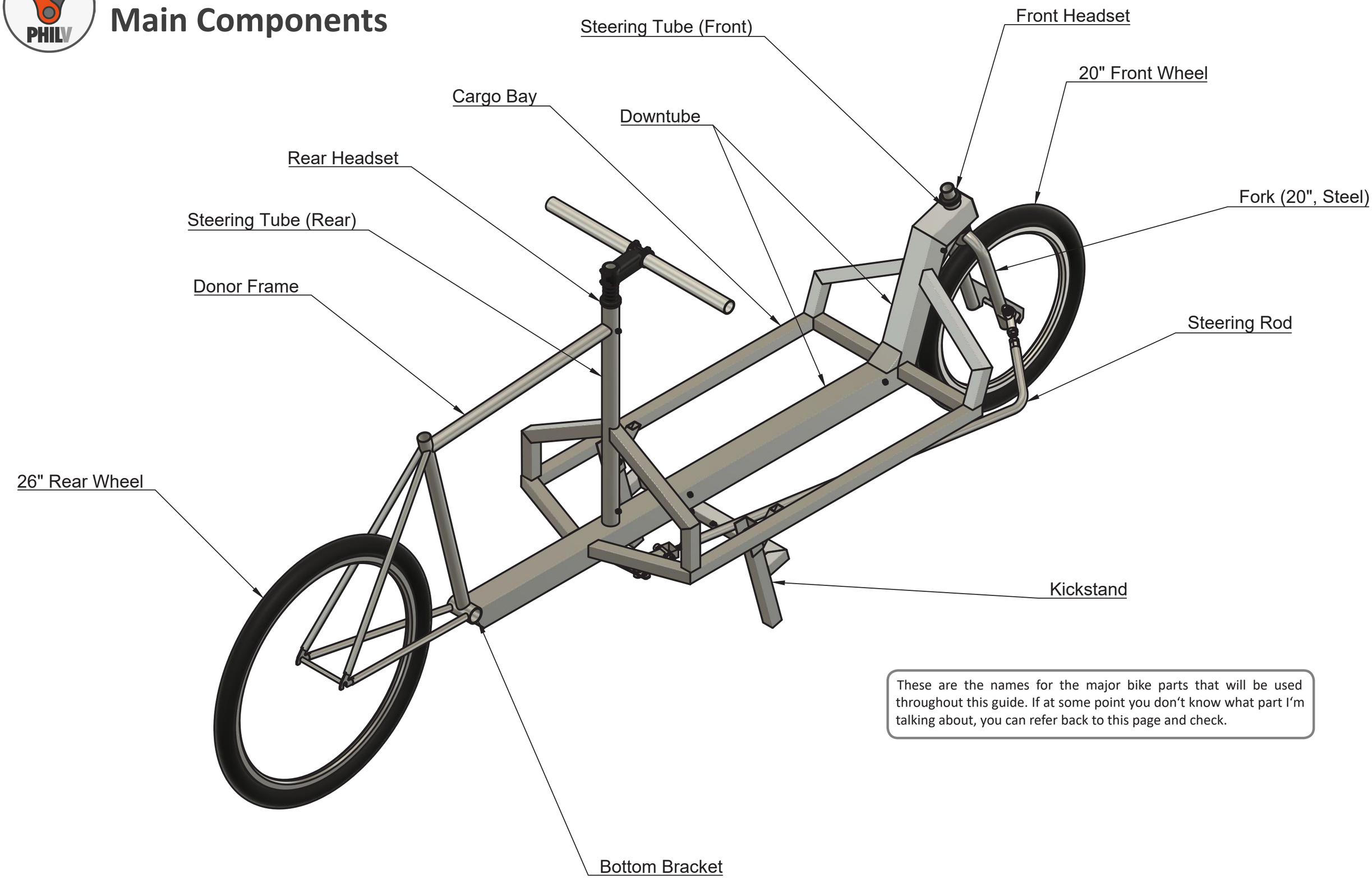
Metal Chop Saw
These are one of the fastest and easiest ways to cut metal stock, they are available with abrasive cutting wheels as well as carbide-tipped sawblades and produce clean, accurate (mitre)cuts. They also don‘t take up a lot of space when not in use. They are **very** loud.

Metal Band Saw
Metal Band saws are some of the most versatile metal cutting saws available, they are a little slower than chop saws but they can be extremely accurate and can fit very large material diameters. Cutting mitres is fast, accurate and easy with these.

Lathe and/or Milling Machine
Of course heavy machining tools make this kind of build a breeze but they are by no means necessary.
If you have these, or are considering getting them, I probably don‘t need to explain much about them, and if you don‘t, you probably won‘t buy them just for this build.

Project: **Long-John Cargo Bike**

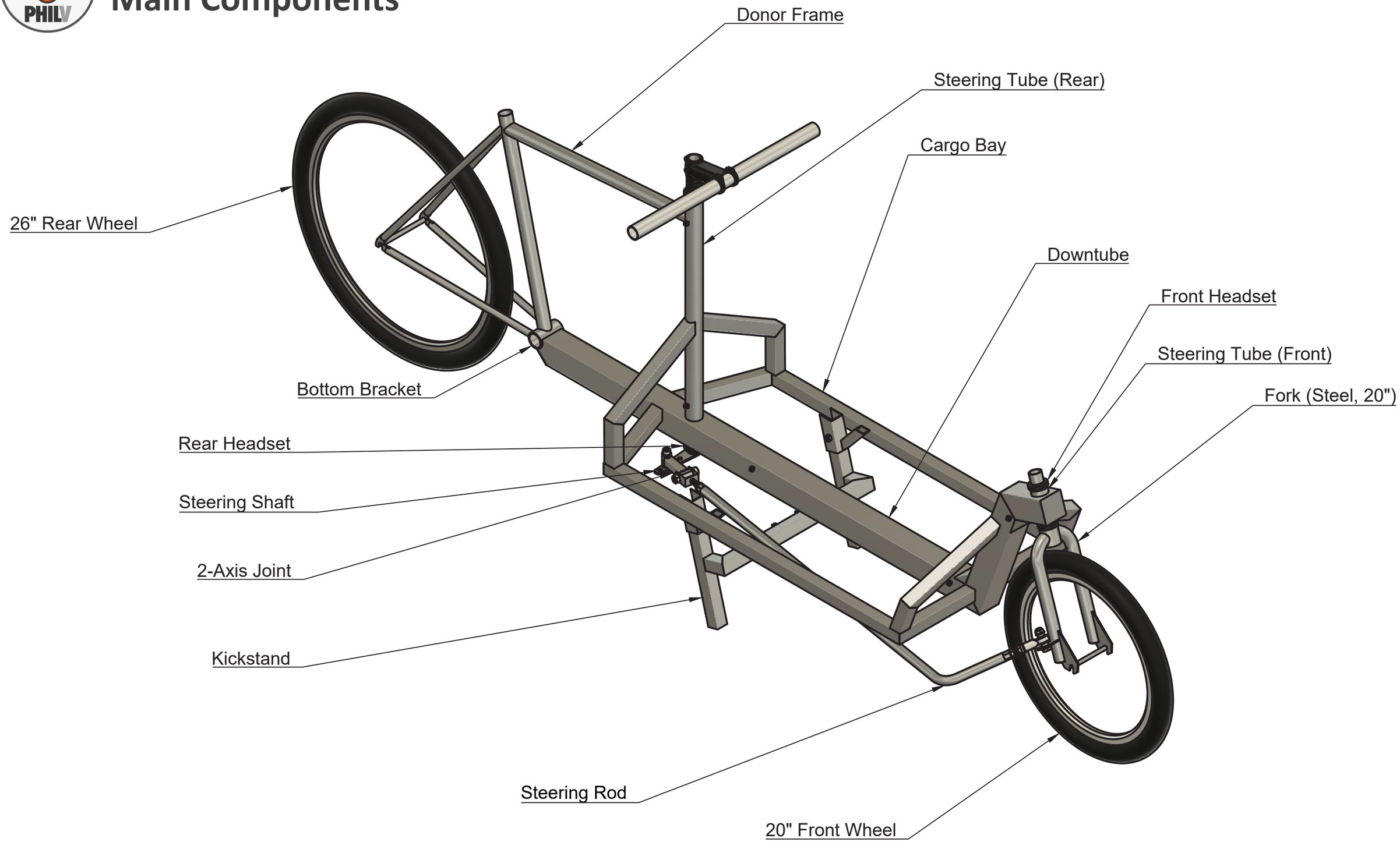
Main Components



These are the names for the major bike parts that will be used throughout this guide. If at some point you don‘t know what part I‘m talking about, you can refer back to this page and check.

Project: **Long-John Cargo Bike**

Main Components



Project: **Long-John Cargo Bike**

Materials and Bike Parts

Square Tubing

Most of the frame is going to be made up of **mild steel square tubing.**
Why? While it‘s not the perfect building material for bikes, it is available almost anywhere in the world, it is very cheap, strong enough for the purpose, easy to weld with almost any welder and most importantly easy to work with. Due to the fact that there are four flat sides to reference off of it is much easier to measure and cut than round tubing.

Notes on Tubing Sizes

For the main Downtube: 60x60x1,5mm
This size can potentially be difficult to find. The reason I picked it is that it‘s thin walled and has the largest profile (for maximum stiffness) that can still be welded onto a standard BSA bottom bracket shell (which has a width of 68mm). This leaves 4mm on each side for the weld - which is cutting it pretty close, but doable.
If you are using MIG or Stick welding, and are not sure you can weld on the sides of the bottom bracket with this little space without affecting the threads, you can also use a slightly smaller tube (see below)

Generally, a piece of tubing with a large profile will provide more structural strength at the same weight than a smaller tube with thicker walls. That‘s why we‘re using a large tube with thin walls rather than a small tube with thick walls, which would be heavier while providing less stiffness/rigidity.

That being said, if you can‘t find this size of tubing, there are alternatives. **50x50x2mm** is a very common size you should be able to find almost anywhere while offering a similar strength to weight ratio. It‘s another good size to use for this build, without having to make large adjustments to the measurements or frame geometry. For a bike this long, I would not go with smaller tubing, if you want your frame to be reasonably stiff (not bouncing or flexing under load) with considerable cargo weight on it. I also strongly suggest not using anything with more than 2mm of wall thickness, because it‘s not necessary and will make your frame very heavy.

For the Cargo Bay: 30x30x1,5mm
The reasoning for this tubing size is the same as with the Downtube. Again, you can substitute this with similar-sized tubing if you cannot find this size, but I wouldn‘t try to go any bigger. You can go smaller, as the Cargo Bay is not too critical for the overall structure of the bike. I chose this size partly because it‘s half the size of the large tubing which makes for good proportions.

For small parts: 35x35x2mm
This size was selected for the mounting brackets for the kickstand as well as a bracket for the steering joint, because it has an inside width of 31mm which means it fits neatly around the outside of a 30x30mm tube, with a little bit of room to spare so it‘s not too tight. This helps us to build some simple joints, quick and easy.

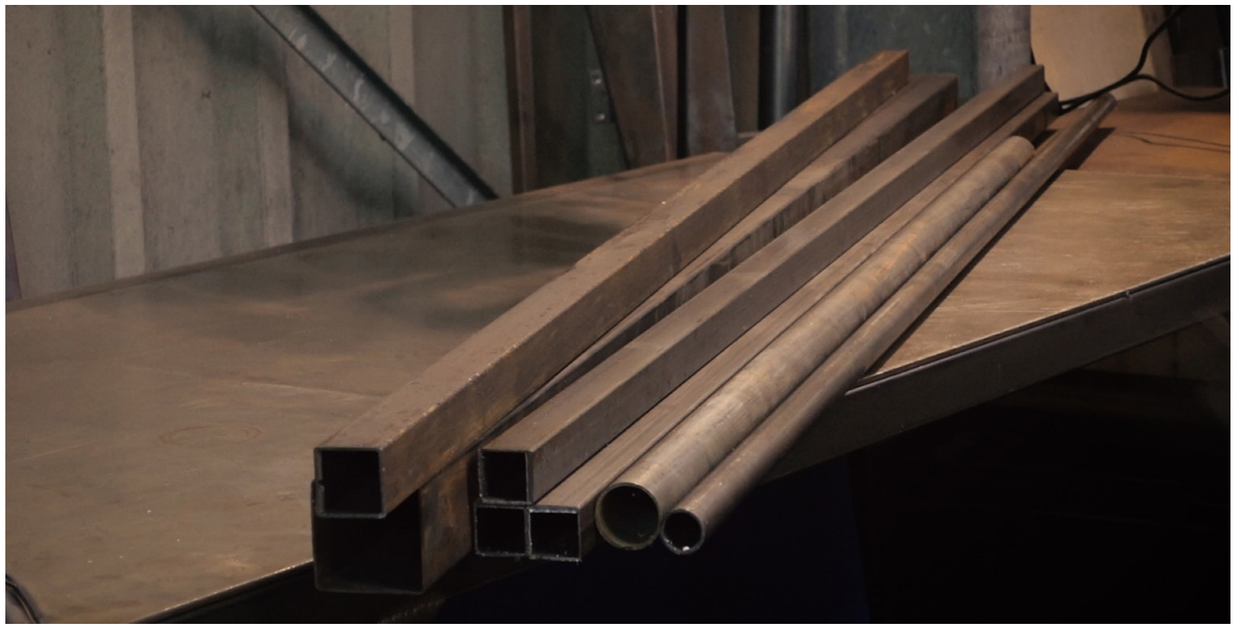
Round Tubing / Steering Tubes

For the steering tubes we need round tubing so we can fit bike headsets into them. This is the trickiest part and the most common question on most DIY bike builds: How do you find tubing that can fit a headset?

There are different ways to approach this, one is to cut a head tube out of a donor bike frame and extend it to the length you need, by cutting it in the middle and welding the top and bottom to another tube that sits between them. The problem with this is getting the top and bottom aligned and welded straight/parallel enough for the headset to work smoothly. Another way is to buy special bike specific tubing from a frame building supplier that is made for this purpose and has the correct inner diameter. But that kind of tubing is expensive and it‘s much harder to find a supplier for it.

For this build, the idea is to use common metric steel construction tubing with an **outside diameter of 38mm and 2mm wall thickness**, which provides us with a **34mm inside diameter**.
34mm is the cup size of a standard **1-1/8” pressed cup (EC34) headset.** This is the most common type of modern bike headset, which is also used for this build.

This tubing size is not too uncommon and should be available at most steel vendors, online or locally. You want to look for „precision tubing“ which, unlike standard tubing, is available in metric sizes of smaller increments and slightly more expensive than standard tubing, which is usually sized in inches.
In theory you can use any other kind of tubing with different measurements, as long as it has an inside diameter that fits some type of headset standard. But for the purpose of this build, this is what we‘re going with.
I have consciously planned this build **to not use 1“ steering tubes, steerers, threaded headsets or quill stems** as it is a very old, outdated standard and in my opinion not strong enough for use on a heavy-duty cargo bike.



Project: **Long-John Cargo Bike**

Materials and Bike Parts

The Donor Bike

The most important thing you need to find is a suitable donor bike for the build. There‘s a few important factors to consider:

Frame Material

You need a donor frame that is made out of **steel.** The reason is that we want to use steel tubing to make the frame and you cannot weld together dissimilar metals (like steel and aluminum).
The other reason is that most welding machines can only weld steel. To weld aluminum, you need a special AC TIG welder that you most likely don‘t have (and if you do, you probably know all this). It‘s expensive and it‘s also harder to learn. There‘s a whole bunch of other reasons, but the bottom line is: For this project, you need a steel frame, **aluminum frames will not work.**

The large majority of bike frames is made out of either steel or aluminum, with aluminum being the most common material for modern frames, whereas steel is more common in older frames (pre 2000s and older). But that‘s good because they‘re usually also cheaper.

One more thing: **Avoid lugged frames.** Apart from probably being ancient, lugged frames are brazed, and brazing and welding don‘t go well together. The welding heat might affect/weaken the brazed connections.

Frame Size

All measurements are designed with a **26“ (ETRO-559) rear wheel** in mind, so you want to find a donor bike with 26“ wheels. You can in theory use a different wheel size if you know what you‘re doing, but you will have to change a bunch of measurements. The reason I chose 26“ is because smaller wheels are stiffer and stronger and 26“ is a common size for older mountain bikes. As for the size of the actual frame (frame height/seat tube length), it‘s entirely up to you. Just pick a bike somewhere around the size you would normally ride. If you are tall and also want to make the bike usable for other people that are potentially shorter than you, it makes sense to go with a smaller frame. (Tall people can usually ride small frames but short people can‘t ride large frames.)

Bike Category

The main point here is that you want a stiff, strong frame, because cargo bikes need to be sturdy. For that reason, categories like road bikes, children‘s bikes and grandma‘s grocery bike are out. The same goes for low-quality bikes that were cheaply produced. Don‘t waste your time putting in days of work to build something based on a bad donor frame that might break on you. Your best bet is to look for name brands that offer some degree of reliable quality. Good examples in terms of MTBs would be brands like Trek, Scott, Marin, GT, Specalized, Cube, Kona, Cannondale, Bridgestone, Panasonic, Giant and many others.
I suggest avoiding „lady“ geometries with a low/sloped downtube, as they can be more diffictult to fit and are structurally weaker. You can use one, but note that the info in this guide applies to frames with a horizontal/ straight top tube.
Since we are going for 26“ there is not much left except for mountain bikes, and some Trekking/ATB/Travel bikes. Mountain bikes are a good choice because they are built for off-road use, so they have strong, well constructed frames, lots of space for thick tires and good mounting standards for brakes such as cantilever brake posts for V-brakes or disc brake mounts. They‘re also fairly abundant, because they were so popular in the 90s.

Project: **Long-John Cargo Bike**

Materials and Bike Parts

Bike Parts

Apart from the wheel size, what parts you put on the bike is largely up to you. If you do hunt for a used donor bike, it makes sense to look for bikes where you can re-use most if not all of the bike components beside the frame because it saves you time and money compared to finding and buying these parts individually. The best donor bike already has usable brakes, gears, shifters, cranks, rear wheel and so on. Of course if you already have that stuff or want to buy it new, you can just look for a frame. In terms of parts, here's some of my personal recommendations:

Brakes

This is one of the parts that needs more attention on a cargo bike compared to a normal one. Since the bike will be considerably heavier than a normal bike especially loaded up with cargo, you will need good brakes to ride it safely. There are really only two kinds of brakes suitable for this.

V-Brakes are very common, cheap to buy and maintain, very easy to service and if set up correctly (get quality brake pads!) they offer good stopping power *for a rim brake*. You will find mounts for these on most older mountain bikes and many other bikes and you can use almost all wheels with them. If you want to go cheap and easy, this is your best choice. Another great option are hydraulic V-Brakes, these are a little rare and expensive, but convenient since they use the same brake mounts, while offering even more stopping power.

Disc Brakes would be ideal and they're what's used on most production cargo bikes and modern mountain bikes. They're usually hydraulic, but contrary to their reputation, even mechanical disc brakes can be very effective. However, to use these, you need to find a frame and fork that already has disc brake mounts, which is tricky because most of those frames are more modern and therefore made of aluminum which makes them unsuitable for this build (see „Frame Material"). You can find steel frames and forks with disc brake mounts but they are rare. Another option is to weld disc-brake mounts to a frame and fork yourself, which is possible even without special tools, but it goes beyond the scope of this tutorial (I might make some content for that at a later date).

Brakes you should avoid are **U-Brakes** (sometimes confused with V-Brakes), any type of **caliper brake** like road bike brakes and **rollerbrakes** because all of these are terrible and don't offer enough stopping power.

Drivetrain - Gears, Cranks, etc.

The choice for these parts is completely up to you. I personally prefer derailleur-gears (external gearing) but you can also use an internal gear-hub on a cargo bike. Keep in mind that for an internal gear hub, you either need to find a frame that has horizontal dropouts (very uncommon on mountain bike frames) or use one of various other methods of tensioning the chain, like a chain tensioner or eccentric bottom bracket.

One thing to keep in mind is that you want a fairly low gear ratio, so again mountain bike parts like triple-chainring cranks and MTB derailleurs and cassettes make sense so you can get into very low gears for when you need to pedal up a hill with lots of weight.

Steering/Forks/Headsets

These parts are not too important on the donor bike since you will most likely replace/modify them anyway.

As mentioned before, the bike we're building is designed to use **1-1/8" threadless standard headsets, steering tubes and steerers**. That doesn't mean you have to find a bike with a 1-1/8" fork and headset though. Since the head tube from the donor frame will be removed anyway, a frame with a 1" fork steerer and 1" stem is still suitable. In this case you would have to find an **additional** 1-1/8" fork though, because you need one as a donor fork to build the steering shaft. This donor fork can be anything, as long as the steerer is 1-1/8". The legs will be cut off, so the wheel size and condition doesn't matter - you can go cheap, or scavenge a trashed fork.

You will also need two 1-1/8" headsets, two 1-1/8" ahead-type stems as well as handlebars of your choice.

20" Parts

For the front of the bike, you need a **20" (ETRO 406) wheel** and a **20" fork.** It has to be a steel fork, because like the frame, it has to be suitable for welding. Just like the donor bike, you want to try and find strong versions of these. 20" parts are most commonly found on folding bikes, kids' bikes, and BMX bikes. BMX bikes are a good start because their parts are very sturdy. Used BMX parts or entire bikes can often be found for a good price online. Since 20" parts are more rare, if you don't feel like searching, you can also just buy these parts new.

Project: **Long-John Cargo Bike**

Materials and Bike Parts (Listed)

Steel Stock/Tubing

Tubing Size (or similar)	**Usage**	**Approximate overall length** (offcut not included!)
60x60x1,5mm (Square)	Main Downtube, Gussets&End Caps	2000mm
30x30x1,5mm (Square)	Cargo Bay Frame	4300mm
30x30x1,5mm (Square)	Kickstand	1100mm
35x35x2mm (Square)	Kickstand Joint Brackets Steering Joint Bracket	200mm
38x2mm (Round)	Steering Tubes Front&Rear	1000mm
20x1,5mm (Round)	Steering Rod	1500mm
25x1,5mm (Round)	Steering Shaft Extension Piece	800mm
20x2mm (Square)	2-Axis Joint Kickstand Bracket Supports	300mm
35x4mm (Flat Bar)	Steering Arm Fork Mounting Bracket	200mm
14x2mm (Round) 10mm inside diameter	Spacer Rings for Ball Joint Installation	2x 6mm

Small Parts

Part/Size	**Usage**	**Amount**
M10 Coupling Nuts (Steel)	Steering Rod Ends Steering Joints	4x
M10 Nylon Locknuts	Steering Linkage	6x
M10 Bolts - 60mm (Partially Threaded)	Steering Linkage	3x
M10 Washers (Metal)	Steering Linkage	6x
M10 Washers (Nylon/Plastic)	Steering Linkage	3x
M10 Ball Joint	Steering Linkage	1x
M10 Threaded Rod - 100mm	Steering Linkage	2x
M8 Bolts	Kickstand Joints	2x
M8 Nylon Locknuts	Kickstand Joints	2x
Tension Springs - 60-80mm	Kickstand	2x
M6 Nuts - 45mm (Partially Threaded)	Spring Holders/Cable Guides	8x

Basic Bike Parts Checklist (Not a complete list! Additional parts depend on your build)
26“ Steel Donor Frame
26“ Rear Wheel
20“ Front Wheel
20“ Fork (1-1/8“ threadless Steerer)
Additional Fork (1-1/8“ threadless Steerer) (for Steering Shaft)
2x Headsets 1-1/8” pressed cup, threadless (EC34)
1-1/8“ Ahead Stem
Additional 1-1/8“ Ahead Stem (used as clamp for Fork Headset)
Front and Rear Brake & Brake Levers
Cranks & Chainrings
Pedals
Bottom Bracket
Gearing Parts (Derailleurs/Cassette/Shifters/Internal Gear Hub)
Bike Chain
Seatpost & Seat
Extra Long Cable for Front Brake (2500mm) & Cable Housing
Regular Cable for Rear Brake & Cable Housing
Shifting Cables & Cable Housings
20“ Front Tire & Inner Tube
26“ Rear Tire & Inner Tube
Handlebars & Grips
Headset Spacers

Additional/Optinal Parts
Cover Sheet for Cargo Bay (Sheet Metal or Wood), 982x52mm
Screws/Nuts/Rivets to Attach Cargo Bay
Materials for Frame Jig
Paint

Project: **Long-John Cargo Bike**

Frame Jig

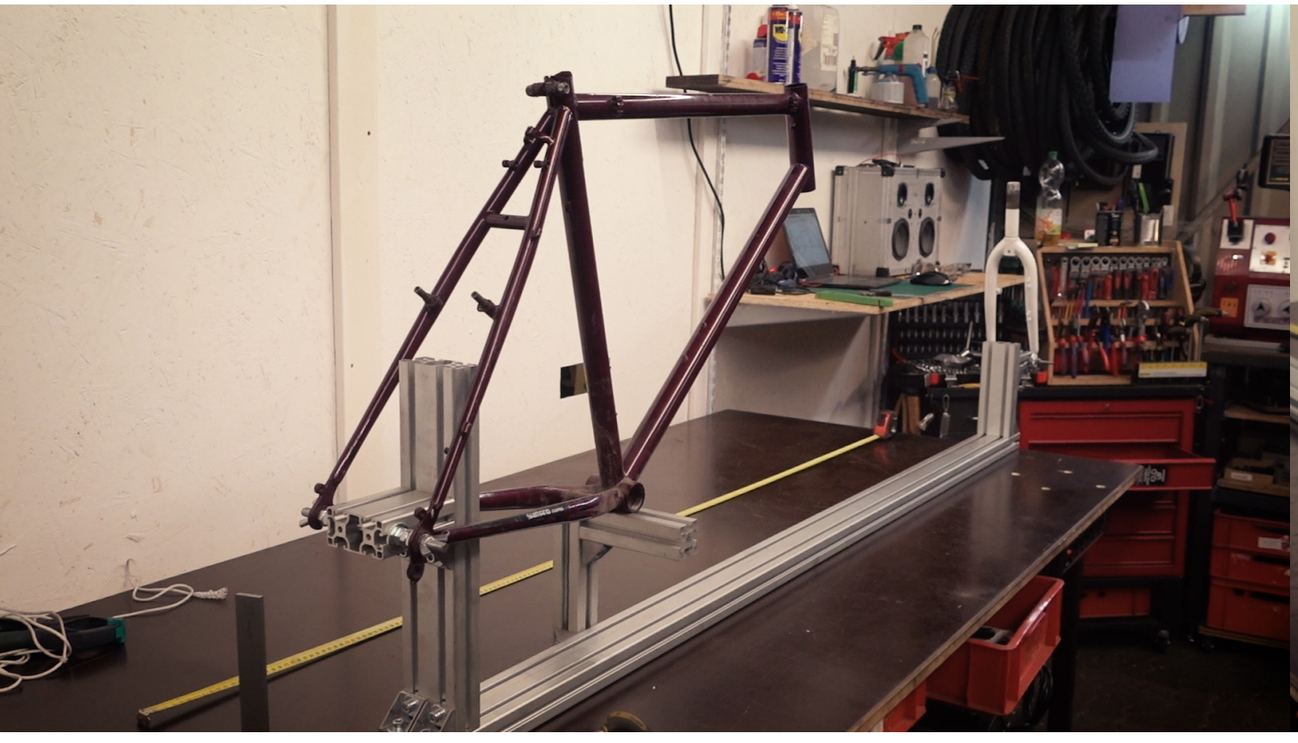
To build a cargo bike it‘s very helpful to have some kind of fixture to mount individual frame parts and align them to each other - this is called a frame jig. You can get away without a jig and try to just weld everything together on a table and hope that it comes out straight enough to be rideable - but your results will be much better even with a very simple jig.

There are a ton of different ways to build a jig and it‘s a big topic on its own. But for the purpose of this build it doesn‘t need to be very complex. **The jig shown on the next page is just an example to give you the important measurements.** How you build it is up to you, you can use any long, straight pieces of material you have around. Besides steel or aluminum you could even use wood as long as your pieces are straight enough. If you want a nice and adjustable jig, you can use 80/40 aluminum extrusion like I used for my jig.

The jig only needs to provide two fixed points in this case: The front and rear axle. You need two „dummy“ axles that represent the position of the front and rear wheel. You want these two axles to be positioned accurately in relation to each other and centered on a straight line. If you know what wheel size you will be using (26“ and 20“ in this case), the axle height doesn‘t even need to be adjustable, but there should be some way to adjust the wheelbase. For this it‘s enough if one of the axles is able to move back and forth in some way.

The dummy axles are made from simple threaded rods, I used M10 for the rear and M8 for the front. (Technically a standard front axle would be 9mm thick, but since M9 is a very rare thread size, using M8 is fine in this case.) Screwed onto the rods are locknuts that are spaced apart according to the width of your dropouts, on modern standard frames this would be 100mm for the front axle and 135mm (sometimes 130) for the rear axle. These axles represent the wheel hubs and should be centered, so the nuts on each side are the same distance from the center of the jig. You can also use additional nuts and washers as spacers to make sure the spacing is the same on both sides. You can then mount the frame and fork onto the dummy axles and secure them.

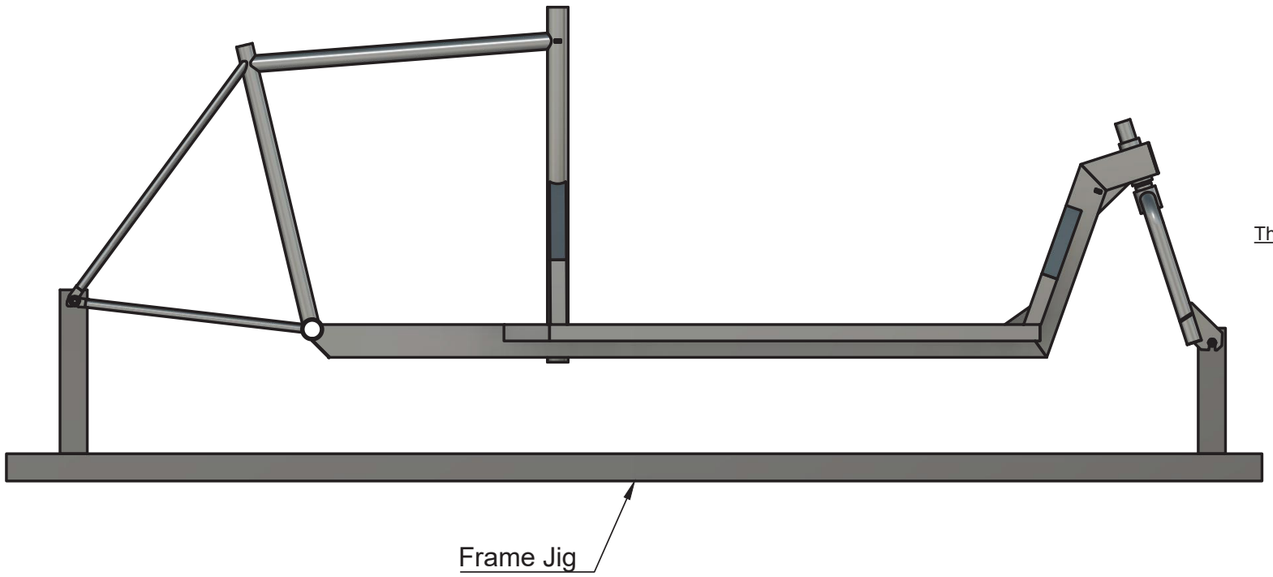
The most important factor for a frame that rides well is that your axles are <u>parallel.</u> You can check this by placing the jig on a flat surface and measuring the distance from both ends of each axle to the ground, it should be the same on both sides. You can check if the axles are parallel to each other by measuring the distance between the ends of the front and rear axles (for example using a tape measure), again it should be the same on both sides of the jig. To increase the accuracy of these measurements it helps to make the axles longer than they need to be (make sure they are straight and not bent). Obviously the more accurate your jig is, the more accurate your frame will come out.



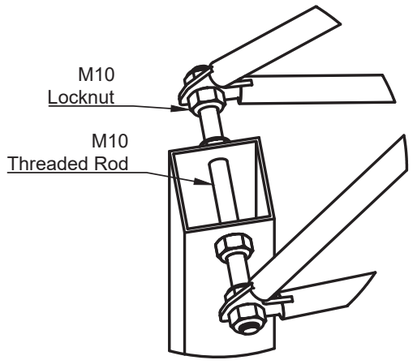
Project: **Long-John Cargo Bike**

Frame Jig

These measurements provide you with the axle positions I used for my bike. You will have to change the **wheelbase (a)** on your jig based on the length of the donor frame you are using (see Page 14). You don‘t need to change the height of the axles (unless you use a different wheel size).



E (1:3)



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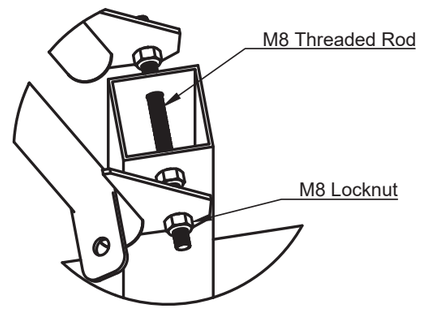
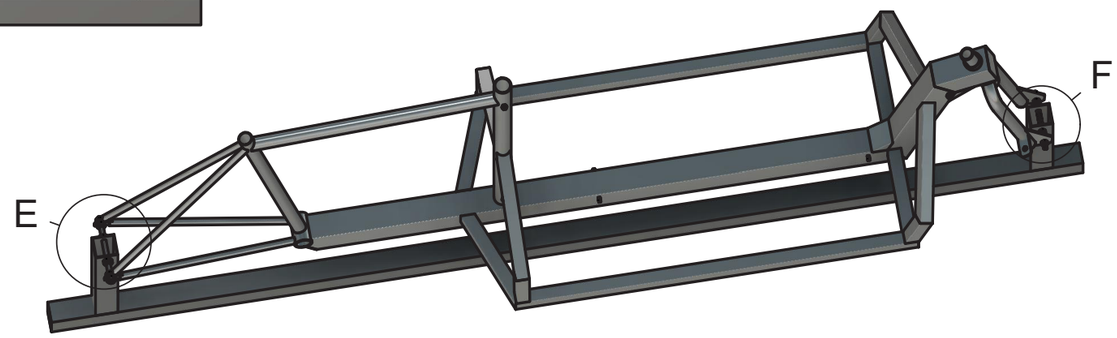
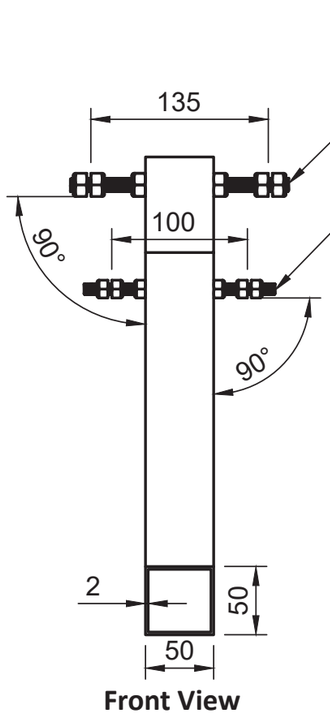
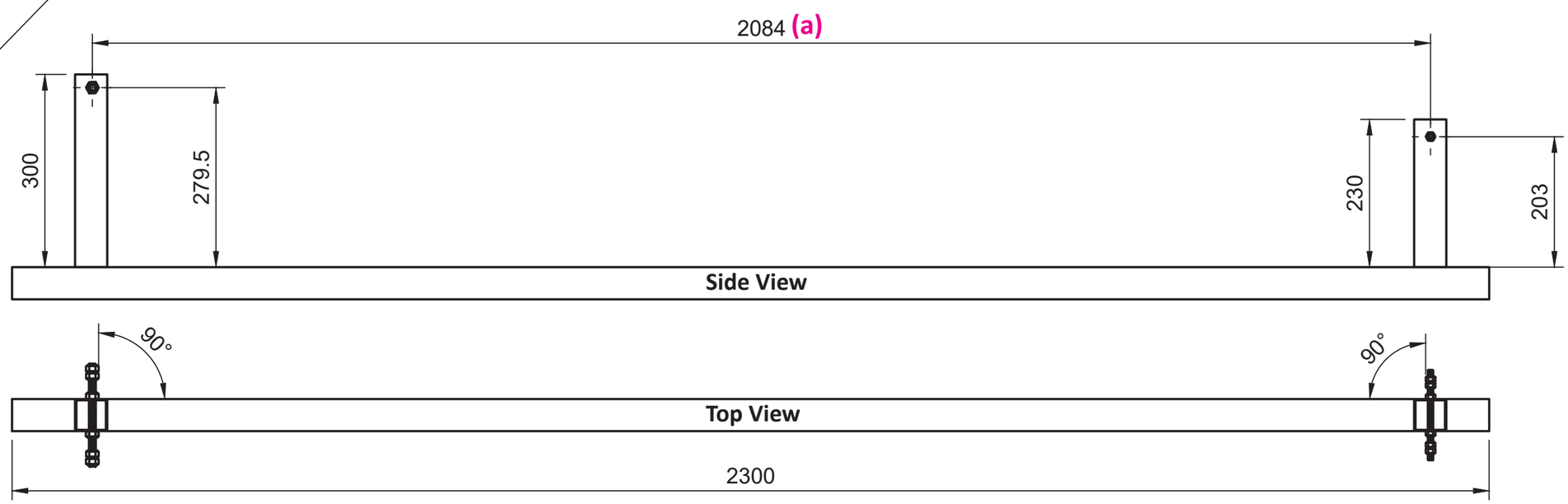


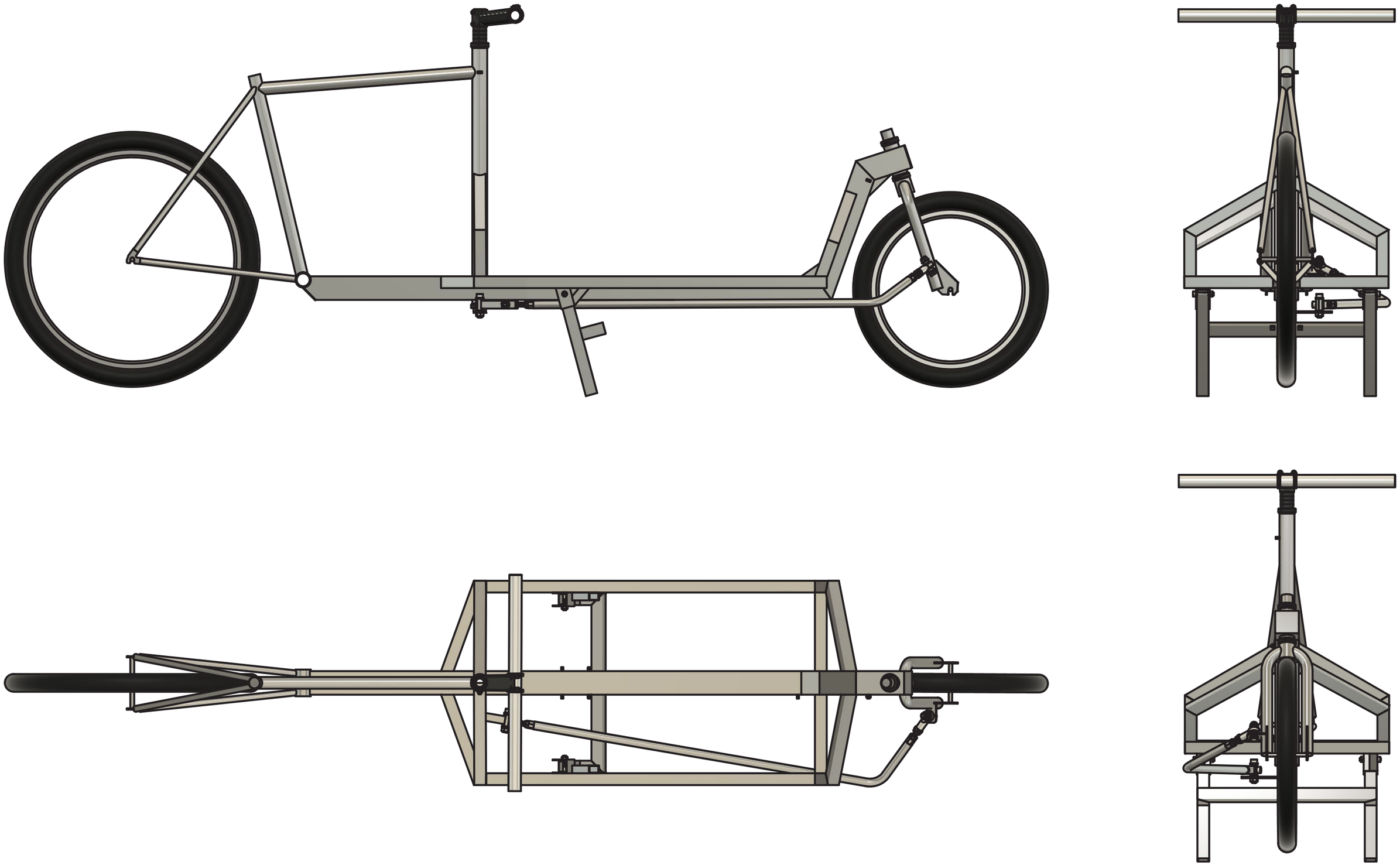






Project: **Long-John Cargo Bike**

Bike Overview



Project: **Long-John Cargo Bike**

Frame Geometry / Custom Measurements

Please read this part carefully!

Since this build relies on using a donor frame, you have to be aware that **you will have to adjust some of the measurements** depending on the size of the donor frame you use so that it will actually fit. There are a million different frames out there, so I can‘t provide numbers that will work for every one of them. **All measurements you find here are based on the frame that I used.** That being said, don‘t worry - there is most likely only two things that you have to watch out for.

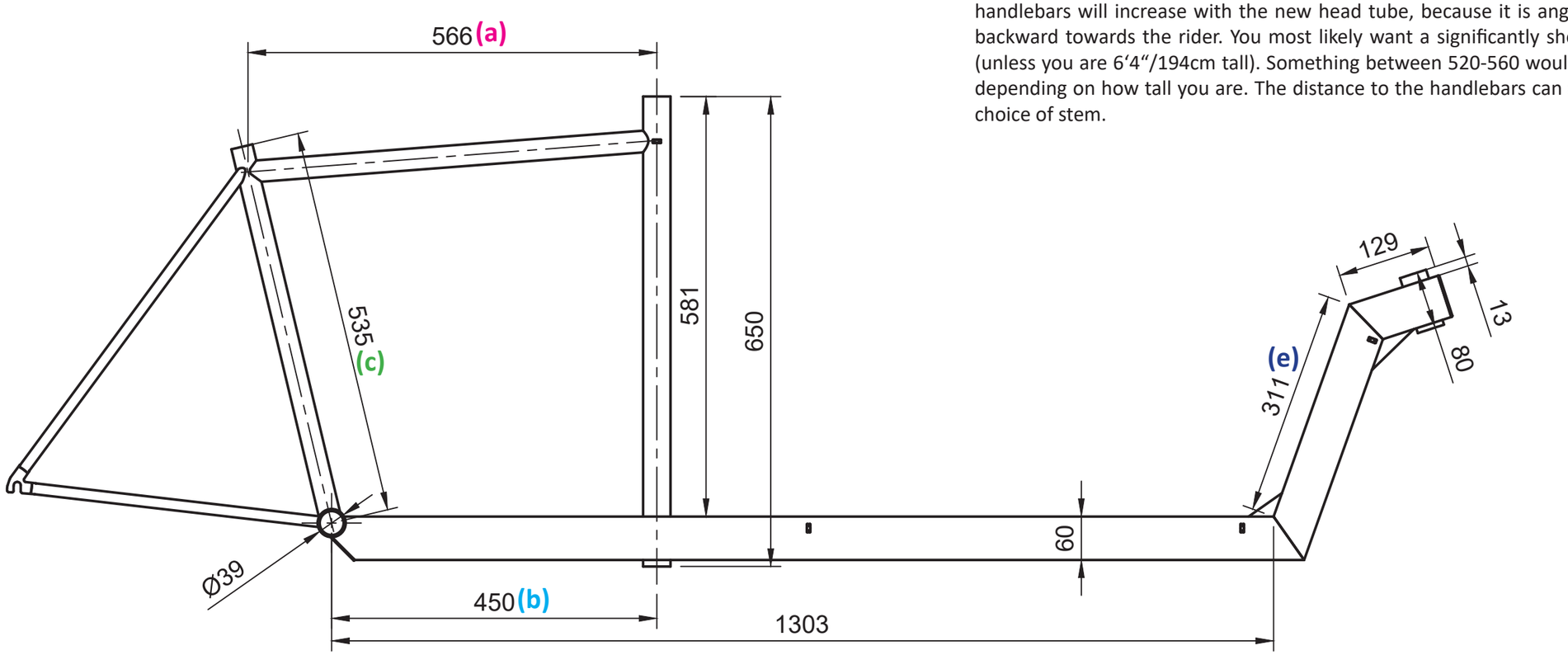
Everything that happens in the front area of the bike can stay the same for most builds.
The main thing that will probably be different on your frame is the **top tube length (a).** That means the **distance between the bottom bracket and the rear steering tube (b)** will also have to be different, so the position of the cut where your bottom bracket attaches to the main downtube needs to be further in or out (meaning the downtube also becomes longer or shorter overall).
If your top tube is, for example, 30mm shorter than the one I used, you would move the center of the round cut for the bottom bracket 30mm closer to the front, making your downtube 30mm shorter overall. Which means **this measurement (b)** would then be 420 instead of 450. The end of your top tube can then connect to the rear headtube correctly.
This also means your overall wheelbase will shrink by the same amount.

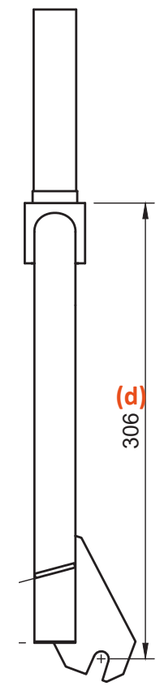
The **height of your frame/seat tube length (c)** most likely won‘t matter - it simply means your top tube will connect further up or down on the steering tube, which is totally fine.

One other thing that could potentially matter depends on the fork you use. Just like frames, different forks, even for the same wheel size, can have different measurements, although this factor is most likely not critical.
The frame is based on a 20“ fork with about 300mm of **crown height (d)**, that is the distance from the front axle to the lower end of the steerer where the crown race would sit. If the crown height on your fork is significantly longer or shorter (more than 30mm) you might want to think about slightly adjusting **this measurement (e)** in order to make the front end of the bike lower or higher according to the crown height on your fork.

This is not a must, if you don‘t adjust it, it simply means the downtube won‘t be horizontal with the wheels installed. If this doesn‘t bother you, or your fork isn‘t significantly shorter or longer than the one I used, you don‘t need to change anything.

By the way: you can make the **top tube (a)** of your donor frame as short as you want, depending on where you cut off the head tube. It is generally a good idea to make the top tube slightly shorter than it was originally (removing more than just the head tube) since the effective distance from the seat to the handlebars will increase with the new head tube, because it is angled straight up at 90° and not tilted backward towards the rider. You most likely want a significantly shorter top tube than I am using here (unless you are 6‘4“/194cm tall). Something between 520-560 would be a good choice for most frames depending on how tall you are. The distance to the handlebars can also be slightly adjusted later by the choice of stem.

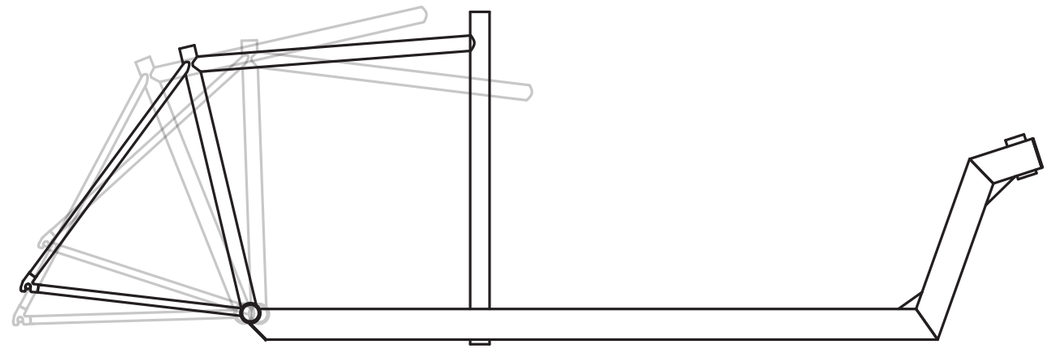




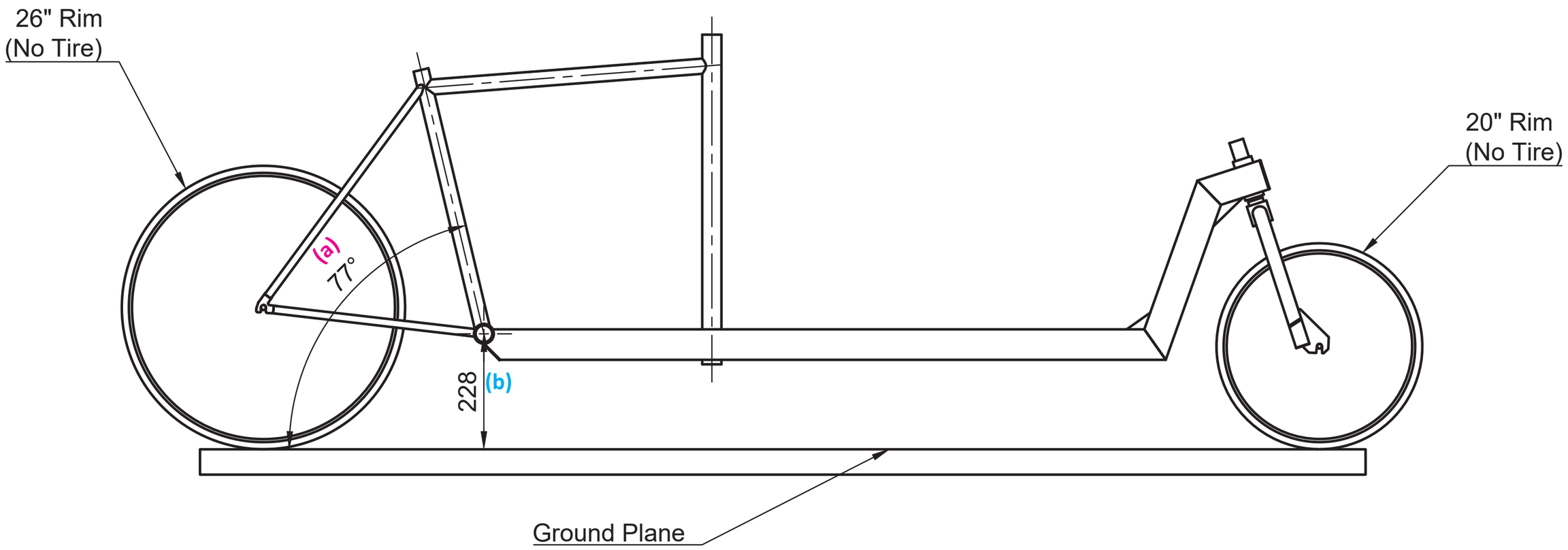
Project: **Long-John Cargo Bike**

Frame Geometry / Custom Measurements

There is one more thing you need to consider to make your donor frame fit correctly.
When installed, you want it to end up in the same orientation it would be in if it was used as a normal bike with a fork installed. That means **the angle of the seat tube (a) relative to the ground** should remain (about) the same as it was before. If you install the donor frame tilted too far forwards or backwards, all sorts of bad things start to happen. For that reason you'll want to measure at least one of these angles **before you cut the frame apart** and write it down. To do this, you can install two regular wheels and a 26" fork, so if you bought a complete donor bike, you should do this first before you take it apart.

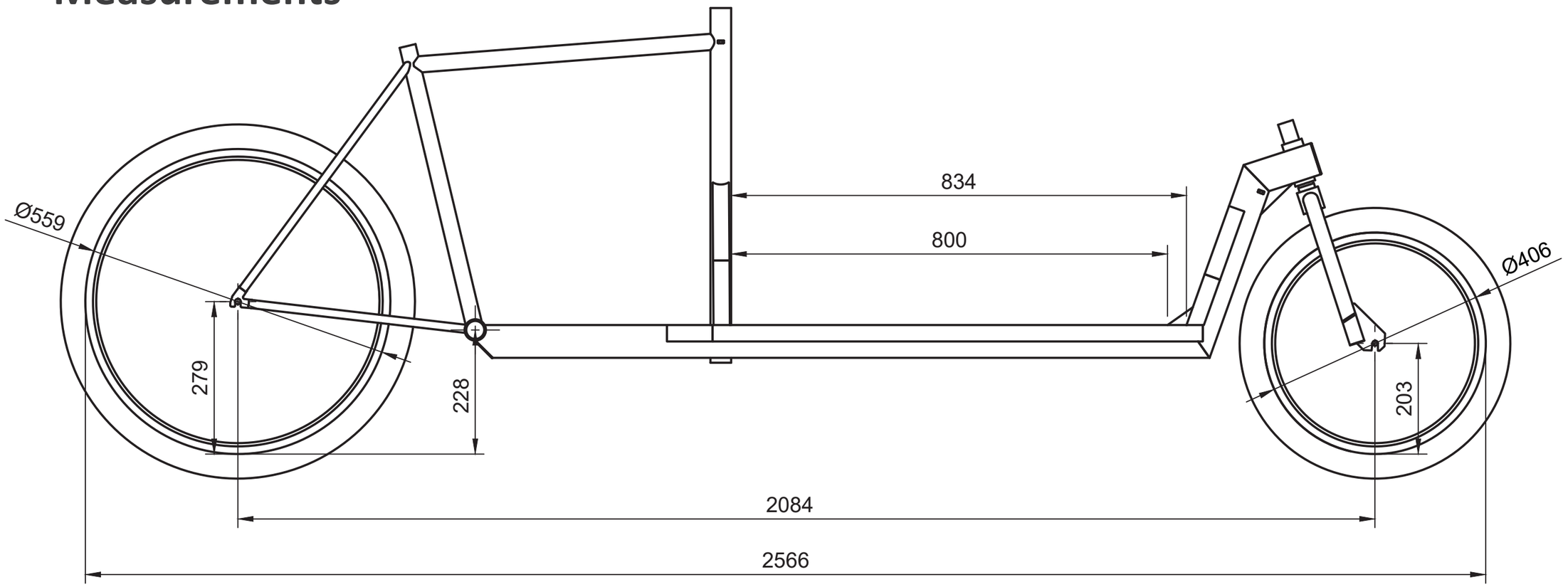


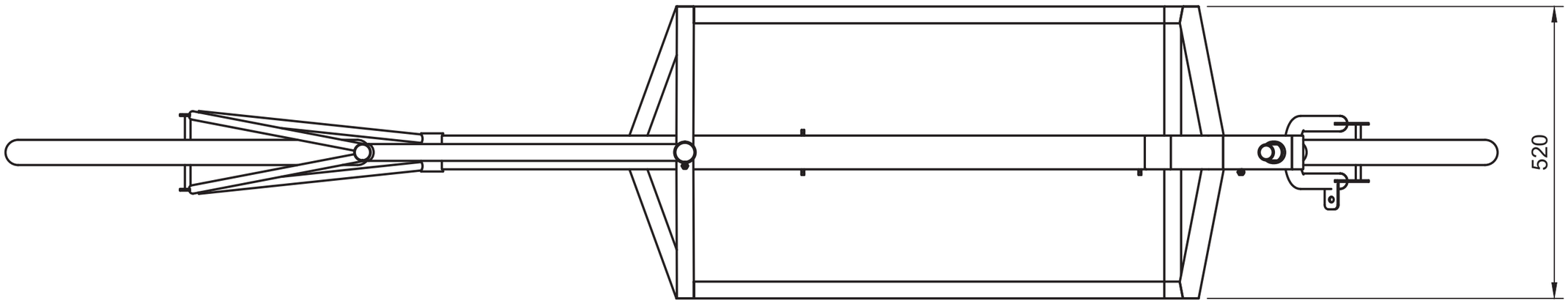
You can measure using a protractor or a digital angle gauge (bevel box). In a pinch, there are even smartphone apps that allow you to measure angles using your phone's orientation sensor.
Another option is to measure your **bottom bracket height (b)** which is the distance from the center of the bottom bracket to the ground with the bike standing upright on both wheels.
When doing these measurements, you always want to measure with the bike standing on a flat surface on **naked rims without tires installed (**because different tire sizes and even air pressure will throw off your measurements and introduce errors). When you put the frame into the frame jig later (assuming you built one) you can then set it up with the same angle or bottom bracket height to make sure it is in the correct orientation.
If you only have the frame and no way to install a fork and two wheels to do the measurements, a ballpark number for an average seat tube angle would be somewhere between 70-80°, so you can use 75° as a rough guideline to make sure you're not completely off - but it would be better if you could measure it.



Project: **Long-John Cargo Bike**

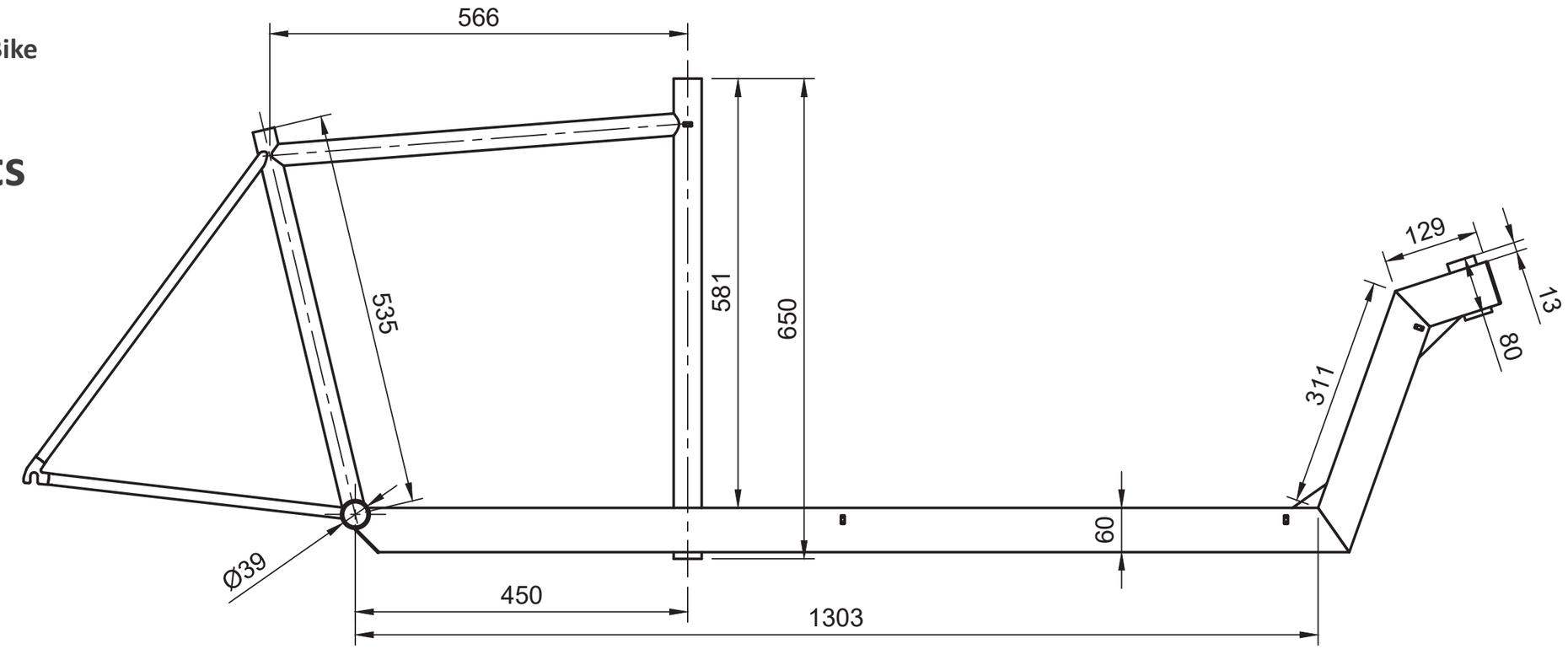
Main Frame Measurements





Project: **Long-John Cargo Bike**

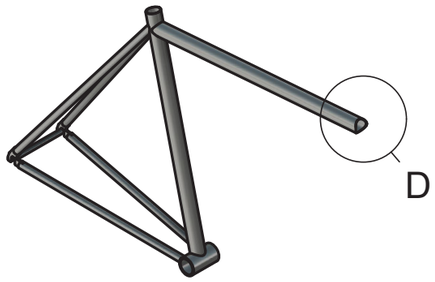
Main Frame Measurements

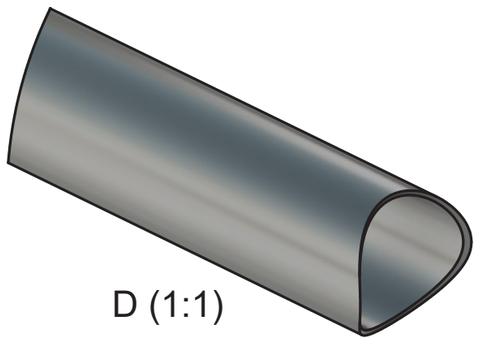


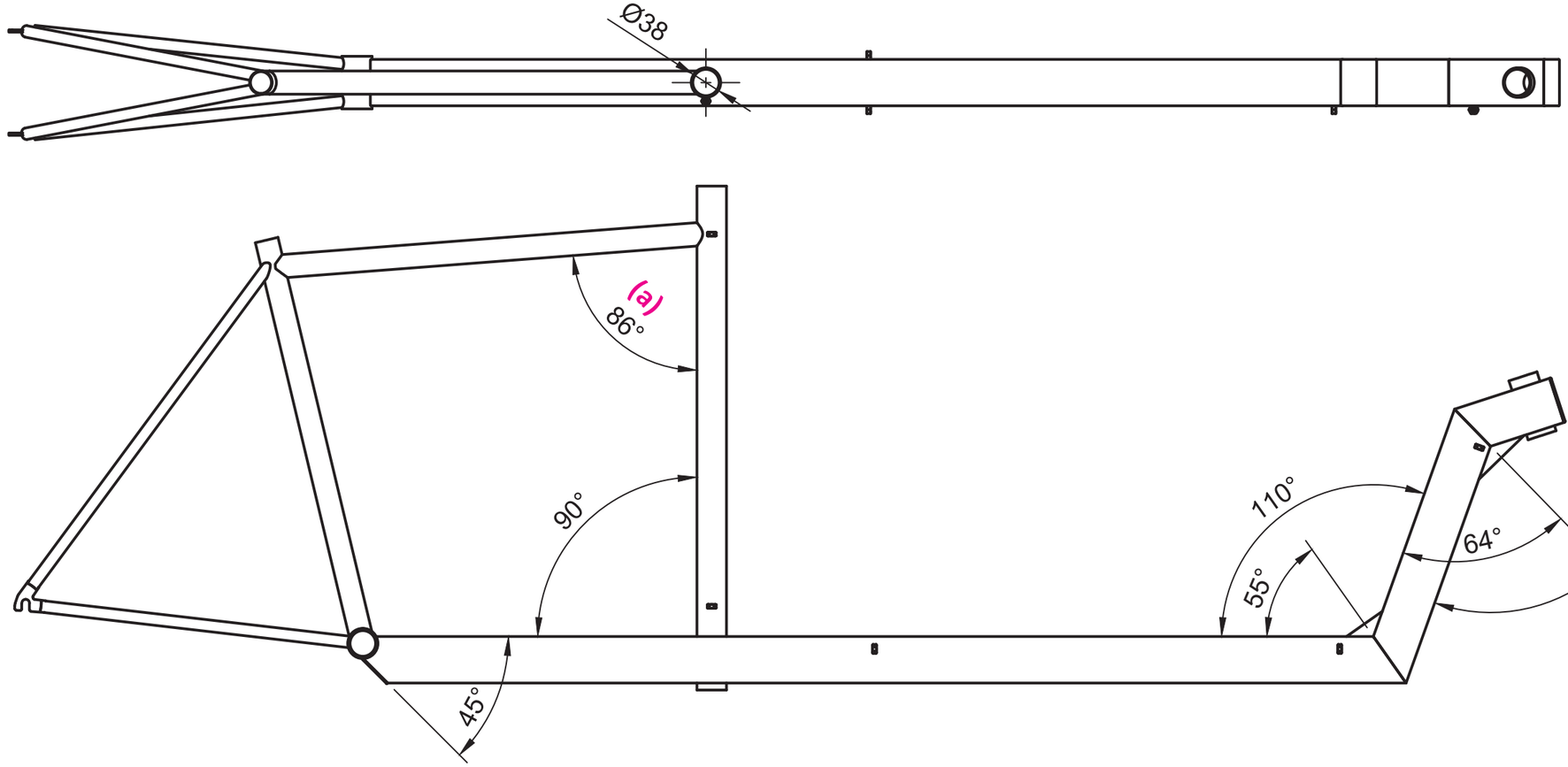
This angle depends on the top tube angle of your donor frame (a)

This is also the angle at which you have to to the notching cut to make your head tube fit to the steering tube (see image below).

To figure out the correct angle to notch out the top tube, the easiest way is to set up your frame in the frame jig at the correct angle (see page 15) and then measure the angle between the top tube and a vertical plane that is square with the ground/frame jig, like a piece of tubing clamped to a square.

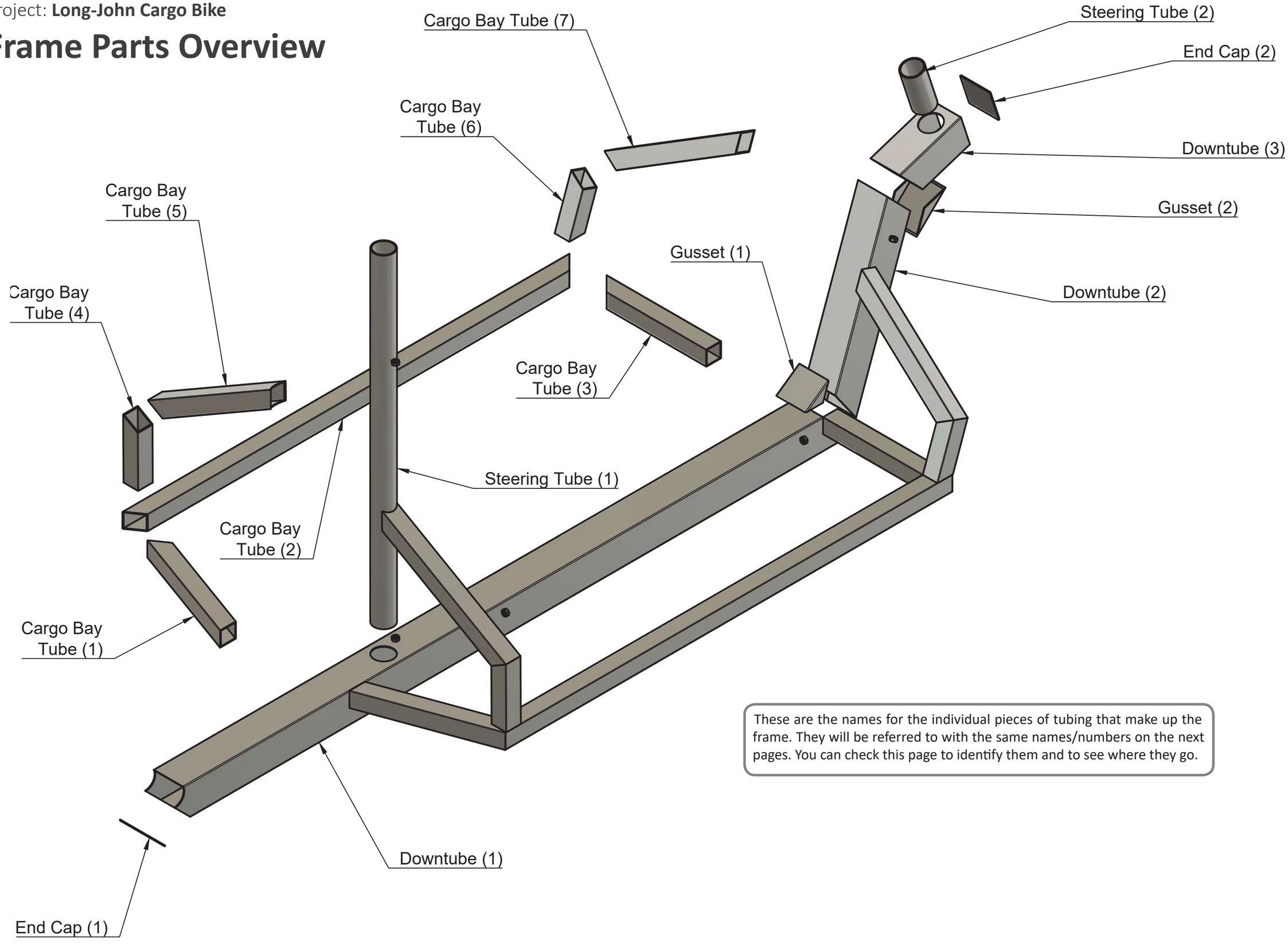






Project: **Long-John Cargo Bike**

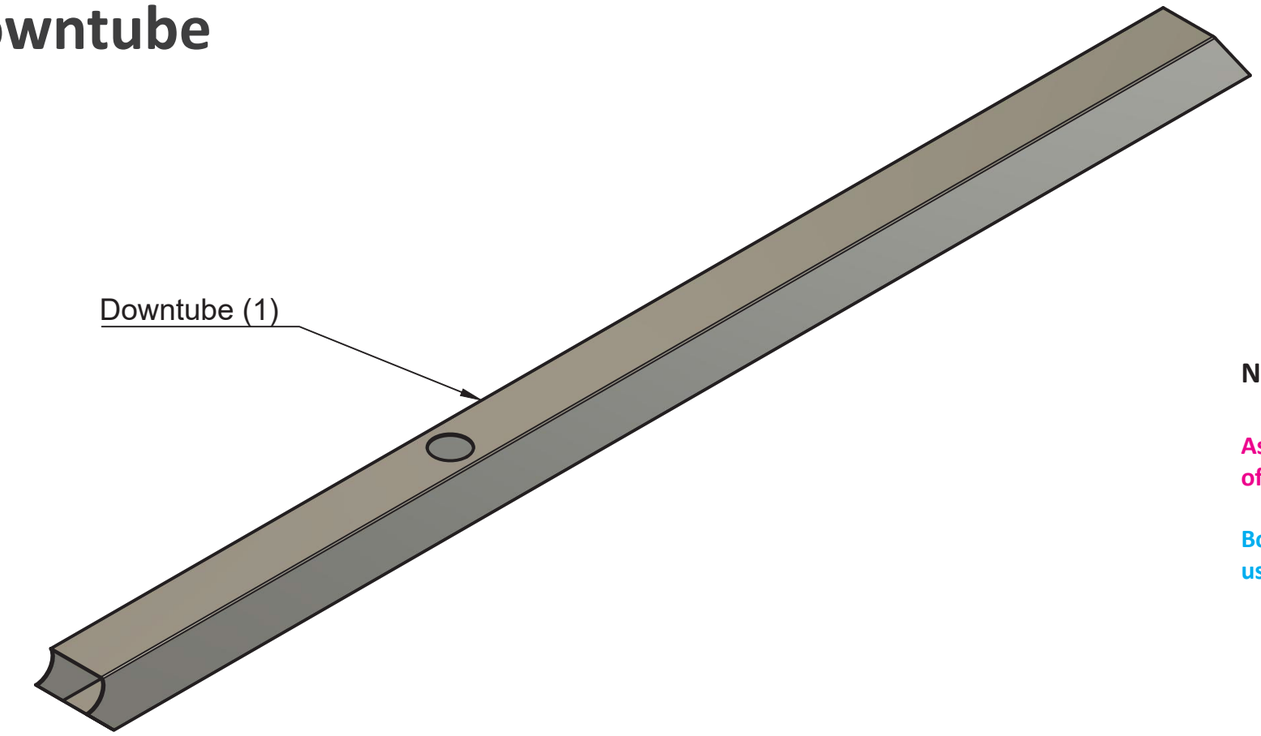
Frame Parts Overview



These are the names for the individual pieces of tubing that make up the frame. They will be referred to with the same names/numbers on the next pages. You can check this page to identify them and to see where they go.

Project: **Long-John Cargo Bike**

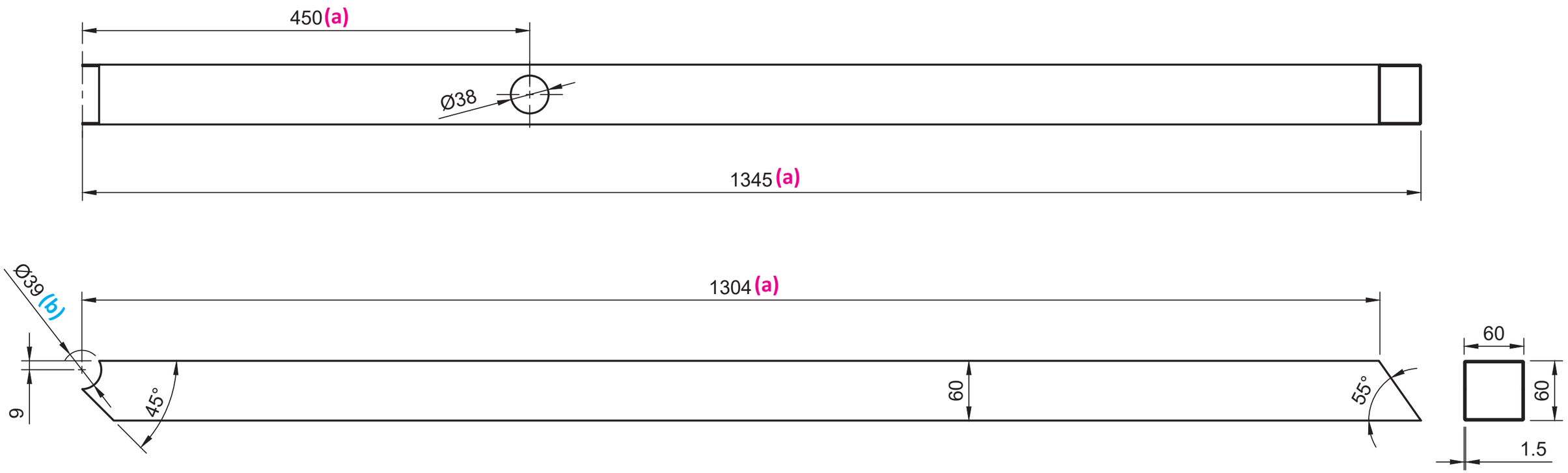
Downtube



Notes

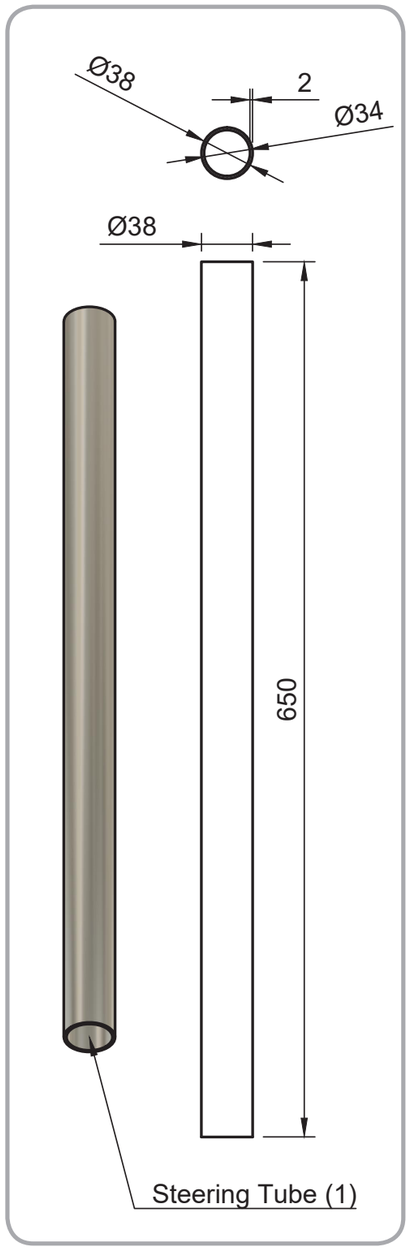
As mentioned on page 14, these measurement depend on the size of your donor frame (a)

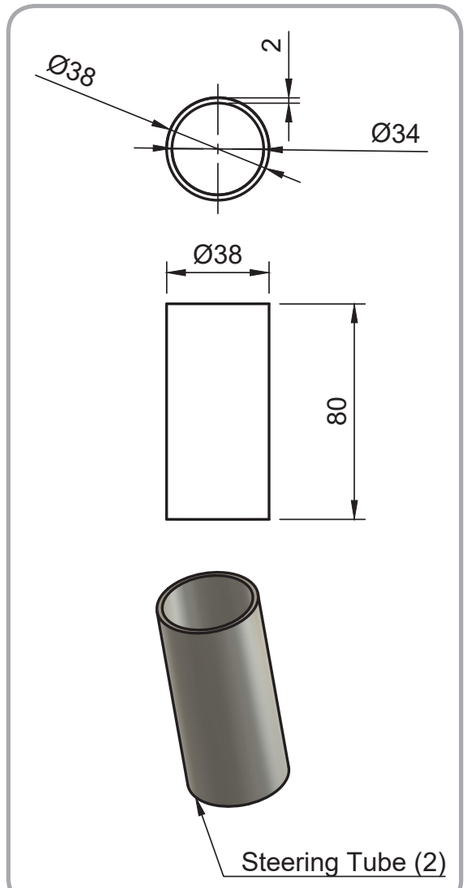
Bottom Bracket diameter can vary slightly between frames. You can usually use a 40mm hole saw for this cut. (b)

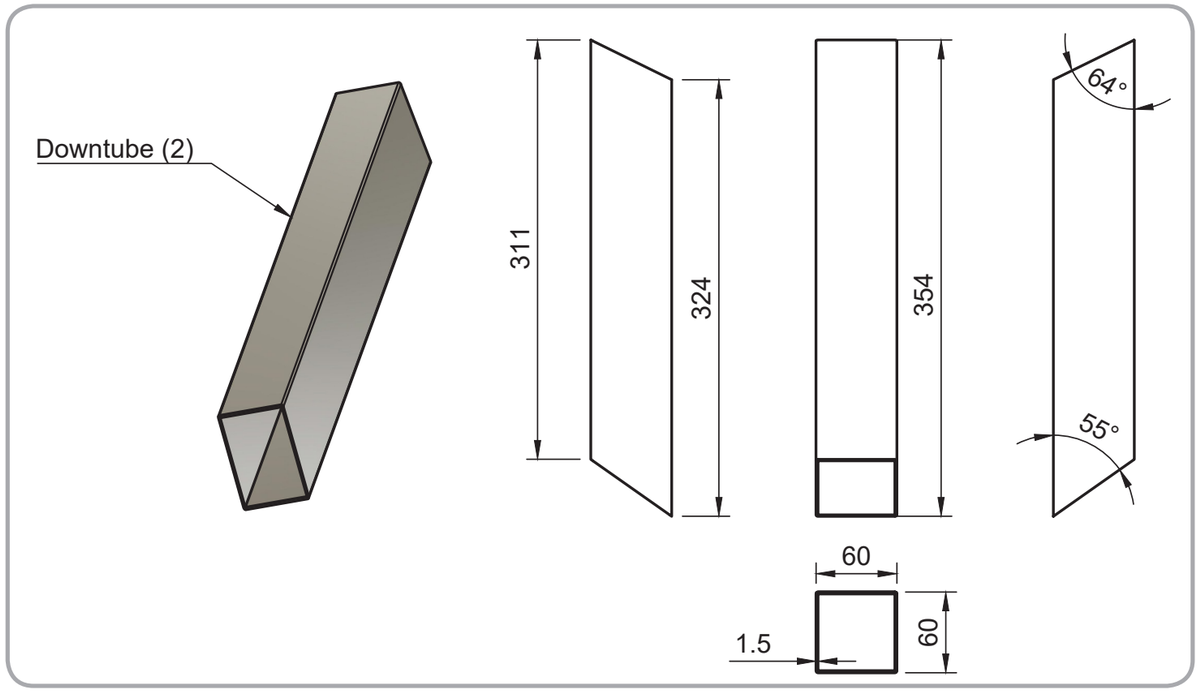


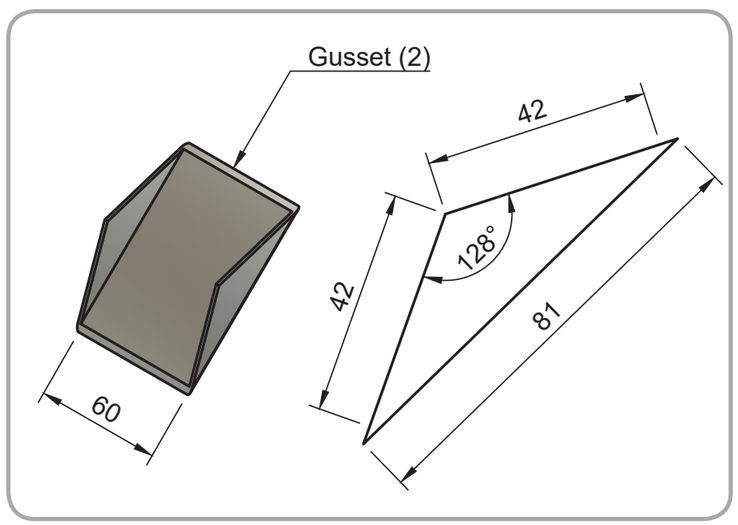
Project: **Long-John Cargo Bike**

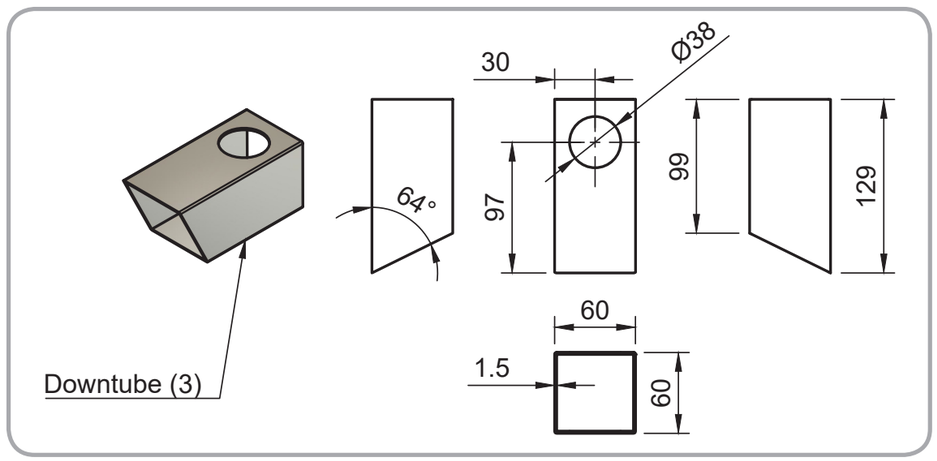
Frame Parts/Headtubes

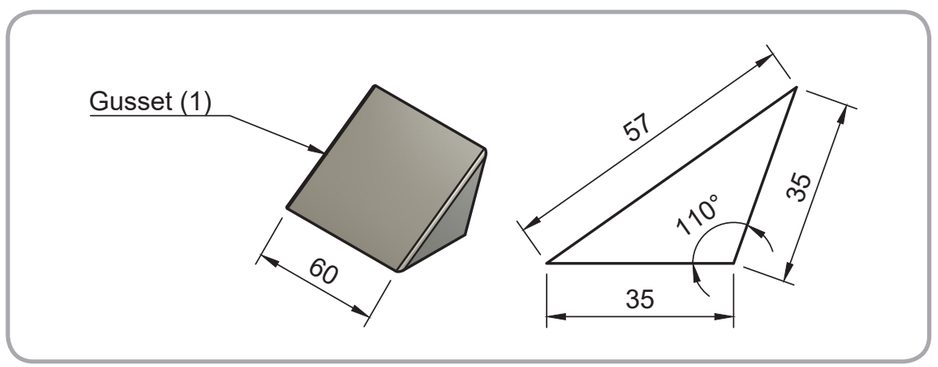






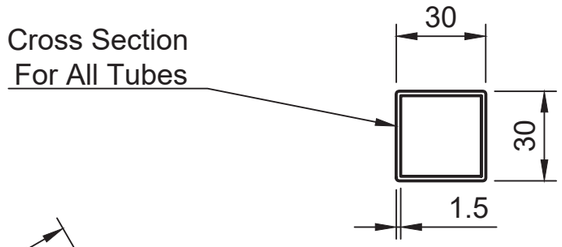


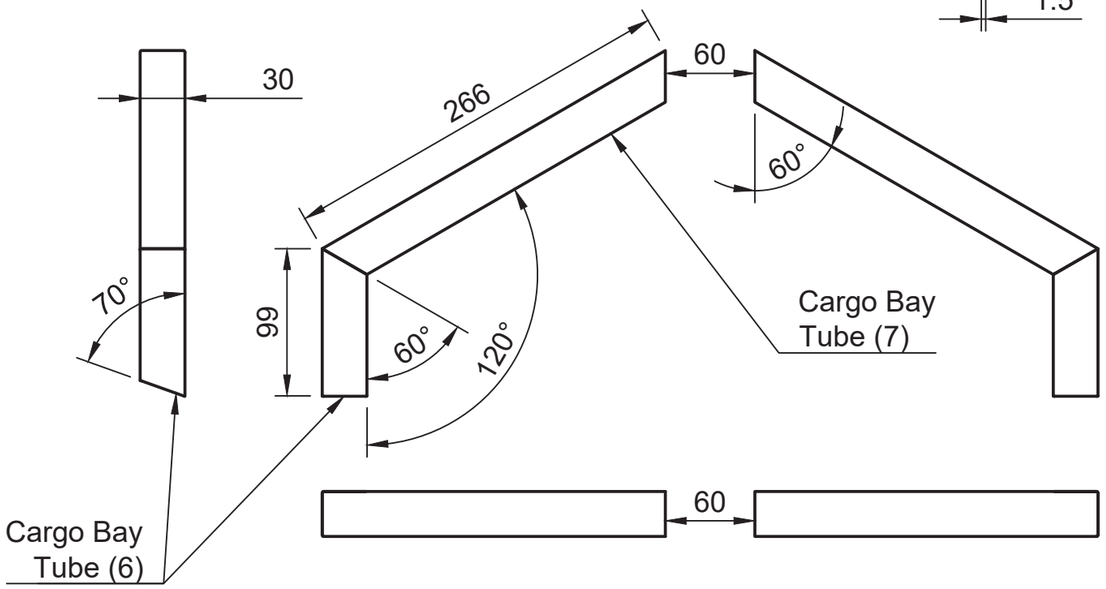


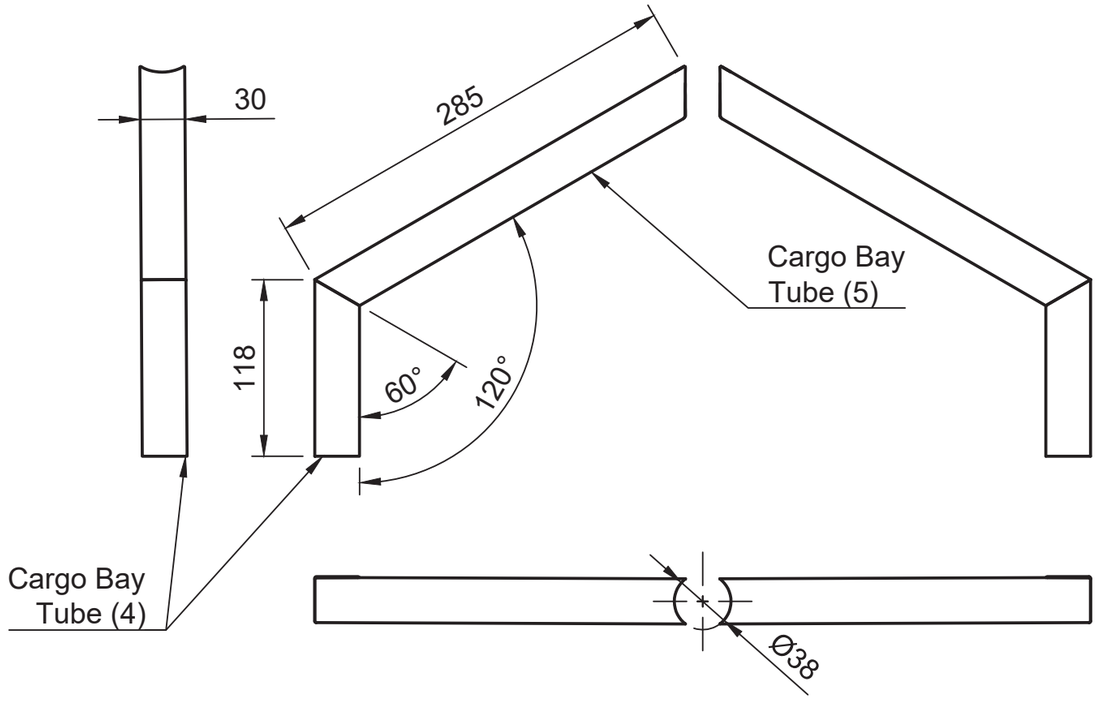


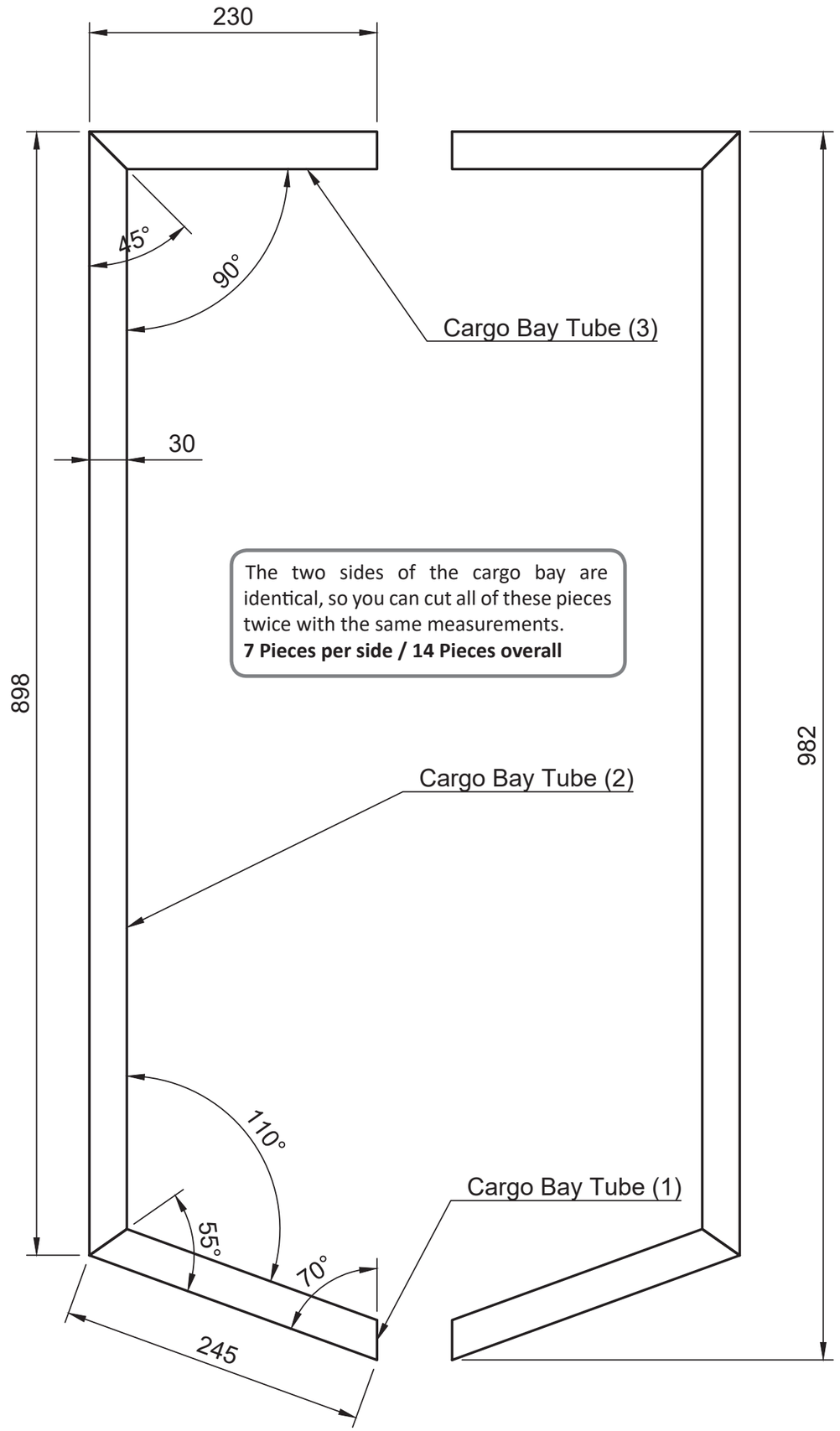
Project: **Long-John Cargo Bike**

Cargo Bay



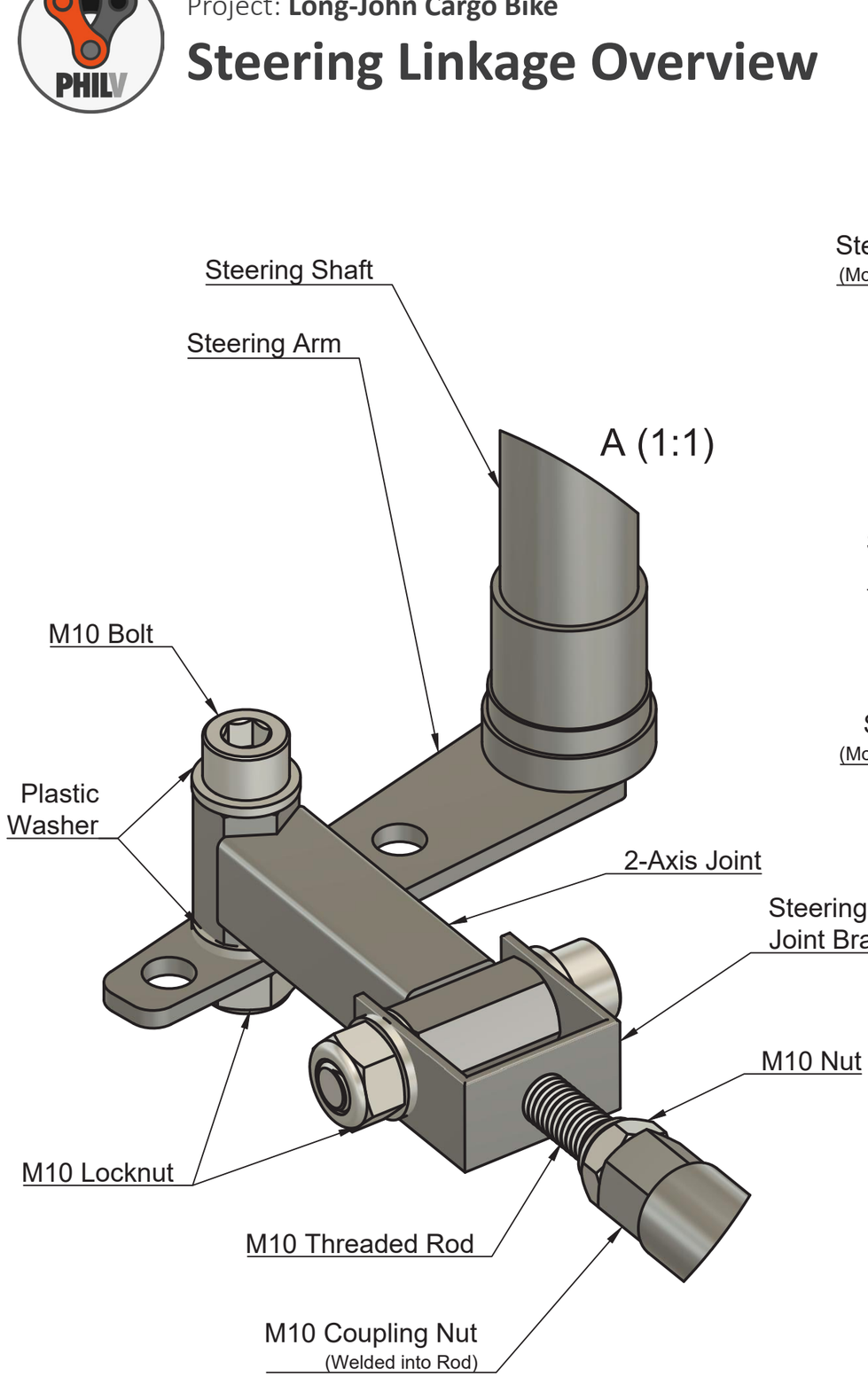


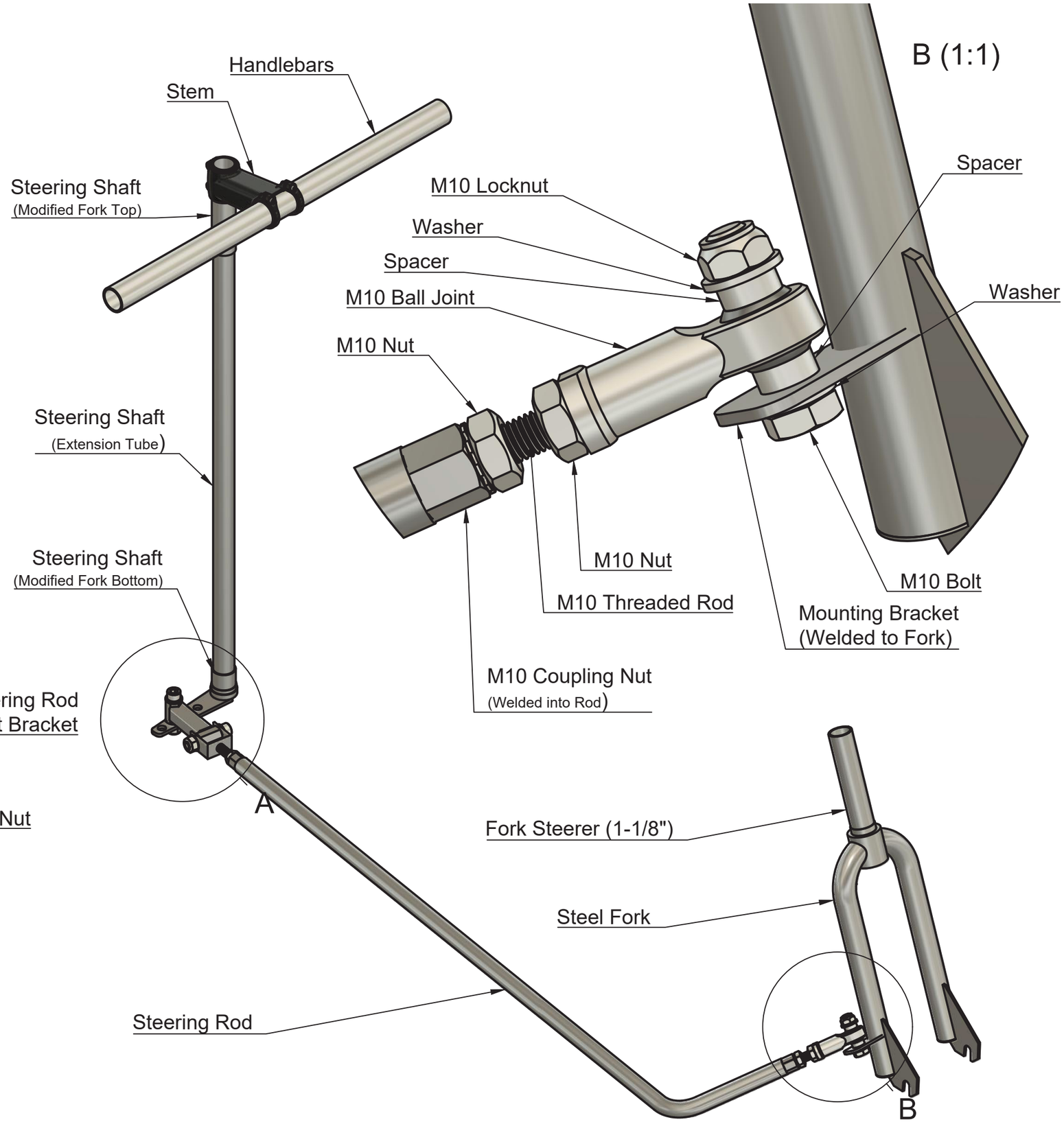




Project: **Long-John Cargo Bike**

Steering Linkage Overview



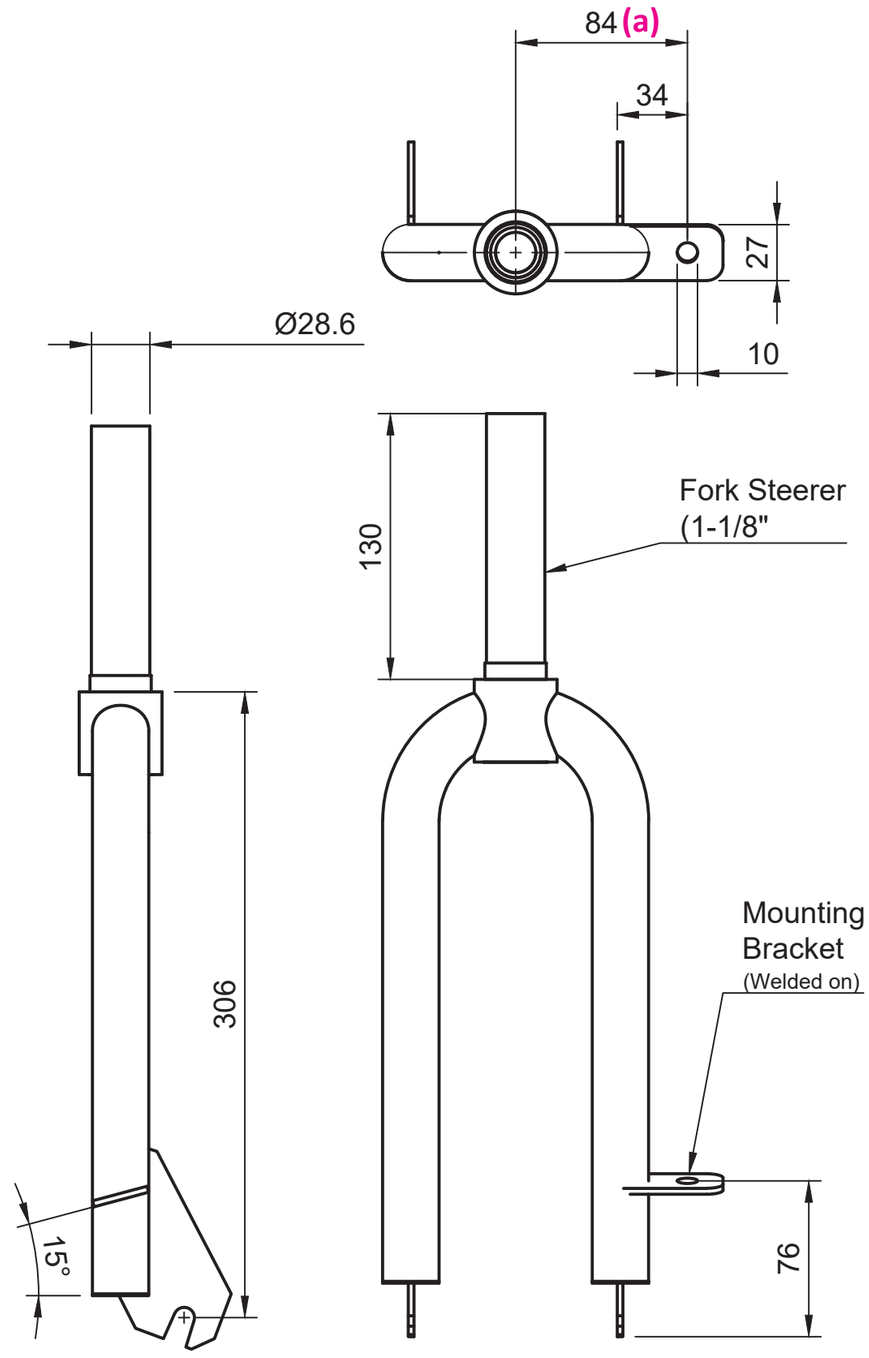


Project: **Long-John Cargo Bike**

Fork

Note that this fork is **just an example.**
Same as with the donor frame, every fork will be slightly different, so the measurements and position for the steering rod mounting bracket are only an estimate. There is one measurement you should try to keep the same on your fork, which is the **distance between the center of the steerer and the mounting hole for the steering rod (a).** This affects the steering ratio (how much the fork turns when you turn the handlebars).

The height of the mounting bracket and its optimal angle vary between forks and builds so it's best to build the rest of the steering first and attach this bracket at the end when you can try out which position works best. The important thing here is that the ball joint has enough range of movement without touching the fork or bracket.



Project: **Long-John Cargo Bike**

Steering Shaft

The length of the steerer you take from your donor fork will most likely be different from these measurements, so you have to adjust accordingly.

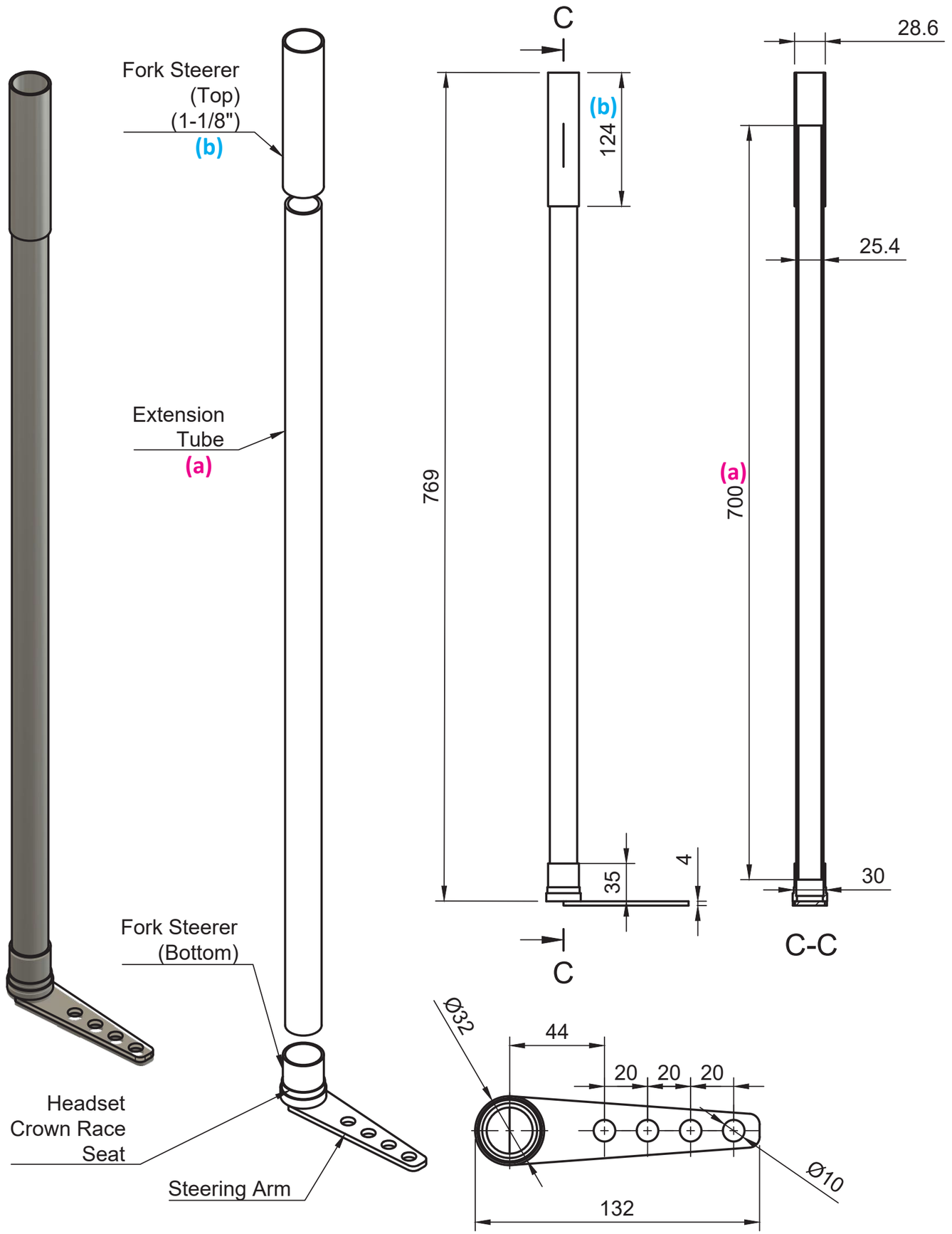
The length of the extension tube (a) can be changed depending on how long you want the steering shaft to be, if you want your handlebars up high you might need a longer steering shaft.

But note that the **Fork Steerer (Top) (b)** still needs to be low enough to extend through the headset and into the steering tube. The extension tube needs to be completely inside the steering tube.

It makes sense to cut the donor steerer not in the middle, but towards the bottom. The bottom piece doesn‘t need to be very long, but if the top piece is longer it gives you more length that can stick out the top, so more space to install a stem and spacers.

On many 1-1/8“ (28.6mm) fork steerers, a 1“ (25.4mm) tube feats tightly inside which makes it a good choice for the **extension tube (a)**. Some have a smaller inside diameter though, so you should check this first and buy the extension tube accordingly.
The extension tube should ideally fit snugly into the fork steerer top and bottom, this makes it stronger, easier to weld and easier to align the pieces. Don‘t use an extension tube that is larger than the inside diameter of the steerer, they should overlap.

On most bikes, water can and will get into the steerer from the top when it‘s raining, which means your steering shaft could fill up with water, for that reason the steering arm should either have a hole in the middle or not cover the entire bottom of the steerer so that water is able to escape.



Project: **Long-John Cargo Bike**

Steering Rod/2-Axis Joint

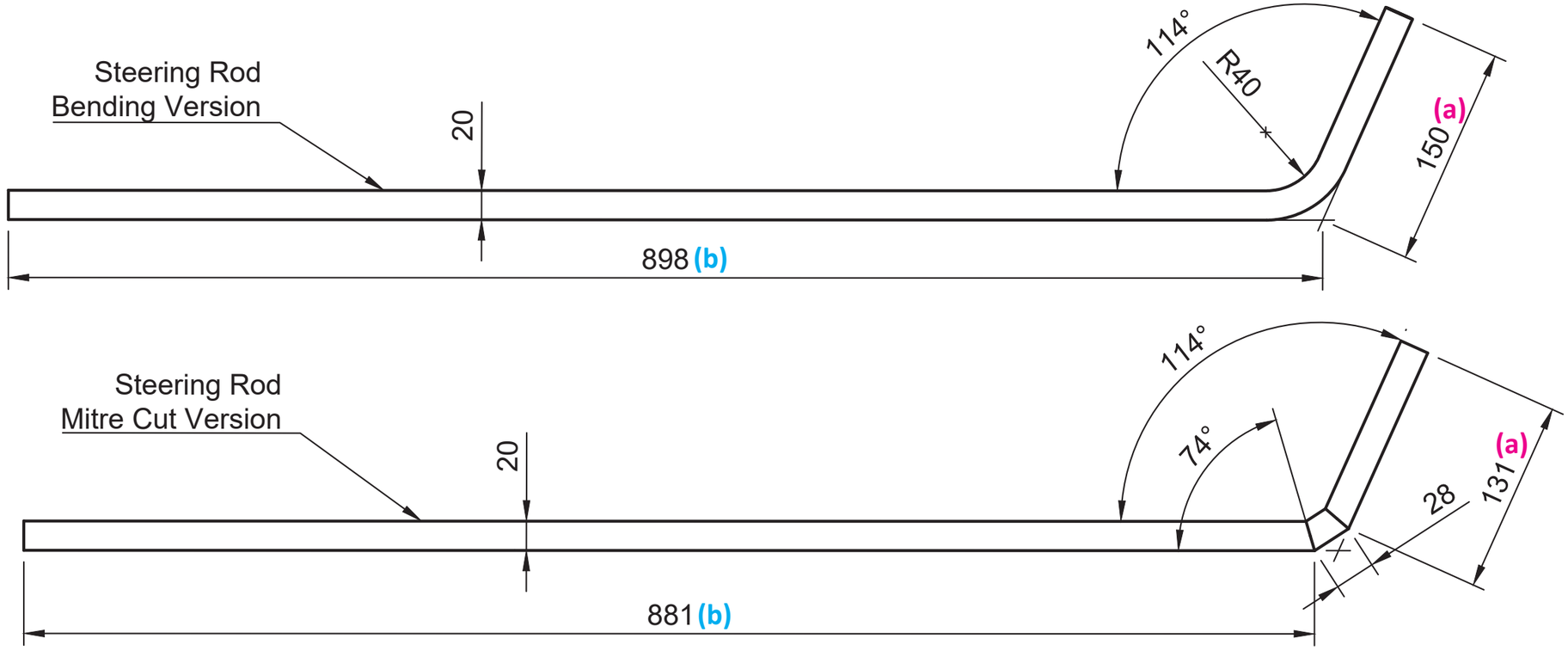
The Steering Rod is just a long tube with a bend in it. Since bending tubing cleanly and accurately is hard to do without the proper equipment (it will kink), I also planned for a version that works without bending.
If you do bend it, you don‘t need to achieve this exact radius, but you should try to get the bend angle to be 114° (+/-2°).

For the other version, you can just do two mitre cuts and simply weld together the tubing to create a bend. The two mitres are not strictly needed, you can just use one (at 57°), but you‘d end up with a sharp outside edge that doesn‘t look very nice. This way you get a more rounded shape.

The steering rod needs to withstand a surprising amount of force, so in some cases it might be necessary to add a gusset to the inside of the bend so it becomes a bit stiffer (it depends a bit on your riding style and the quality of your welds).

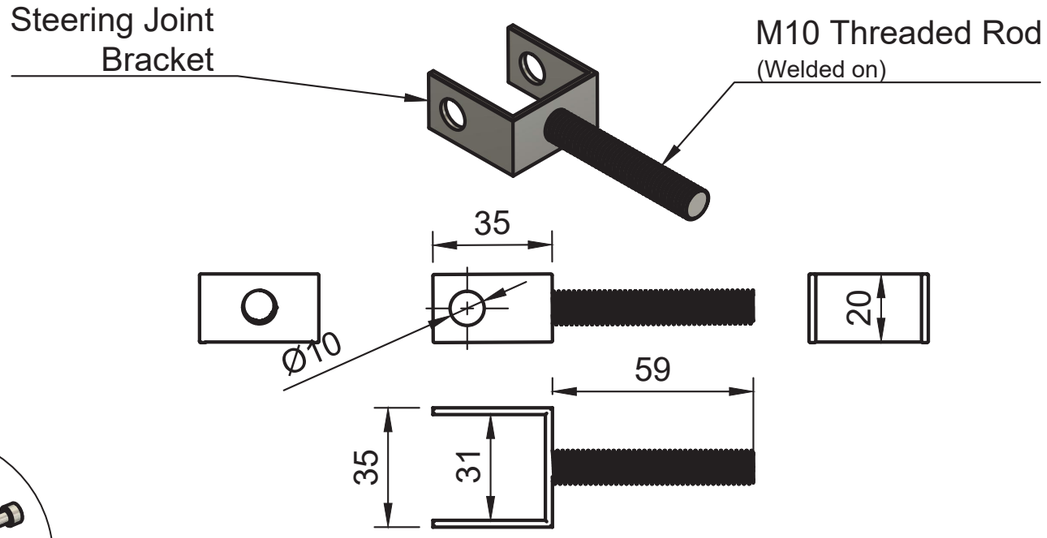
If you weld the rod, resist the urge of grinding down the welds, especially if you don‘t add a gusset - it will significantly weaken the joint and the steering rod is one of the worst things that can break on a cargo bike, it needs to be reliable. If it breaks, you‘ll lose your steering immediately and most likely crash. If you don‘t trust your welds, use a larger tube (22-25mm) and/or add the gusset, just to be safe.

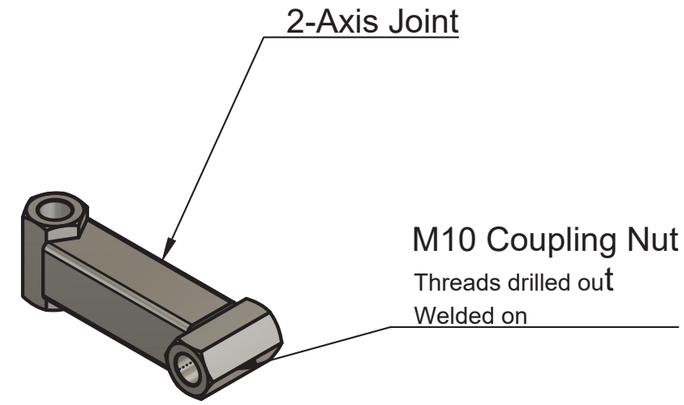
The measurements **(a)** and **(b)** might need to be adjusted for your build, especially **(a)** which can vary based on the width of your fork and the kind of tires you want to use (wide tires will need more space so the rod needs to move further out). It‘s a good idea to create the bend first and leave the rod a little bit longer than it needs to be and cut it to size afterwards. You can use the threaded rods to adjust the fit, but you want to have those stick out as little as possible to improve overall stiffness.

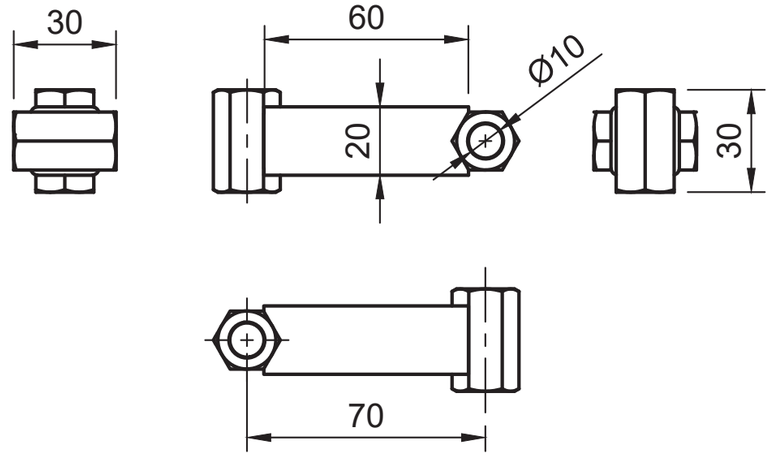


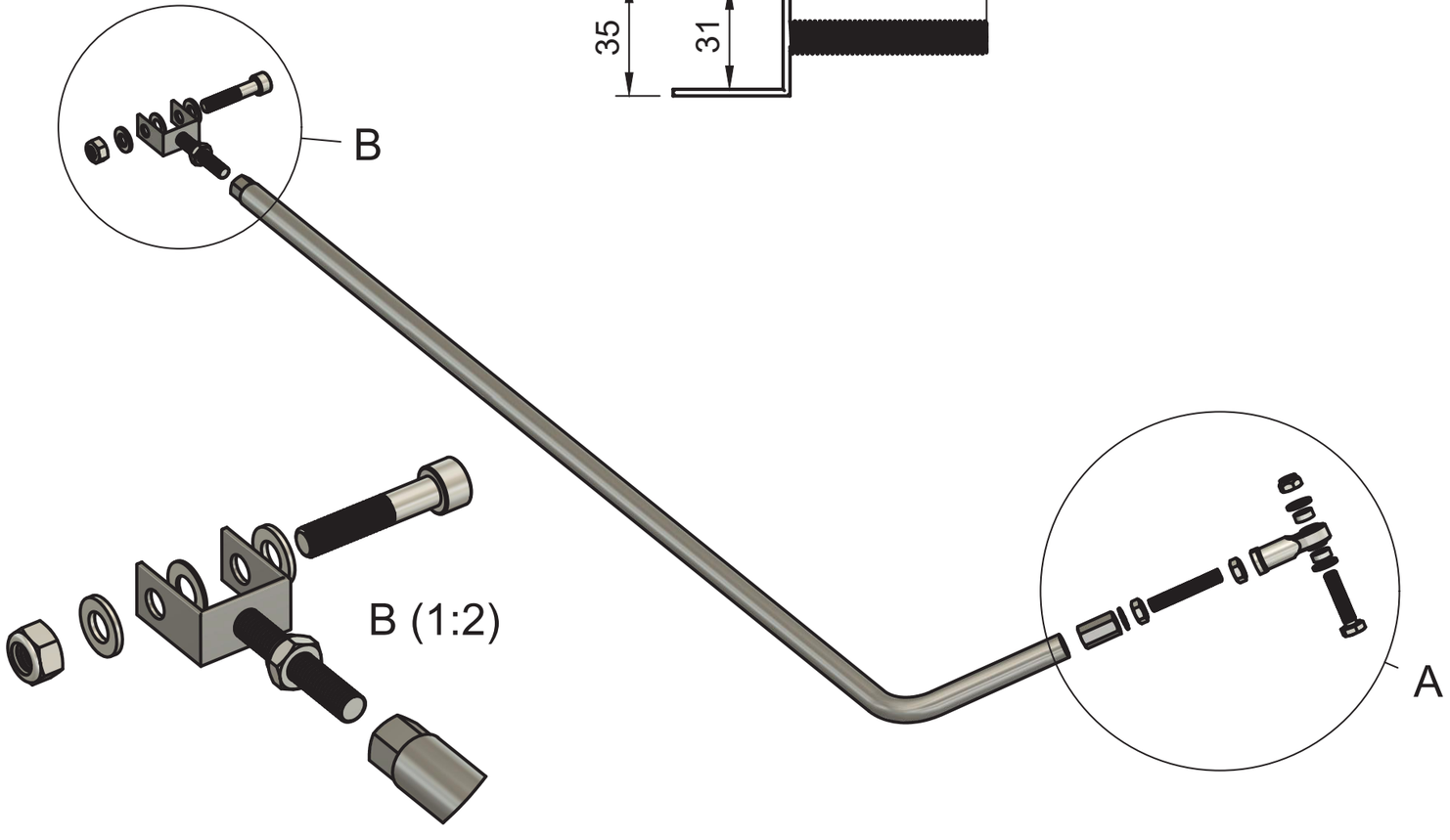
Project: **Long-John Cargo Bike**

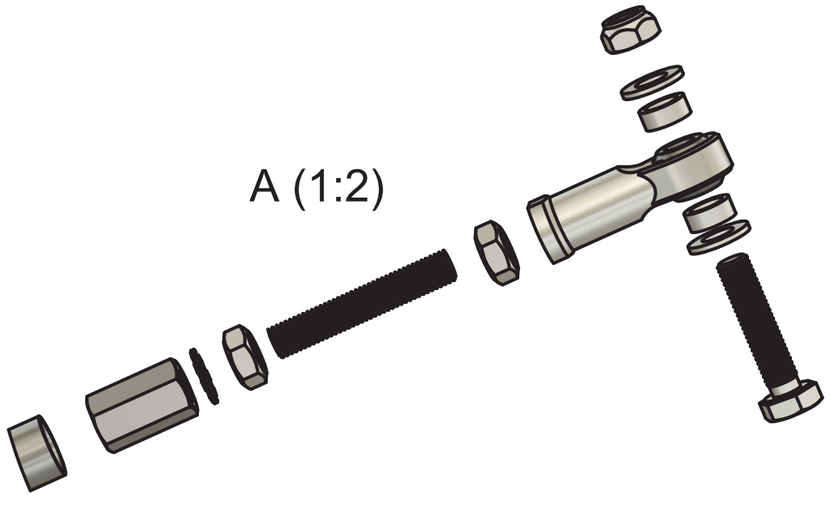
Steering Rod/2-Axis Joint





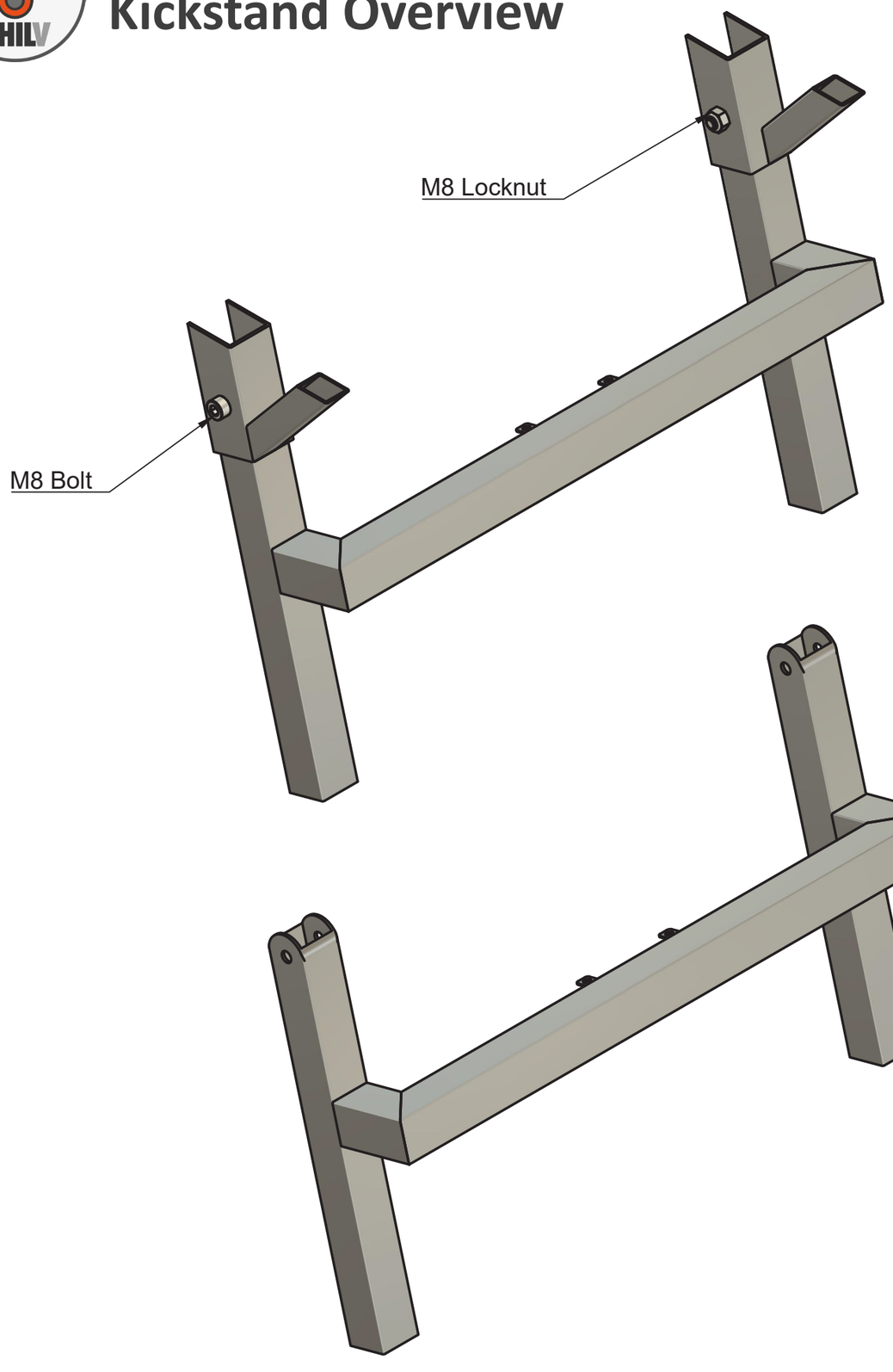


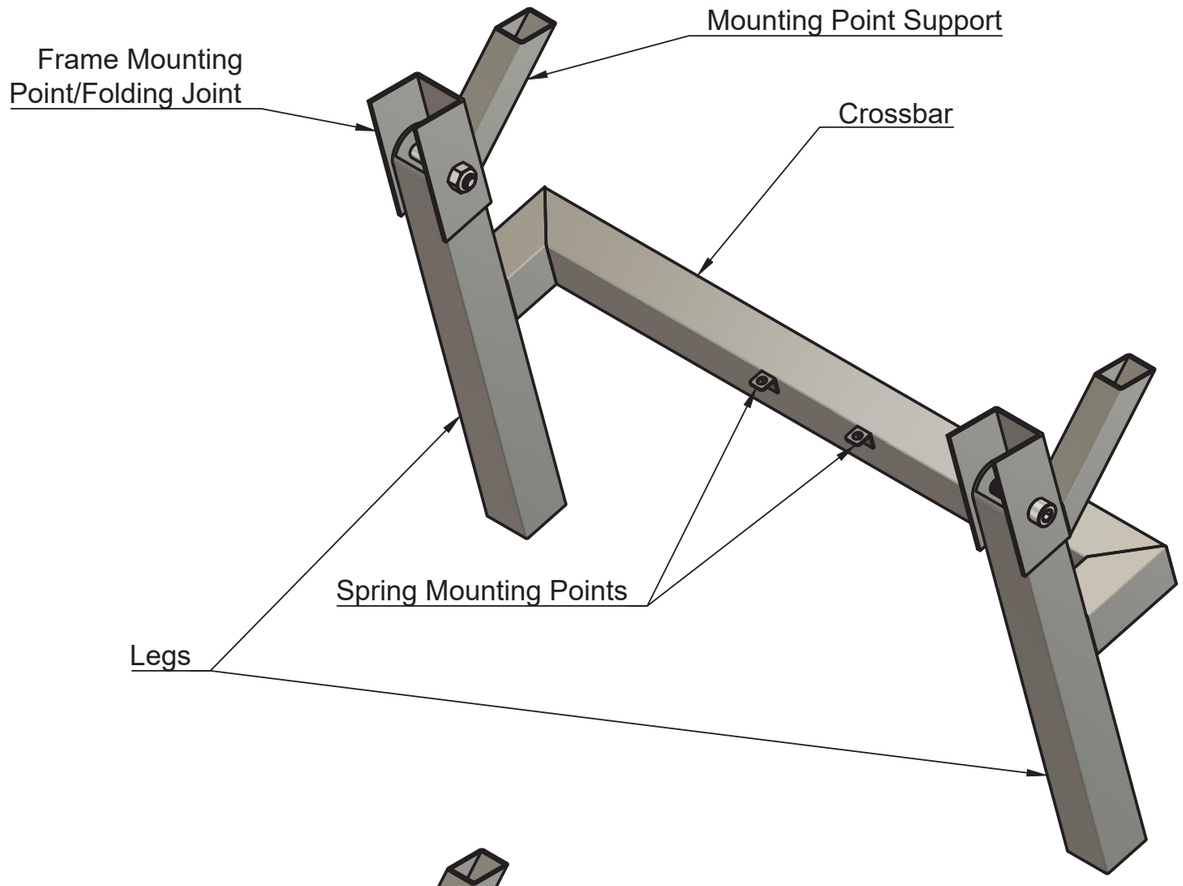


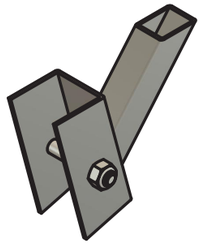


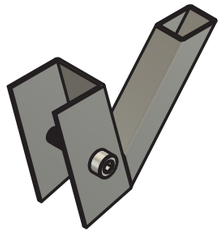
Project: **Long-John Cargo Bike**

Kickstand Overview









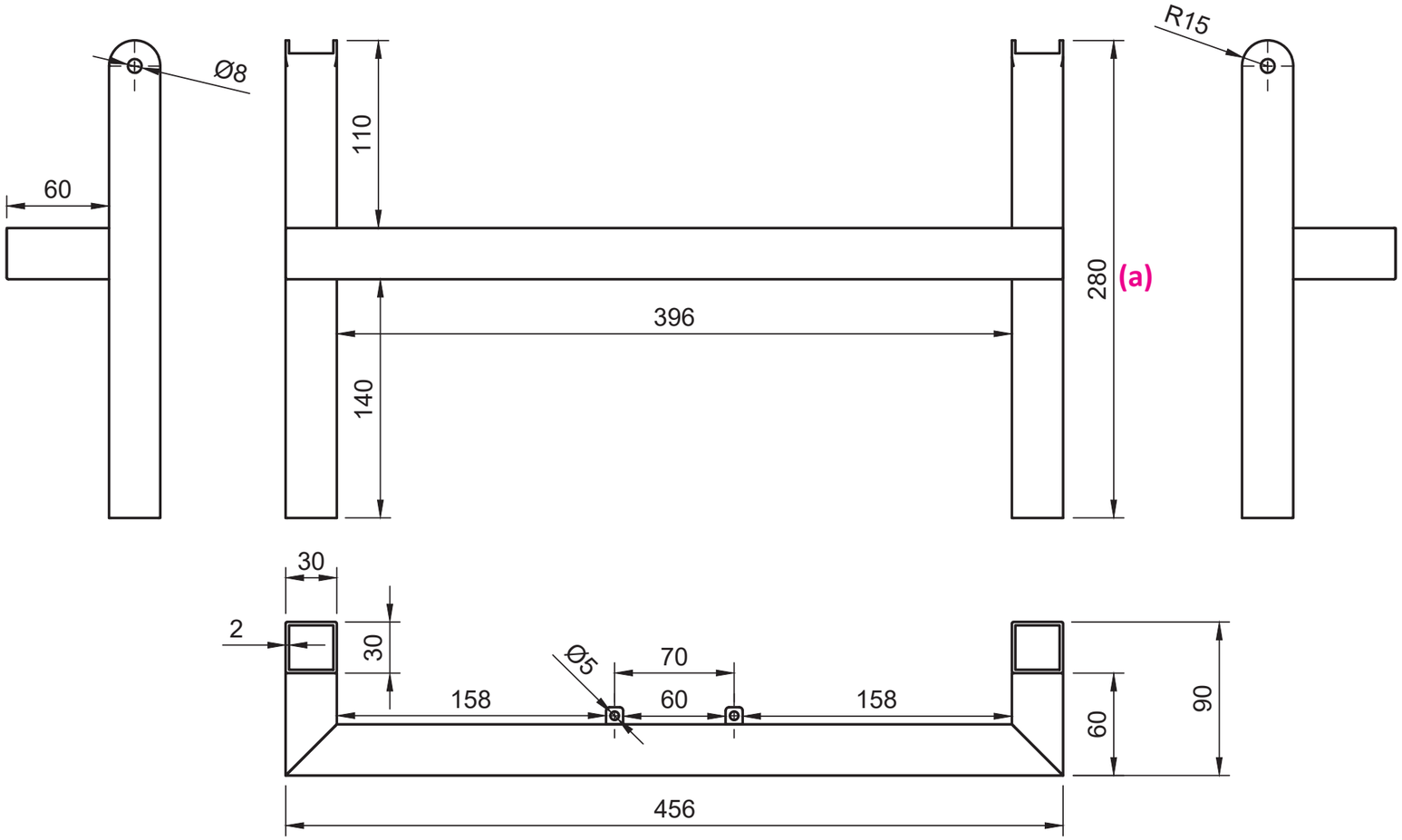
Project: **Long-John Cargo Bike**

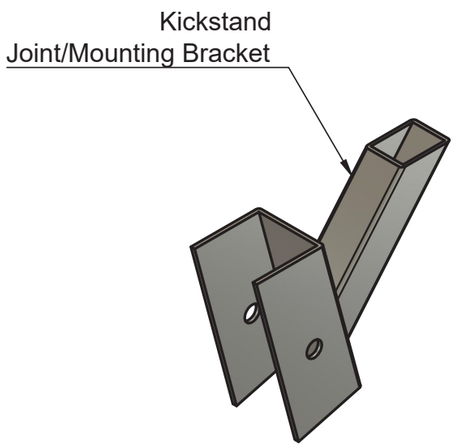
Kickstand

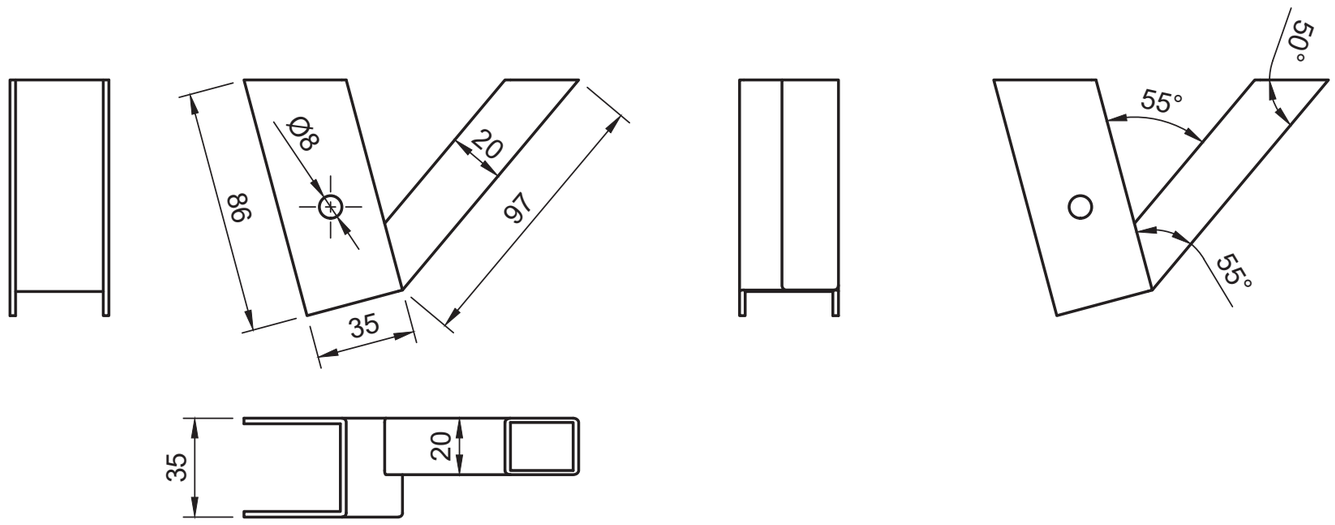
On the kickstand there is one measurement you might need to adjust which is the **length of the legs (a)**.

Since the stand is in the middle of the bike, depending on the load and weight distribution the bike can tend to seesaw back and forth. This is not a problem but it can be annoying if the front moves up and down too much.
The ideal length for the legs largely depends on the size of your tires. If you use smaller tires you want shorter legs and vice versa. The value here is a good starting point (most likely too long), it's best if you build the stand too long at first, try it out and then cut it to a length where your front wheel is about 20-30mm off the ground with the stand deployed.
Don't make it too short, that's much worse than when it's too long because then the bike will start to tip from side to side. Also keep in mind that on soft ground (grass or dirt) the stand can sink in a little bit, effectively making it shorter and making the bike tip.
It's a good idea to close the bottom of the legs with plastic plugs or weld on a cap, to avoid wearing out the edges of the tube, and to avoid dirt getting stuck in the open ends.

For the spring mounting points you can also just drill holes into the tubing and attach the springs through those, or screw in bolts or hooks to hold them. Even some Zip-Ties might do the trick.

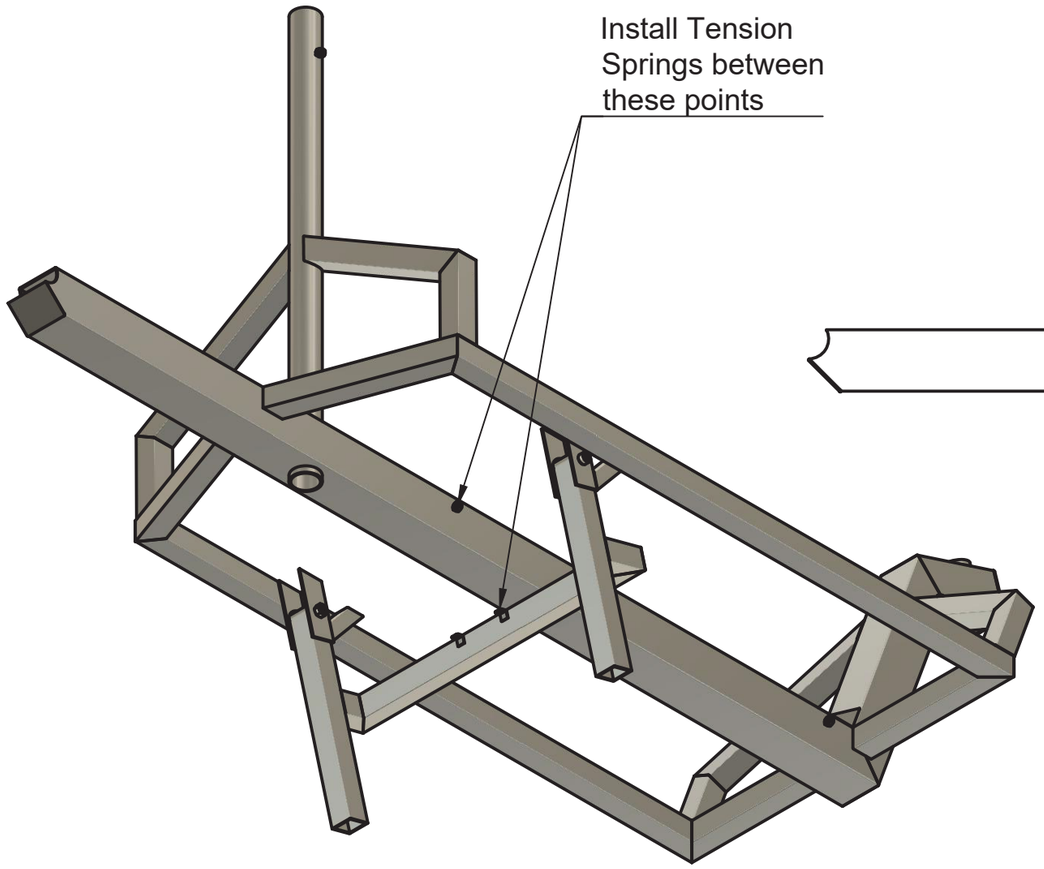


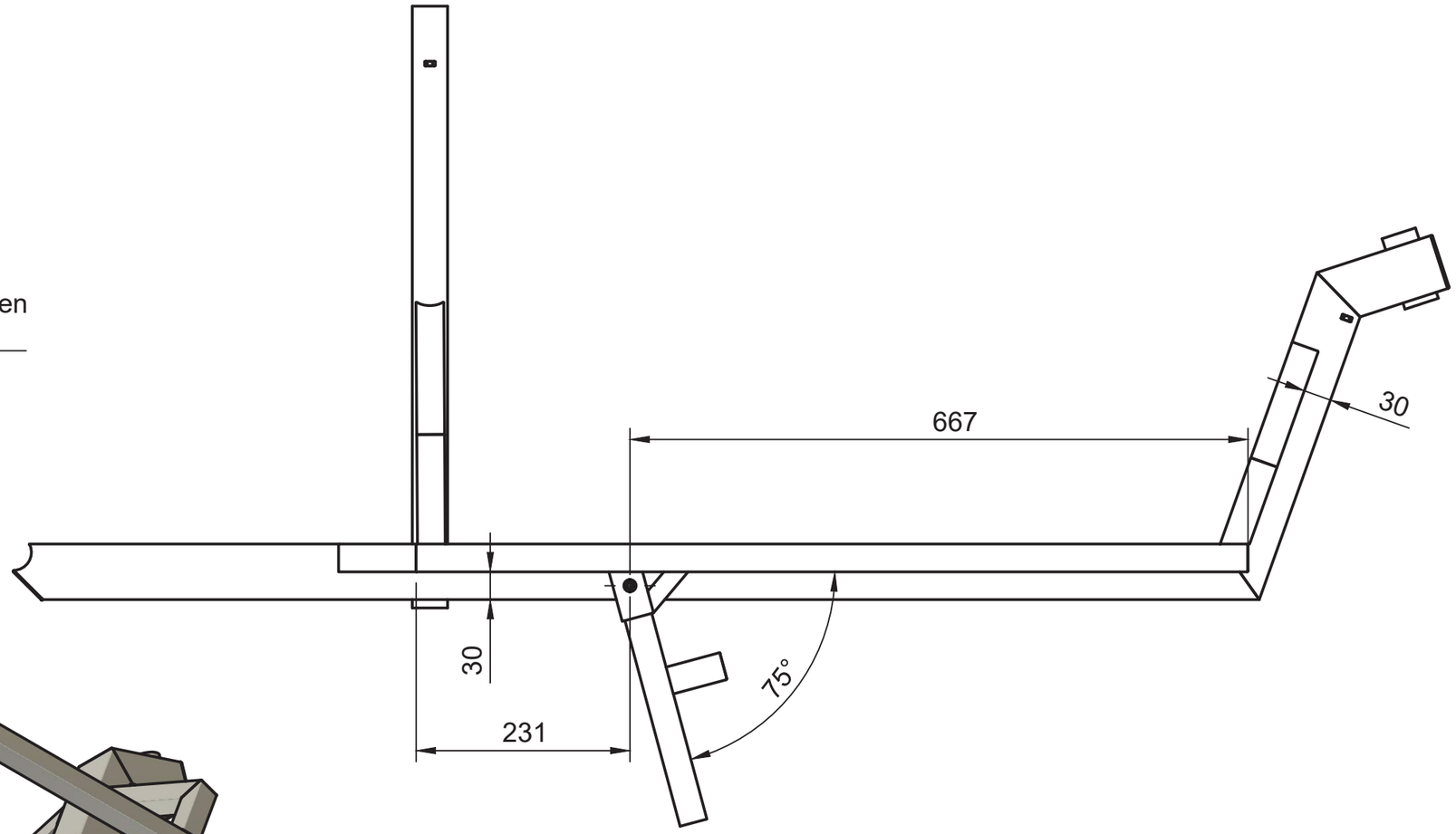




Project: **Long-John Cargo Bike**

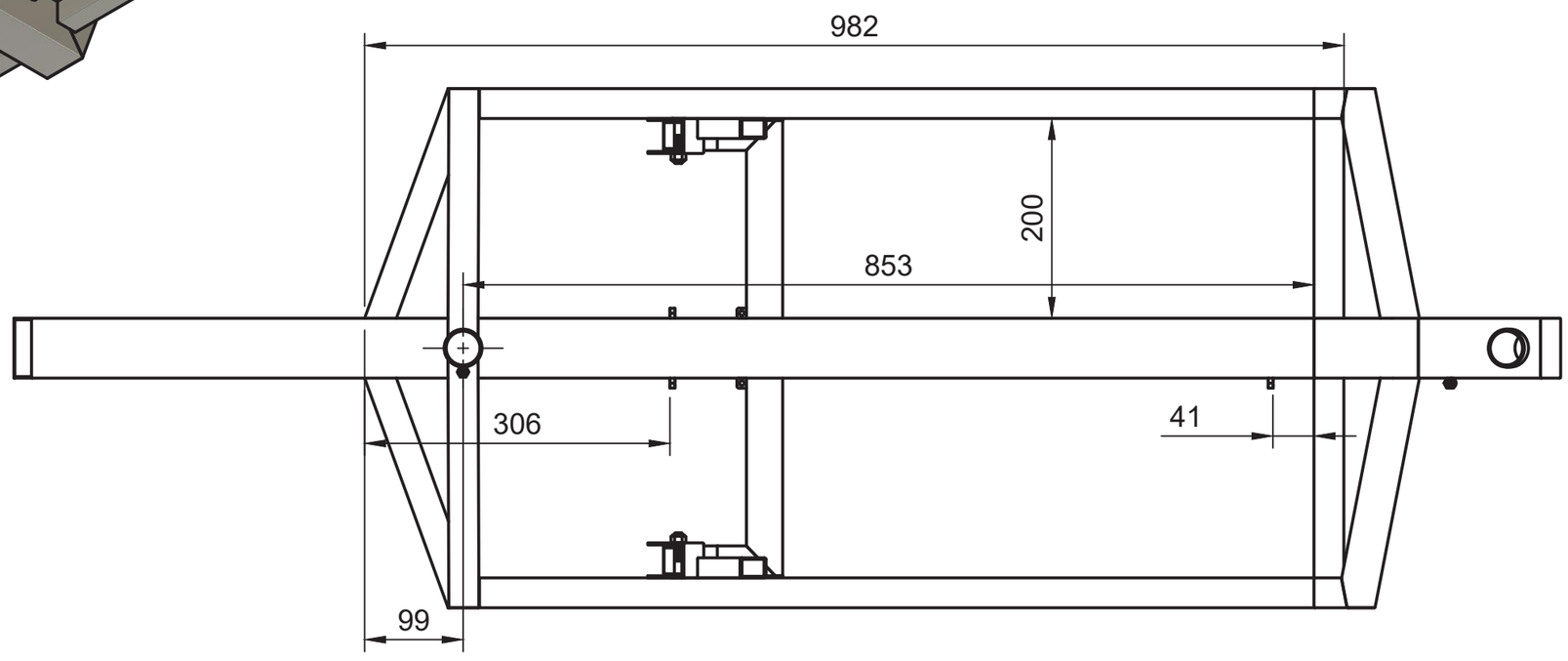
Cargo Bay Position
Kickstand Position





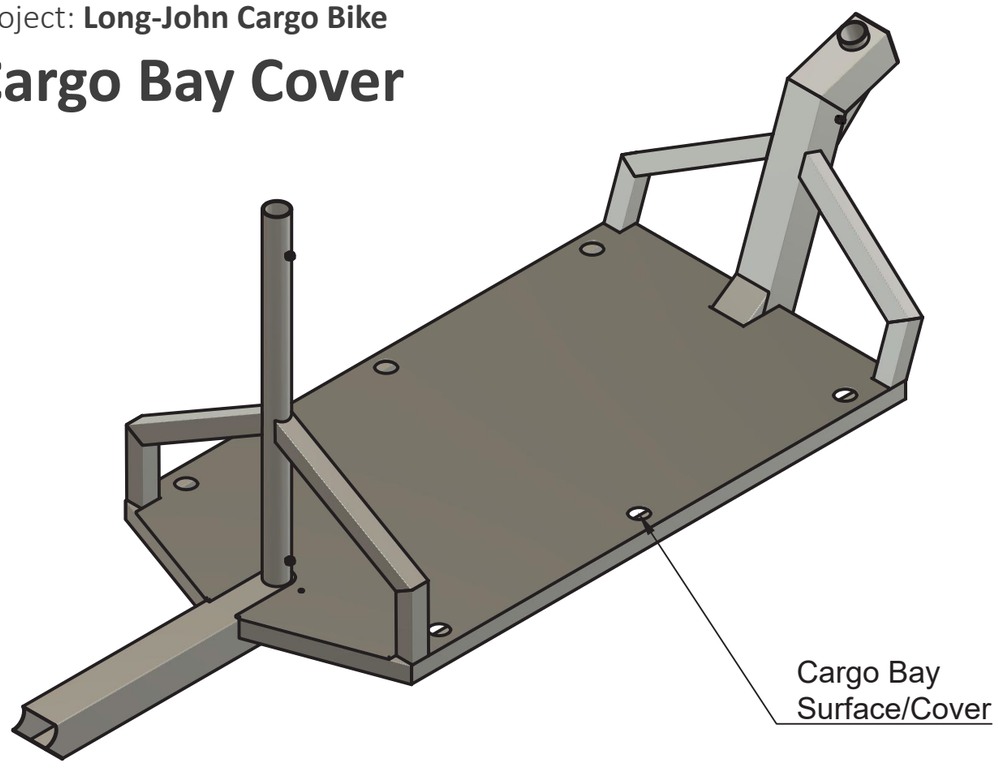
This is how the cargo bay should be positioned in relation to the rear steering tube, and the kickstand is then positioned in relation to the outer edges of the cargo bay.

Make sure that the legs of your kickstand stick out from under the cargo bay, if they don't, you need to change its position. You need to be able to reach them with your foot to deploy the stand.



Project: **Long-John Cargo Bike**

Cargo Bay Cover

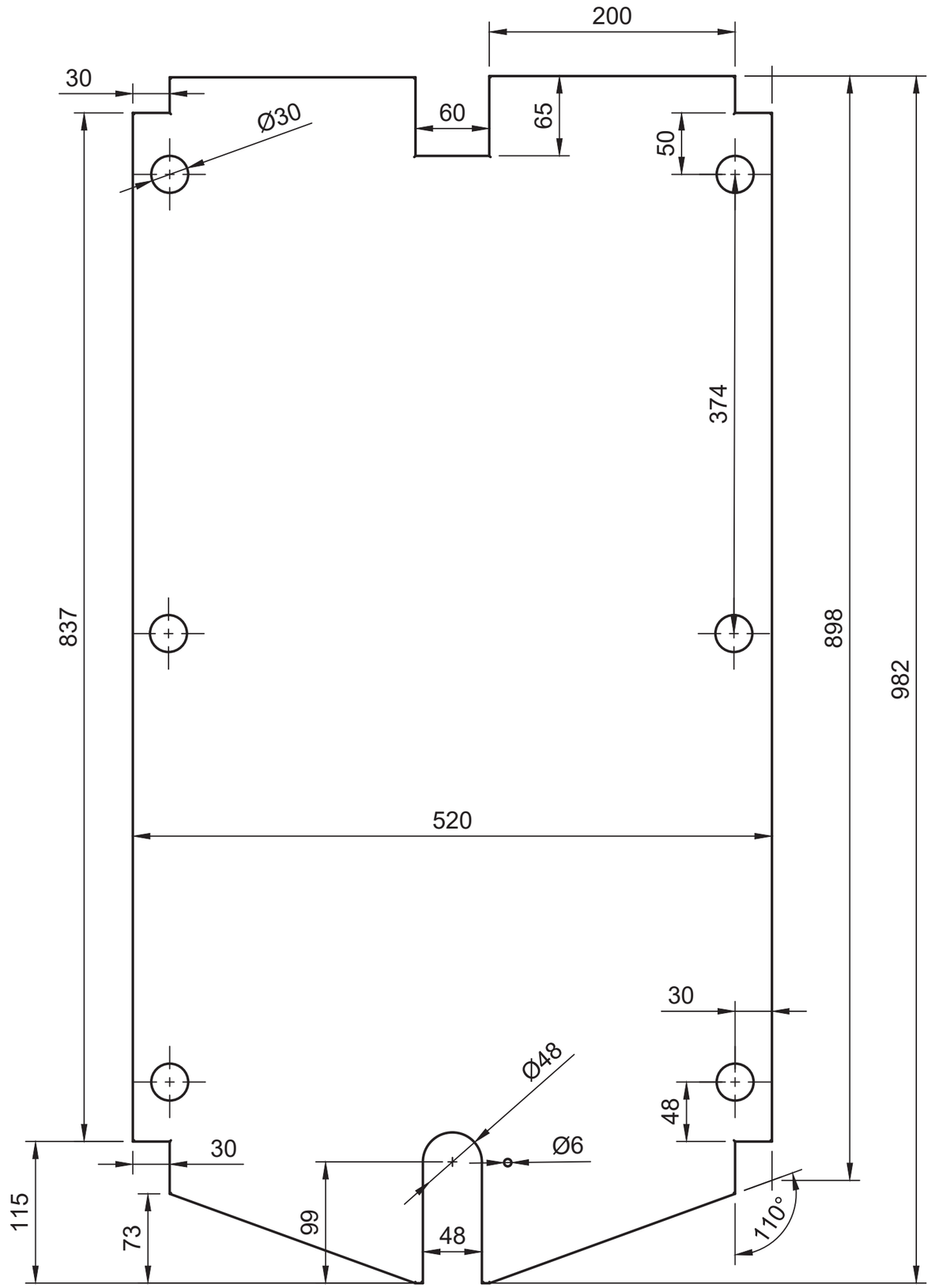


If you followed all the measurements correctly, this cover should fit neatly onto your cargo bay. The cutout for the steering tube is intentionally oversized to leave room for the thickness of the weld.

You can use whatever material you like for the cover. A good option is corrugated aluminum sheet. I used 2mm sheet which is fairly light and strong enough. You can also use coated plywood, some people even use hollow plastic sheet or simply a webbing of inner tubes.

I haven‘t included positions for mounting holes. You can drill these wherever you like to attach the cover, using bolts or use some other method to attach it (in case of sheet metal, rivets work great). If you drill holes into the frame, it‘s a good idea to do it on the frame pieces **before you weld them together,** otherwise you will get metal chips stuck inside the frame from drilling.

The large holes can be used to attach holding straps, rubber bands or any other way of securing the cargo to the cargo bay frame. You can also (loosely) put some zip ties through these holes and then use them to quickly attach hooks or carabiners.



Project: **Long-John Cargo Bike**

FAQ

Here I will try to answer some of the common questions about DIY cargo bikes that I get and some that I anticipate people will ask about this particular build. You don‘t have to read all of this - most of it is not critical for building the bike, but might provide you with some relevant info on cargo bikes in general.

What is the reasoning for the size/length of the bike?

The effective cargo capacity has a pretty simple reason: It‘s based on European industrial norms which are extremely common in Europe and many other parts of the world. At 80cm in length, it exactly fits two of the very common Euro containers, which are 60x40cm in size. This means it also fits a Euro shipping pallet sideways, which is 80x120cm (which means the pallet also neatly fits four Euro containers on it, it‘s almost like someone designed it this way!). Due to how common these sizes are, many other everyday objects also fit in a similar way, and many other commonly used boxes and crates also fit into this norm, which makes 80cm a good versatile cargo bay length, while still having the bike be fairly maneuverable.
As for the width, the cargo bay is about as wide as an average handlebar, which helps because it means if the front of the bike fits through a gap, the rest will fit as well. There‘s no point in making the cargo bay any wider, because if you have wide objects, they can simply hang over the sides, it‘s usually enough to support them in the middle. On the other hand having a wider cargo bay reduces your maneuverability even when riding empty without bringing much of a benefit.

Can I build it shorter or longer?

Yes, absolutely. I don‘t recommend going too much longer, since the handling starts to feel pretty weird at some point and the downtube will be less stiff. But some people have built ridiculously long bikes in this style (4 meters and more) just to show it‘s possible. You can certainly make it shorter to make it easier to fit into buildings and get snappier handling while reducing cargo capacity. The general principle stays the same, but obviously you will have to alter a bunch of measurements including the length and potentially the shape of the steering rod.

How do I notch out round tubing without a hole saw/drill press?

This is one of the trickier operations if you have limited tools, but since you only have to do it once for this build there‘s a bunch of good alternatives. One method is to print out a notching template with any regular printer and use it as a guideline. There are easy to use tools and even websites (Google: „Tube Notching Calculator“) where you simply put in the diameter of the tubes and the angle at which they meet, and you get a printable file with a template. Once you printed it out, you simply cut along the line with scissors and then wrap the template around your tube and trace the outline with a pen. You can then roughly cut out the shape with a saw or grinder and use files to refine it. With this simple method you can get very accurate notching shapes.
But often that‘s not even necessary - many people simply „eyeball“ it, by putting the tubes against each other at the correct angle, and roughly sketching the cut onto the tube, and then it‘s just a matter of doing a rough cut first and then going back and forth, checking the fit and carefully filing until it fits well enough to weld.

What kind of springs do I use for the Kickstand?

Unfortunately I can‘t give you exact specs for these because I always buy mine at a local hardware store which doesn‘t provide any info on their pull-strength. What I can tell you is that they‘re about 60mm in length and about 10mm in diameter and fairly strong. My suggestion is that you get a few different ones, they‘re usually not very expensive, and experiment. You want the kickstand to be pulled up tight enough so it doesn‘t bounce against the frame when the ride gets bumpy.

Loading Two rows of 80x60cm Euro Crates

Example of loading cargo that is much larger than the actual cargo bay

Tube Notching using a paper template

Project: **Long-John Cargo Bike**

FAQ

Can I convert it to an electric bike?

You can, and it‘s probably a good idea especially in hilly areas. I can‘t go into the numerous models and conversion kits that are on the market, but anything from a mid-drive motor mounted at the bottom bracket to hub motors in the front or back should work without problems.

Is it easy to ride?

With a little bit of practice riding a long-john is almost like riding a normal bike. The first few minutes on it are going to feel a little awkward because the steering is a little more indirect and obviously the turning radius is bigger than on a normal bike. But once you get the hang of it, it‘s a lot of fun to ride and often people even prefer riding cargo bikes over normal ones because it‘s a new experience. Many first timers have problems because they are focusing too much on the movement of the front wheel, which can throw you off because it doesn‘t move the same way you‘re used to on a normal bike. The best advice here is to just ignore it - look at where you want to go, not at the bike, and simply pretend you‘re riding a normal bike. You‘ll stop noticing all the steering stuff in no time. Once you are comfortable riding it empty, you can slowly practice with heavier and larger loads, since the handling changes quite a bit depending on what you‘re moving.

How much does it weigh?

It depends on what parts you use, my build weighed in at slightly under 30Kgs with a kickstand built from aluminum, but the bike parts I used weren‘t especially light. You can expect something between 28-35Kgs for the final bike. This is heavy for a normal bike, but actually not too heavy for a cargo bike. Due to using mild steel this kind of build will always be a bit heavier than an aluminum bike or a production cargo bike made from cromo-tubing, but that‘s the tradeoff for having a simple construction that is easy to make with cheap materials. That being said, at this weight the bike is perfectly rideable without electric assist and even when moving heavy loads, but obviously it will make you sweat a bit more than a regular bike especially on uphills. It could be built lighter, even with the same methods, but it was planned for reliability over light weight.

What about painting the frame?

I left this part out because it‘s a big topic on its own and mostly not really bike specific, so anything that generally applies to painting steel applies here too. Obviously steel will rust when not protected so I do suggest applying some kind of paint or other protection. How much effort and money you spend on this is up to you - a standard DIY paint job with spray cans is, for the most part, sufficient to protect the frame from rust. Of course you can also apply paint/lacquer with a brush or a roll. This kind of paint usually isn‘t too durable but having a few rust spots here and there in the long run won‘t do too much harm, it takes a really long time for rust to significantly weaken even thin tubing - mostly it just looks bad. If you want to go the extra mile, the best/most durable paintjob for a bike frame would be to have it powder coated professionally, which can be quite expensive.

Steering Wobble?

Steering Wobble is a common phenomenon that can sometimes occur in cargo bikes, or technically, any bike. It‘s essentially a feedback loop where the front wheel starts to slightly vibrate left and right on its own, which results in a cascading effect, eventually making it rapidly wobble back and forth on its own. This can happen quickly (within a few seconds) and of course it affects your handling, but most of all it‘s very scary, especially when it first happens and you don‘t expect it. Due to the indirect steering on a Long-John cargo bike and the different parts involved, Long-John bikes are somewhat more susceptible to this, so that‘s why I‘m adressing it here.
If you are into motorcycling, you might even be aware of this phenomenon already - it‘s a problem that can happen with motorcycles too, and you might have seen it in motorcycle races, where race bikes front wheels suddenly shift from side to side rapidly, shaking their riders off like a mechanical bull.

The set of physical circumstances that plays into this is so complex that even companies that produce (cargo-)bikes professionally haven‘t been able to completely and reliably get rid of it on their bikes. On some bikes it happens more than on others, for some people it happens all the time, others have never heard of it. Some companies offer steering dampeners as a retrofit-kit for their bikes which can prevent this - the same solution is used on motorcycles.
If you ever run into this problem, don‘t freak out! It‘s scary at first, but usually more harmless than you think. Even though it does affect the handling, the fork isn‘t physically able to move more than a few centimeters left and right as long as the steering mechanism is still safely attached, so there won‘t be any drastic changes in the direction you‘re going. Due to the low speeds on a bicycle it usually doesn‘t result in a crash. The best thing to do when it happens is to apply your front brake (but don‘t mash it down, just brake like you normally would, don‘t panic!) and the wobble will quickly go away. Don‘t try to fight it with your handlebars or tense up, it will make it workse. The resonance cascade that leads to wobble usually only happens in a specific speed range that can be different between bikes, as soon as you slow down out of that range, it disappears and the wheel will stabilize by itself.

But how can you prevent it from happening at all?
There‘s a lot of factors that play into whether you get steering wobble or not, and it‘s hard to pin down exactly what causes it. There‘s a good chance you will never even experience it. The most important thing is to make sure your steering setup has as little play as possible. The main culprit is a headset that has play in it, so make extra sure your front headset is adjusted correctly. Make sure there is no play in any of the joints in the steering linkage and that everything is safely attached. Again: make sure both headsets are properly tightened and not worn out. Another thing that can play a role is if your front wheel is not trued properly, or even if you‘re using a tire that isn‘t balanced (especially cheap tires are often lumpy and seriously out-of-round). A fork that‘s too flexible can also be a culprit. Even tire pressure can have an effect, as well as how much weight you‘re carrying. If adjusting all of these things doesn‘t help, you can still look into installing a steering dampener which will get rid of the problem for sure.

Project: **Long-John Cargo Bike**

FAQ

Why a front loading cargo bike? Why not put the cargo in the back?

This is probably the most common question people ask when they‘re not familiar with cargo bikes, so I‘ll try to answer it in a bit more detail. *There‘s some serious nerd-talk ahead, so feel free to skip this.*

Usually the question stems from applying car-logic to bikes (a car usually has its trunk in the back, same with trucks and pickups, so that‘s whats often considered to be the default and „normal“).
However, a bicycle is a completely different vehicle so the same rules don‘t apply. One of the main reasons for having the cargo in front is that the entire drivetrain of the bike can stay the same. You can use normal drivetrain components and a normal chain because the rear end is just like any normal bike.
Putting the cargo area behind the rider requires making the bike longer in the back which also means you have to extend the drivetrain which usually involves using a very long chain which comes with a whole new set of problems like more weight, more drag, a greater chance of chain slippage and often more (moving) parts like chain tensioners, idle pulleys, chain tubes and so on.

But the other disadvantage is that in designing the bike, you are less flexible in placing the cargo bay, because the chain has to either go under the cargo area or straight through it, severely limiting your options of providing a large, flat surface for carrying things. You can‘t just route the chain around complex shapes or change its direction however you want because that makes for an extremely complicated drivetrain which is prone to mechanical malfunctions. So your only option is to either have it run below the cargo area (or rather: put the cargo on top of the drivetrain), which requires having a relatively high cargo bay and consequently high center of gravity which negatively affects handling, or having the cargo to the left and right with the chain going through the middle, which is awkward and severely reduces the flexibility regarding what shapes and sizes of objects can be transported.
Of course on a front-loading cargo bike you have added complexity as well, because you have to have a more complex steering mechanism, but extending the steering is generally simpler and less prone to problems than extending the drivetrain. The advantage this provides you in the case of a long-john is to have a large, completely flat cargo area that is also very low, providing a low centre of gravity which greatly improves handling. Centre of gravity is the most important factor in how easy a cargo bike is to ride while carrying loads.

But front loading also has other advantages: You can always see what you are carrying and you always know how long and wide your bike is, which is a huge advantage especially when cycling in dense cities. Unlike a car, a cargo bike can load objects that are much wider than the vehicle itself and/or the rider. When you are carrying bulky objects, you don‘t run the risk of your cargo getting stuck on obstacles or colliding with other vehicles or pedestrians *behind your back* and potentially leading you to crash, which is a constant risk with rear-loading bikes and trailers. It‘s very easy to judge if a gap is wide enough for you to fit through when you can see the widest point directly in front of you. You can also see if your cargo is starting to slip off when badly secured, or when stuff shifts around after you ride over a bump. I can‘t overstate how important this is when riding in city traffic. It is also a huge help when you are carrying kids, adults or dogs on the bike because you can see what‘s going on with your passengers directly in front of you and react accordingly - it also helps with communication. Of course rear-loading cargo bikes do exist and rightfully so. They have their own advantages and in some situations they might be better suited for the job than a front loading cargo bike. But for the reasons mentioned here, I would almost always choose a front-loading bike over a rear-loading one - a lot of it simply comes down to personal preference.

In any case, the fact that a large majority of commercially produced cargo bikes that have flooded the market in recent years (there are hundreds of models now) are based on the long-john format speaks for itself. It has simply established itself as the most versatile and popular model.

Examples of very bulky loads that would be dangerous to carry on a rear-loading bike.

Project: **Long-John Cargo Bike**

FAQ

Why not just use a trailer?

Many of the disadvantages of rear-loading cargo bikes apply to trailers as well - *and then some.* Apart from the constant risk of the trailer getting stuck on obstacles behind you due to being wider than the bike in front, trailers are simply the opposite of „sporty“ even when not loaded. Due to adding two extra wheels to the equasion, they effectively double rolling resistance compared to just a bike, introducing more drag. Empty and even loaded trailers have a risk of tipping over when you take corners too fast and you never know when it might happen because you can‘t see what‘s going on behind you. A front-loading cargo bike, when empty, rides pretty much like a regular bike, apart from a slightly larger turning radius. But there‘s a noticable difference between riding a single vehicle with „one set of physics“ contained in itself, as opposed to what‘s technically two vehicles attached to each other. With a cargo bike, you simply don‘t have to worry about what a trailer might potentially be up to behind you. The handling, feedback and general feel for the bike and the cargo on it is much more direct even when carrying heavy objects, than the relative vagueness of pulling something behind you that has its own two wheels and might behave differently than the bike, or get caught on things even though you think you‘ve dodged them.
You can dodge a pothole with your bike and pass it, and the trailers wheels can still hit it because they‘re moving in a different wheel track, potentially tipping over the trailer or knocking off the cargo. A cargo bike is easier to park and even carry, less bulky and just generally a much better everyday solution that makes sense to ride even without transporting anything (but still having the option!). Almost nobody uses a bike with an empty trailer attached as their everyday ride, while many people use cargo bikes even when they don‘t need to carry anything. And that says a lot - trailers are annoying, which is why people only use them when they really need to, while a cargo bike has much fewer disadvantages. Again, I‘m not saying trailers are useless and terrible (although I do hate them), they do have their uses, but you just can‘t compare them to a cargo bike - they are two completely different things.

Why use a 20“ wheel in the front?

You might be tempted to think this whole build would be easier if you just used a 26“ front wheel and fork as well, since it already involves getting a 26“ donor bike that has these parts. After all, a 26“ wheel does provide a smoother ride and the components are easier to get, so why go through the trouble of finding 20“ parts?
There are a few disadvantages to using a large wheel in the front, the main one being that the frame would become less stiff and the handling worse. If you used 26“ in the front, the front end of the bike would have to be much higher, the center of gravity would move up and the wheelbase would increase as well. Stiffness in the front is very important for a Long-John, as it‘s already a frame style that is prone to too much flexing due to the long, unsupported downtube. The forces acting on the front end, especially when braking with cargo are immense, (effectively, the fork gets pushed backwards) so you want the front end to be stiff and compact, the same goes for the fork. 20“ parts are much more rigid than 26“ parts and a well built 20“ wheel is nearly indestructible in bicycle terms. Due to the longer spokes and larger rims, 26“ wheels and 28“ especially are much less stiff and tend to go out of true faster. Having a higher head tube in the front also changes the steering behaviour, because the point over which the bike „tips“ sideways when steering is now higher up. And there‘s one more disadvantage to it: In many cases, especially when you mount a box, you‘re actually able to move objects that are much longer than the cargo bay itself, by simply having them stick out over the the front wheel and extend forward almost as long as you want. If the head tube and wheel are taller in the front, this ability is much more limited.

Examples of loading objects that are longer than the actual cargo bay, thanks to the low front end and small wheel.

Project: **Long-John Cargo Bike**

FAQ

How much weight can I carry?

This is hard to give a general answer for, it depends a lot on how much you are comfortable riding with. You will quickly notice that the more weight is on the bike, the more sluggish the steering gets because you have to work against all that inertia. It becomes harder and harder to maneuver and also to keep the bike upright when starting and stopping, because it will want to tip over. How well you can control this behaviour comes down to your personal skill in riding (cargo)bikes, what risks you want to take and also stuff like your body weight. A person weighing 50kg will have a much harder time controlling a bike that is carrying 70kg than someone who weighs 90kg themselves, because you have less mass that can act against the occuring forces. It can generally be said that the limiting factor on a bike like this one is most likely not going to be the bike itself, but rather your ability to ride it safely. Although this also depends on the quality of your build (how good are your welds?) and the components you used (how strong are your wheels?) In the end, please use common sense and don‘t take unnecessary risks. If you have trouble controlling the bike with a certain loadout, then make two trips or don‘t ride it. But to give you an estimate: 100kgs is a reasonable maximum load. Everything higher than that is starting to get adventurous. Personally the most I have ever carried with this bike as a test was 160kg which is really pushing it and was barely rideable - but the bike itself was showing no signs of failure. But it‘s not safe to ride in traffic with that kind of loadout.

Why not use three wheels?

Three-wheeled cargo bikes are certainly an option and again, they do have their uses, but just as with the things discussed before they are a different design for doing a different job.
Three wheeled bikes are essentially a completely different category of bike that you can‘t really compare to two-wheelers. A three-wheeled bike will have vastly different handling and riding characteristics from any normal bike because it lacks the fundamental feature that makes bikes so maneuverable, easy and fun to ride: The ability to lean into corners and thereby shifting the center of gravity. You can‘t do that with three wheels, the exception being designs with tilting mechanisms, which are cool, but very complex and a rare exception with its own set of problems.

Riding a three wheeled bike feels *weird.* With three fixed wheels, whenever you have to go into a corner, centrifugal force will not only want to tip the bike over, but also act on you, the rider, which makes riding these bikes feel pretty awkward, because it feels like you‘re being pulled off the seat sideways in every corner. This also goes for riding over uneven terrain or on sloped terrain. Since the bike doesn‘t stay upright like a two wheeled bike, you‘re now sitting on a bike that‘s shifting around under you and changing its orientation, your seat doesn‘t stay level, but your upper body is instinctually trying to do so, which results in a feeling of „fighting“ against the bike. The same thing happens in a car, but since you‘re comfortably sitting much lower and in a padded seat and aren‘t pedaling it doesn‘t feel as strange.
The biggest downside is the tipping though, three wheeled bikes *can and do tip over* in corners and it happens at surprisingly slow speeds, much sooner than most people expect at first. This results in having to ride much more carefully and slowing down more before taking a corner. They are also usually much heavier, slower and bulkier than two wheelers. The huge advantage they have is their capacity - they can carry very large and heavy objects for a bike so you could consider them the trucks of the cargo bike world. They also don‘t need a kickstand and they can‘t tip over when standing which is a big advantage when loading and unloading them. If you want to carry a certain size or weight of cargo, adding another wheel to the design not only makes sense but becomes necessary, but that‘s not the goal of this build.
The beauty of the long-john design is that it offers the best compromise between all the things mentioned here. It can do a little bit of everything - it can be fast and agile for a cargo bike, but it can also carry a lot of stuff. It‘s big but not too big. It can go anywhere a normal bike can go and still bring a few crates of beer. And that‘s why I chose to show you how to make this particular bike - because I think for the majority of people that want a cargo bike, it‘s probably the best choice. That being said, there‘s a good chance I will make more tutorials that will cover other cargo bikes - stay tuned!

Project: **Long-John Cargo Bike**

The End

...aaand we‘re done!

I hope you got enough information from the video and this guide to build your own bike.

Once again I want to thank everyone for buying these plans and I wish you the best of luck with your build. Send me a pic when you‘re done, I‘d love to see your finished bikes!

See you with the next build.