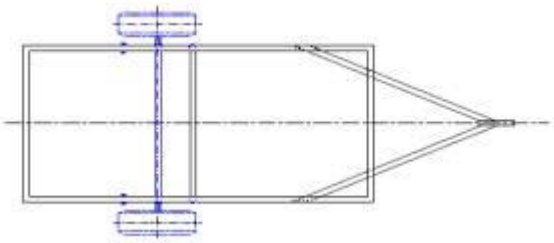


TRAILER FRAME BUILDING TUTORIAL

For your benefit please read this in its entirety to get the most out of it before starting your build.

I would like to give you a short explanation why I believe Doug and I are qualified to write this tutorial. I personally started welding professionally for a industrial ventilator company when I was 19 doing heavy stick welding, that was also where I got my introduction to MIG welding, though at that time MIG was not used very often, primarily for welding lighter steel to heavier stuff. No one there really knew much about it.
I spent 4 years in the USAF after that plant closed down, after leaving the military I took a job with a roofing company in VA welding railings and such for apartment roofs.
Didn't like working in D.C. so I quit there and came back to Butler, where I did an extended stint building tie walls and landscaping, then house construction.

In 1989 I took a job with a trailer manufacturer where I designed built and welded every kind of trailer from small cemetery dump trailers to 40 ton air brake gooseneck, drop deck and beaver tail heavy equipment trailers. I worked there for 15+ years until a back injury put me on the sidelines. I also did about a 2-year stint in this time period as a second job fitting and welding industrial machinery for steel mills; we welded materials up to 5" thick solid steel, what fun.

So in summary I have no shortage of experience in this field, I have taken and passed a certified welding test but had no desire to be certified at the time (still don't). I have done stick, MIG (lots), some TIG (very little) I'm good with a torch, plasma cutter and nearly anything else used, never had anything come back in pieces.
I am even pretty fair on a mill, a lathe, a Blanchard and a few other machines I won't go into.

Now for a little background on Doug:

My welding and metal work experience began in 1973 when in college...I lived on a farm and had a very large scrap pile of odds and ends. I got a buzz box, a box of rod and started welding up yard art. I gradually moved onto Ag type welding on all sorts of farm implement repair. After college I used my fabrication abilities in the mineral exploration industry and have built a number of fishing tools for down hole retrieval of drill cones etc.... After the mineral market crashed in 82 I went into partnership with the individual that taught me how to weld. Our specialty was fire trucks, aluminum bodied on full frames and gliders. We also built a large number of end dumps, pups, and tandem dumps. When not building a vehicle for resale we built miscellaneous trailers, car haulers, specialty equipment trailers and motorcycle and snowmobile trailers. We also did custom frame stretches on tractors. It was during this period that I also learned to shoot automotive paint. I have no "official" education in welding, but am proficient in MIG, stick and gas welding, plasma cutting and torch skills. While not involved in manufacturing on a daily basis any more, I have built 3 tear frames and custom fabricated several hitch systems in the last 2 years, as well as other repair work. I got my first tear in 1980 a '49 Kit, for 300$. It's still around as are the trucks I've built. Doug

Disclaimer: This tutorial is just a guide to help you on your way to building your own welded trailer. We can in no way accept responsibility for your finished product, only you as the builder can do that. We will be happy to give you any advice we can but how you follow it is entirely up to you. So please, no lawsuits, there's nothing in the kitty.

Useful Equipment

First thing we'll start with is some basic equipment you should have.
A welder of some sort is pretty much a must have. My advice is if you are buying try and get the best you can afford if you intend to use it for more than this project.
The best alternative is a 220v MIG welder that is gas capable, it's relatively easy to learn and the gas option gives much more versatility to the beginning welder.
I am not going to recommend a specific brand because it really doesn't matter that much, most any brand welder will do its intended job.
I will however recommend a 220v welder if you have a place to plug it in, if not the largest 110v welder you can get will do. If you already have your welding setup you're good to go, if you are buying one you need to decide if you are going to use strictly flux core or if you want the option to use hard wire and gas. If you buy a gas capable welder you can always buy a bottle and gas later, but if you buy a gasless welder most can't be converted to gas.
If you already have a buzz box and are proficient with it feel free to use that too, we're not prejudiced against stick welders we just find MIGs easier to use for most people. They also allow you to weld in positions a stick won't.
Any useable helmet with a #10 or #11 shield in it will do but an auto darkening shield is really nice (a bit pricey though, $140+ range) some people prefer the gold shields but I personally never cared for them although they may work well for you. Get yourself a good pair of leather gloves that fit your hands fairly well, they will give you much better control of your gun. A set of welding leathers or a green welding jacket is a must unless you enjoy sunburns. You can also get the green pants or leather chaps but a good pair of blue jeans should suffice just fine. I also don't recommend you weld in shorts, welders don't care where or what they burn. I have welded in sleeveless t-shirts for years using a 50 or better sun block on my arms and face, I would recommend sun block on your face while tacking your frame together, particularly if you sunburn easily. I don't however, recommend anyone else welding this way because it doesn't prevent burns from sparks and hot slag.
An angle grinder to bevel your steel for welding and removing excess rust (bad for welds) and possibly cutting your steel if you haven't anything else. Also comes in handy for cleaning up some of those less than perfect welds too. A chipping hammer is necessary if you are using flux core, you'll need it to remove the slag before you try and make another pass over your weld. You could also weld an old chisel onto a piece of steel rod for a chipping hammer, that's all most of them are anyway.
Some good clamps are always a big help too, particularly the pipe clamp type. They are handy for getting the trailer square and straight. I personally don't care for the magnetic corner clamps; they don't really have the strength to hold your material straight once you start tacking it together.

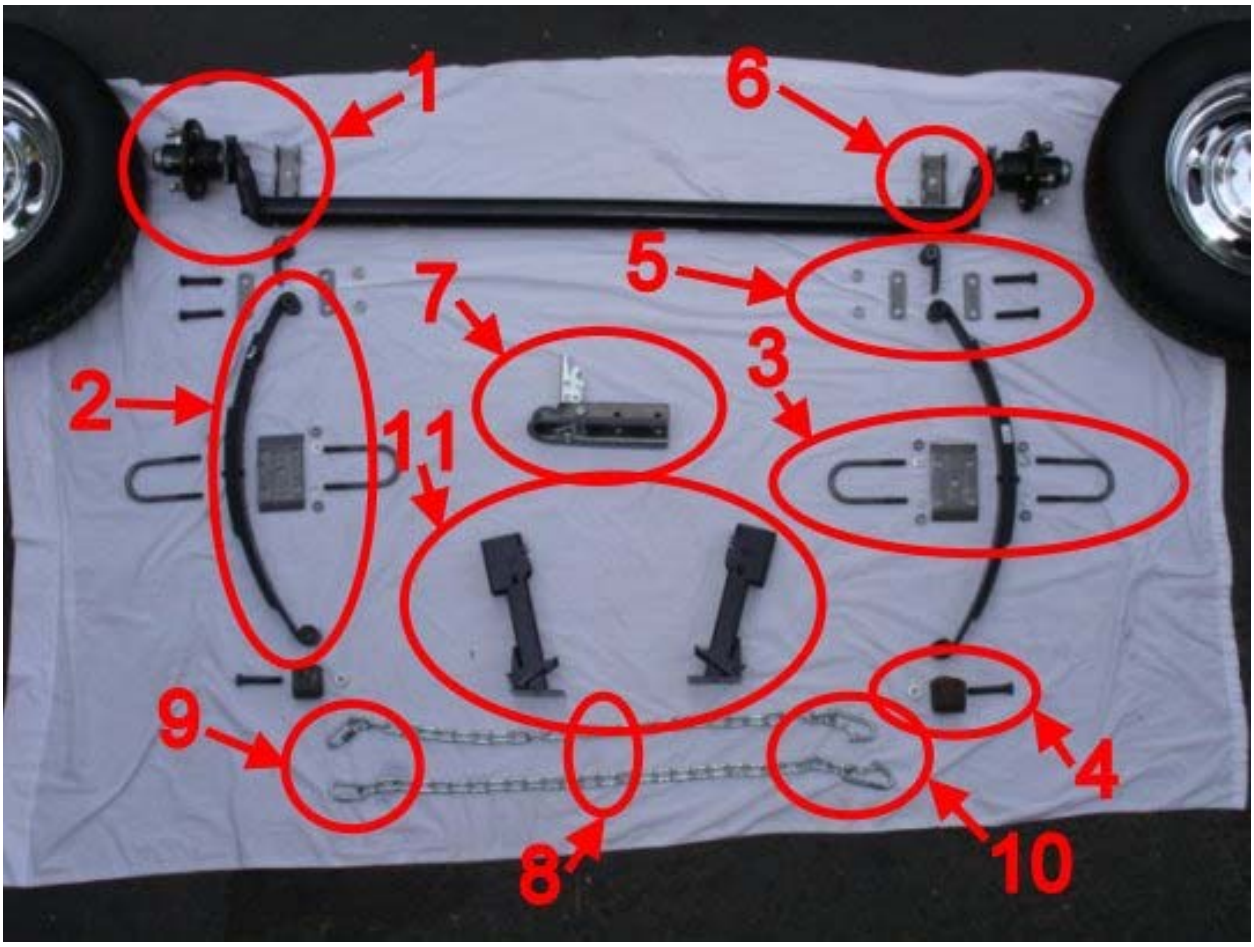
We won't cover all welders in this tutorial just what we have available, so everything will be generalized and should work for most welders. The best piece of advice I can give you to get you started is practice…practice…practice, and when you think you have got it right get a few more pieces of scrap and practice a little more, you will be glad you did when you run your welds on your trailer and you don't have to grind them out and start again or have to grind them to make

them look good. Not having to worry about your tongue falling off or having someone following you run over pieces of your trailer will make all your practice worthwhile.

Our Goal

This frame tutorial is built from the point of view of a garage/ shade tree builder. While there are many ways to build a frame to suit your needs, we are documenting what we have built. This build was done with a minimum of iron working tools. It also assumes that the builder has basic competent welding skills in MIG and or stick welding. It is not intended to teach you how to weld or operate the tools necessary to complete the frame.
We will try to include any tips we can think of to make things go as smoothly as possible for you, but again, we can't teach you to weld.
The materials used in this build have been checked with Andrew, the Tears and TTT forum resident engineer, and he has designed the basic frame based on our requirements. Opinions may vary as to the techniques and methodology; however it is a good faith effort to document the construction. It is not necessarily the "only" way to build one and should not be considered as such. This is the type of thing that those of us that have worked with steel have pretty much learned a different method or technique. As a potential builder, you can take what you will from this or totally dismiss it all. We know that there are other opinions on proper frame construction, but we feel that this is certainly a viable method. There are a number of axle options, and materials that can be used, please review Andrews specs on materials, and your axle suppliers information regarding these options. Due to cost restraints, we could not document every option. If others would like to contribute by documenting a Torsion Axle set up, it would be greatly appreciated and included.

Parts Description



This is a description of the basic parts of your under carriage, your parts may differ visually from these but they should still function and mount similarly to these.

1. 3500# - 4” drop axle, yours may be straight and could be 2000# or less

2. Double-eye spring, slipper springs are also an option. Shown are 2-1100# springs, your weight may vary.

3. U-bolts and plate, one set for each side

4. Weld on front spring hanger and bolt, these can also be found in bolt on style.

5. Rear spring shackles and shackle hanger, there are several different styles of these, they can also be made from 3/16” – ¼” wall square tubing in a pinch.

6. Spring seat or perch, this goes between the axle and the spring and get welded to the axle **only**.

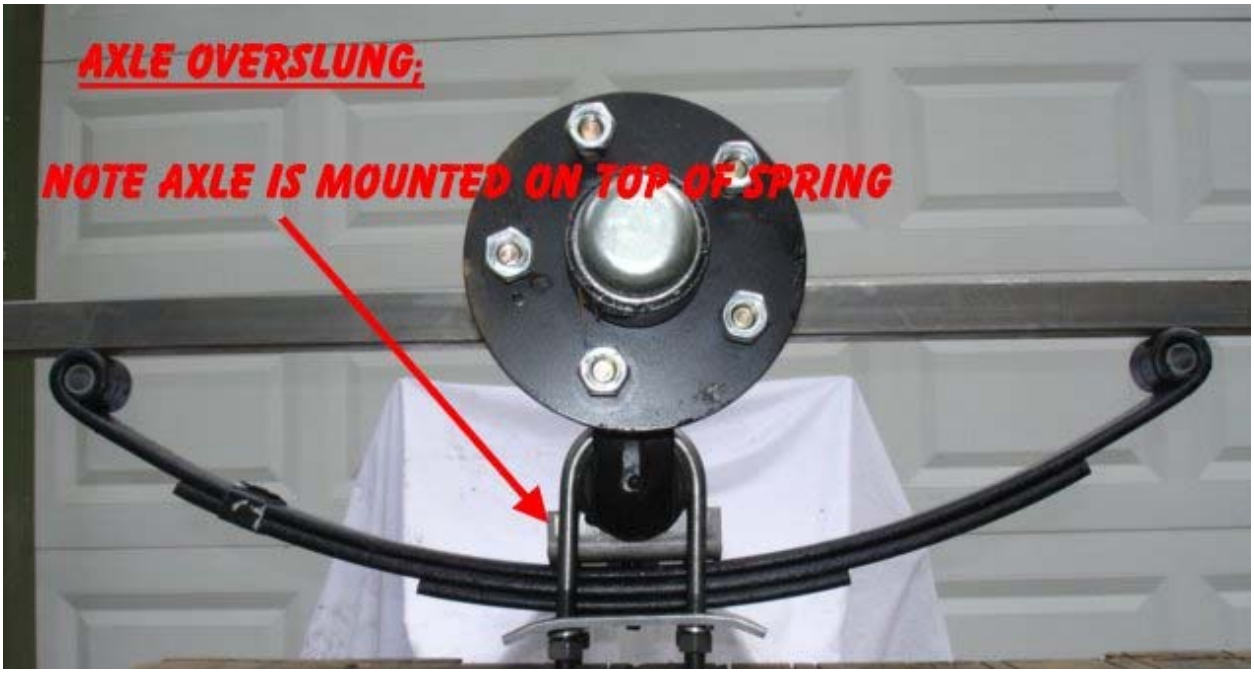
7. Coupler, bolts or welds to your tongue. You'll need one of these to hook to your tow! They also come in an assortment of different styles.

8. Safety chains, you'll want to have two of these, they'll save you some tickets and maybe even your trailer one day.

9. Quick links, these can be used to attach chains to your tongue but I think welding or bolting are better options

10. Chain hooks, the business end of your safety chains, look for ones with the clips on them, in much of the country they are required now.

11. Stabilizer jacks, these are optional and usually just get 2 mounted on the back but occasionally get mounted under the front also.



This is a shot of an over slung axle, the axle seat will sit on top of the axle and the axle will sit on the seat. When using this type of drop axle the spindles must be mounted in the upright position. This is the normal position for a drop axle to be located in. It gives you the most available drop from the axle.

This is a shot of a under slung axle, the spring seat will be on top of the axle now with the spring sitting on top of that, the spindles must still be in the upright position. In this position you will decrease the amount your chassis will drop to a point slightly higher than a straight axle mounted on top of the springs would give you.
Therefore this position is normally only used to raise a trailer that has a drop axle installed but more ground clearance is required.

Both of these axle positions can be used with a standard straight axle to adjust the height of your chassis. Again back to personal preference.

This is a FYI shot to demonstrate the difference in mounting positions.
The horses are on a level surface with the U-bolts sitting on the horses, this should give you an idea of the height difference.
Also note the bow in the center of the axle is up.

Tools We Use

Now we'll give you a quick introduction to the tools and equipment you should have before starting this project. Some of them are necessary, some of them are optional and some can be improvised from things you may already have around your shop/garage.

The welder, these come in all different styles from different companies.
If you plan to weld you'll need one of some sort.

Welding helmet, this is an auto darkening one but a regular shield will work just fine. One thing to keep in mind if you buy an auto dark shield, buy some extra clear cover shields and use them inside and out. Hot splatter will ruin your expensive shield.
Chipping hammer and Welpers.
Welpers are made just for MIG welders for cleaning nozzles, tips etc.
Expensive but very handy to have.

	Leather sleeves and bib.
	Green welding jacket, handy item to have and it will save you a lot of burns. Much less expensive than the leather sleeves and bib above but a little less burn proof.

	Leather welding gloves and my personal favorites, cheap leather work gloves. Here's a couple of clamps that come in real handy but I wouldn't recommend you run out looking for these ones as they are just a might expensive. The 2 you see there are about $200 for the pair.
	Angle grinders with wire cup and grinding or flapper wheels. Safety Glasses, buy them and use them!! The wire wheel cups are particularly useful for getting slag out of your welds. They are also particularly good at throwing short lengths of stiff wire at you. My grinders are Bosch and Ryobi and Metabo but for someone who doesn't use them frequently a $15 one from HF will work just fine.

	Chop saw, if you can buy or borrow one, do. It will save you a lot of work. Use a little caution when using one of these though. When cutting long pieces make sure to block the piece up level with the saw. Also use the clamp, if the piece moves while you are cutting the blade can bind and shatter, it will throw chunks everywhere. (and they hurt, trust me) Also check your backstop for square with blade, it'll save you a lot of work if your cuts are square. Pay attention to what is behind your saw also, the sparks are hot and they will catch stuff on fire!!

The Frame

The picture above shows the frame that was being built as we wrote this tutorial. Keep in mind it's just a frame, built to meet the requirements of the trailer that will be built on top of it. Your frame does not need to look like this one to work for you. Your choice of materials and the design of your trailer will determine how your frame is built.
Below we will go into detail as to where our measurements came from and how this particular design came to be.

ABOUT THE FRAME

There are a number of ways to determine the width and length of the frame you want. It is your choice depending on your profile or needs.

You can either determine the width from the inside out, or vice versa.

Want a 4'6" interior? That's what I'm building.
1. 54" interior width, full size mattress
2. Add wall thickness x 2 i.e. ¼" outside ¾" framing and ¼" inside = 1 ¼" x 2 = 2 ½" for walls
3. Add tire clearance x 2 you decide...I fit them tight 1" each side x 2 = 2"
4. Add offset of tire on wheel inside x 2 i.e. 4" from hub face to the back of the tire x 2 = 8"
5. Final dimension gives you hub face to hub face...order your axle
6. Weld perches where you want to allow for exterior wood perimeter to shoot screws into for sides.

To sum it up: 54” + 2 ½” + 2” + 8” = 66 ½” Round it up to 67” and that is your axle width hub face to hub face.

Have an axle already?
1. Take hub to hub face dimension. Ex. 72” hub face axle.
2. Subtract wheel/tire offset x 2 i.e. 4” from hub face to the back of the tire x 2 = 8”
3. Subtract wheel/tire clearance x 2. I fit them tight 1" each side x 2 = 2”
4. Subtract wall thickness x 2. i.e. ¾” walls x 2 = 1 ½” for walls
5. Final number will tell you how wide the interior can be.

Sum it up: 72” – 8” – 2” – 1 ½” = 60 ½” inside cabin, enough for a queen size mattress.

If your spring seats (or axle perches – same thing) are already welded to you axle you will need to measure the outside of the seats, this will tell you how wide the outside dimension of your frame can be. The seats should sit directly under your frame rails for the spring hangers to mount properly.
If your springs are not welded on or you have to cut them off your outside frame dimension will determine where your seats go.

Building a 4' wide?
Remember, 4' wide is the maximum outside dimension on the body, to minimize materials, so add the tire/wheel clearance + tire/wheel offset to the 48" and order your axle, hub face to hub face.

Tires and wheel combinations can vary, especially when using an automotive sized tire. Wider or low profile tires are going to require more clearance from the hub face and may cut down on your project width. Just think it all through. A narrower frame can be modified easily to accept your trailer body, a 2x wood frame perimeter can take up the extra, a frame that is too wide is much more time consuming and costly to modify, as it is all steel work.

This trailer will be built with an outer wood perimeter as it allows me to completely hide the frame and gives me some material to shoot screws into to attach the sides.

Once you have your outer perimeter laid out you need to square it up. Some pipe clamps will come in handy here. Clamp it together tight and then measure corner to corner with a tape measure. Be sure to hook the dumb end in the same spot and read the smart end from the same side as you do this or your square won't be square. You can use a framing square too but it is not as accurate as the tape method.
Another thing to keep in mind is if your side rails are bowed at all it's hard to get a good square. The solution here would be to put an x-member or 2 in the frame before you clamp the ends. That should straighten everything up pretty good so you can get it squared up.
Once you have it square (or real close) you can tack each corner. Be sure if you tack the right side you immediately tack the left side. Never tack caddy corner, you will pull things out of square. At this point you should keep your tacks to the extreme inside or outside of your joint. In either case keep them where you can easily get at them with a grinder.
Check your square now. Still square? Yes? Tack the other side of each joint. No? Well fix it! Repeat.
Now I will impart a few hard learned words of wisdom here. You know that level you are so fond of when doing your other building projects? Well get it out. If you don't get your trailer flat now it won't be flat after you weld it, ever.
At this point I usually put my frame up on horses, make sure your tacks are good first. I do it now because my horses aren't wide enough to build on. After you've got it up on your horses get your level. You are going to want to level the front and back rails. Don't bother with the side rails you'll just find yourself working way harder than you have to. Level the front and back side-to-side, use shims where necessary, now your trailer frame should be flat and, oh you did check square again right? You moved it remember.
From this point on you will want to keep your frame leveled, once it's welded it'll be a little more forgiving but not yet.
Check the square.
Add the rest of your x-members now, making sure to space them where you want them to be. Plan ahead now for a drop floor, water tank or anything else you want to put under there. Avoid putting one directly over your axle. However having one where your front spring hanger is going to go is a good idea particularly if you are using angle for your frame.
At this point you can add your tongue.

The Tongue

Installing the tongue

It is up to you to determine the total length of the tongue, and the materials you want to use. Please check with Andrews's strength charts on the materials to be used to make sure it meets your structural requirements.
Something to keep in mind is that the shorter the tongue is, the quicker it will react when backing the trailer. When I say quicker, that means, that a slight movement in the steering wheel will cause the trailer to turn quicker than you may want, causing extreme maneuvering to straighten it out. Let's just say, "practice makes perfect". This has been talked about at length about backing a trailer, so we won't go into details here. Also, if you want a tongue box, for battery, or propane tank, storage, racks for bikes, or a scooter, you may want a longer one to accommodate these options. I am building with a 4' tongue, and the plan is that in the future, a small-motorized trail bike rack can be added. A longer tongue also gives you the advantage of more room while loading the vehicle, especially important with a pick-up when the tailgate is down. On this frame, it actually measures 4'3" from the front cross member to the center of the ball. I find that this length is easier to back. I will also deck the A members with tread plate aluminum, giving a great place to set a water tank, since I don't build it in, and it looks really good. It's not uncommon to have a short tongue contribute to damage to the taillights on a tow vehicle, or worse, damage to the tear.

I used 3x2 rectangular tubing .125 in. thickness, overall length, 6'. It is very stout and can easily be used without the A members that I am adding. Again, I am thinking about future additions and am building in the structure for them now.
The tongue should be attached to the front member and into the 2nd cross member back from the front one. Some people will butt the tongue into the front member, however, more strength is gained by laying the tongue under the framing and tying it in on the 2nd member. Again, I use typical squaring methods to locate this position. Once it is in place and centered, clamp it in the 2 places where it crosses the first cross member and where it attaches to the 2nd one. I tack weld the rear first, then the front. Now if you measured right and mounted your tongue straight you should be able to hook a tape on each side of the end of the tongue and measure to the front corner of the frame and get the same measurement on both sides. If not go back and see where it's off.

At this point you will need to gusset the tongue to the frame. This can be done using any scrap material, strong enough, to prevent any twist to the tongue. I use 1/4" flat stock for the gussets, but you could probably get by with thinner material, 1/8" ought to be fine, at a minimum. Place the gussets in position, 2 on each cross member, tack weld them. After everything is tack welded, burn in the rear, front, and the gussets and the rest of the frame bottom.

Optional:

If you want the optional A members, not necessary, but I'm building them in, as I will have more weight on the tongue in the future.

I cut the A members out of 2x2x1/8" angle and tied them in just behind the coupler to the end of the 2nd cross member. These need to be cut, probably with a reciprocating saw, or a torch. The extreme angle of them will make it difficult to do them with an abrasive chop saw; I've done it, but wouldn't recommend it. Just remember, the sloppier the fit up, the more weld and clean up you are going to have to do in the end. Again, use the grinder to make the final fit up as tidy as possible. What I do at this point is tack weld them up to hold them in place, flip the frame and really burn them in on the backside. Turn the frame over, and you should only have to do a really clean weld on the top. At this point, the top weld isn't such a critical one for structural integrity, but more of a cosmetic/structural one. I burn these members in where ever steel is touching steel. At this point you're a master on welding, so they should look really pretty on the topside. That's what everyone is going to see anyway. The bulk of the strength is underneath.

A side note: I cut a low angle on the rear end of these A members, on the down leg of the angle. It just looks cleaner, hit them with the grinder, as when you are doing the running light wiring, a sharp point on them might just cut a divot on your forehead!

Install the coupler:

After you have decided on the ball size for your coupler, you need to mount it up. Keep in mind that if you have a number of other trailers, it is advisable to use the same size ball. Make sure you purchase the appropriate sized coupler end for the width of the tubing/channel, you are using for the tongue. It can either be welded up, or drill the tongue and install the coupler with grade 8 bolts. The coupler will most likely come pre-drilled. Why grade 8? Some people might not know this, but bolts are graded according to their shear strength. 8 is the toughest, 5 probably will work, if it is un-graded don't use it, as they will shear easily, and can be stripped when bolting it up. You can either use a locking nylon nut (commonly called nylocks), or lock washers and nut. The disadvantage to welding up the coupler is that if you ever screw up and bend the coupler, it will take a torch to get it off.

Install the safety chains:

Safety chains can be purchased from a lot of places. You can get them from the local hardware store, and you will need clips to attach to the hitch on the car. There are quick clips available, or

you can get the threaded couplers. What you choose is up to you, however, 1/4" link on the chain is typical. Trailer supply houses will most likely have them made up and ready to go. They will typically add chain to the length to drive up the price, but you can always cut it down. To attach them to the tongue, they can either be bolted or welded up. I prefer to use a threaded coupler, weld it to the frame and attach the chain to it. If doing this method, make sure you have the coupler threaded shut prior to welding, as the heat will distort the link and make it impossible to thread it up afterwards. You can also weld the end chain link directly to the tongue on each side, or drill and through bolt the links on the chain on both sides. If doing the latter, again, use a grade 8 bolt. I don't believe that there is any "rule of thumb" in terms of exactly where they are attached. Most importantly, make sure you have correct chain length. Too much and it will drag the ground. Too short and it will bind when you are doing some tight turning. Chains when towing, should be attached in accordance with local laws. Here in Calif., it is required that the chains be crossed (note: I believe this is nationwide now, also spring clips on your chain hooks are or will be required, they are in PA). This method will hold the tongue centered behind the tow vehicle if it were to come unattached and minimize radical movements on the trailer.

The Axle

Let's hang the axle!

At this point you have a structurally strong frame and it's time to assemble and install the running gear. You have already determined the spread on the perches/saddles when you laid out the frame. If your axle already has the perches attached, then that dimension between them has determined the width of your frame.

I set the axle on a couple of 4x4 blocks on a table and since I want a drop to it, I let the spindles hang down. This is assembled upside down. I clean off the paint on the axle where I think that the perches will fall. I measure from hub face to hub face divide by 2 and mark that spot on the axle. Take the width of your frame, I measure outside to outside, divide by 2 and measure out each side on the axle and mark. Then locate the perches and level them with a small level. Tack weld. If it is all OK and where you want it, burn it in. Since I use a gas less welder, I need to make a root pass and then another pass over that to get a good weld.
You can also mount them with the trailer upside right and the springs hung on the hangers. The mounting bolts all need to be tightened on the springs. This method can be used if your clearance is a little tight and you want to make sure your axle is centered. You hang your axle with the U-bolts loose, just snug enough to hold the axle in place. Now what you want to do is take a small square or a short straight edge, hold the edge against the hub face either in front of or behind the hub so it sticks up beyond the frame. Measure from your straight edge to the frame, now do the same on the other side of the axle. Adjust the axle till it's as near center as you can get it. Now start tightening your u-bolts in an X pattern at first, do both sides until they are fairly snug, measure while you are tightening to maintain the measurement you got earlier. When the bolts are nearly tight you can adjust the side to side by tightening either the inside or outside u-bolt. It will pull it up to a 1/8" of an inch so don't do it a lot, just enough to get you centered. Remember if your measurement is a 1/16" more or less on one side you are really only a 32nd off, no sense trying to get much closer. This method is more work than described above but is about as accurate as you can get.

Now if you just measure and weld your seats on you can still use the u-bolts to adjust the side-to-side if you are off a little bit.

Now set the springs onto the perches centering them in the hole in the bottom of the perch. Springs should droop down as you are building upside down. Set on the spring plate so that the bent portion is in line with the springs. Push the u-bolts from the backside of the axle through the spring backing plate and install lock washers and nuts. Snug down the bolts but don't torque.
Depending on where and when you get your u-bolt kit, they may or may not have lock washers with them. A lot are coming with washer nuts like these.

Seems the lock washers are smashing too much under the stress or splitting and breaking apart when they are installed, allowing for the u-bolts to loosen later on.

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Install the front spring hanger on the spring. I've always heard that the front of the spring is the portion that doesn't have the clip holding the leaves together. Hang the front hanger using the appropriate bolt, nylon or bronze bushing and nut. I don't tighten them up at all at this point, the bolt and bushing will get you what you need, finger tighten the nut.

Spring hangers, left side is front hanger, right side with nylon bushing is rear hanger.

Spring hanger installed on end of spring, in this photo the hanger is already welded to the frame.

Measure and mark the frame where you are wanting to install the axle. **This was determined by using Andrews's calculation. I use about 43" from the rear for my axle location, it's worked for me and my tongue weight always works out fine.** Set the assembled axle onto the frame to that the front spring hangers sit directly on the tubing. Clamp them to hold the assembly in place while you check some dimensions.
***

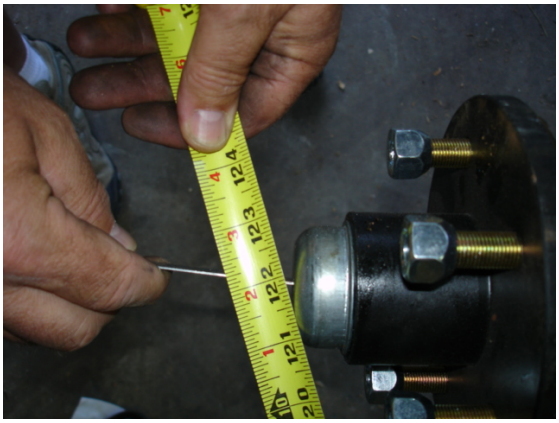
Note: Andrew's Calculations for Axle Positioning Explained More Fully
Andrew has a formula for figuring out the distance back your axle should facilitate, tongue weight, fender position and door opening issues for your Teardrop.

Andrew explains his rule of thumb for axle placement:
"My simplest rule of thumb is to put the axle between 35% and 40% of the frame length from the back – so 36" on an 8ft frame is bang in the middle at 37.5%! You can go as far forward as 45% of the frame length, but only if you have a light galley and intend to fit a heavy tongue box."

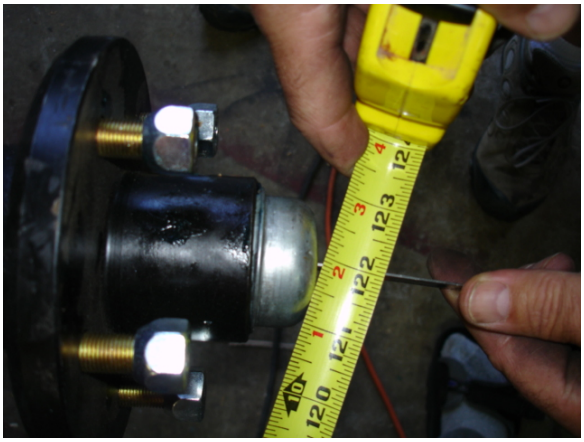
Andrew's formula to facilitate door clearance & accommodate tongue weight
Where should the axle be put on my trailer?

Either by using an assistant or in my case I drill a small hole in the center of the tongue at the very end and install a sheet metal screw. . I measure from the furthest point on the tongue to the center of the axle hub. You can remove the hubs if you want and measure to the center of the stub, but I've had good luck just using the cap. Also if you remove the hub and drop the axle, you run the risk of dinging up the threads on the end of the axle. What you want to achieve at this point is that you get the axle centered in the frame. When the distance from each hub end to the tongue is equal it is centered. I make the adjustments with a ball peen hammer. Tapping it forward and back. A true centered axle will minimize tire wear and will track true behind the tow vehicle. As a double check I measure from the hub faces to the frame on each side also. That way I know that I have the axle centered from side to side, in case I'm off when I bolted the axle to the springs.


Checking right side


Checking right side

 Checking left side

 Checking the left side

After you get it all squared up, firmly clamp the front spring hangers to the frame. Double-check the axle alignment. The front and rear of the spring should be falling directly on the frame members, both centers of the hubs should be exactly the same dimension in relation to the tip of the tongue, and the hub to hub measurement should be centered over the width of the frame. Then tack weld the hangers to the frame. Check your measurement again and do the final weld.

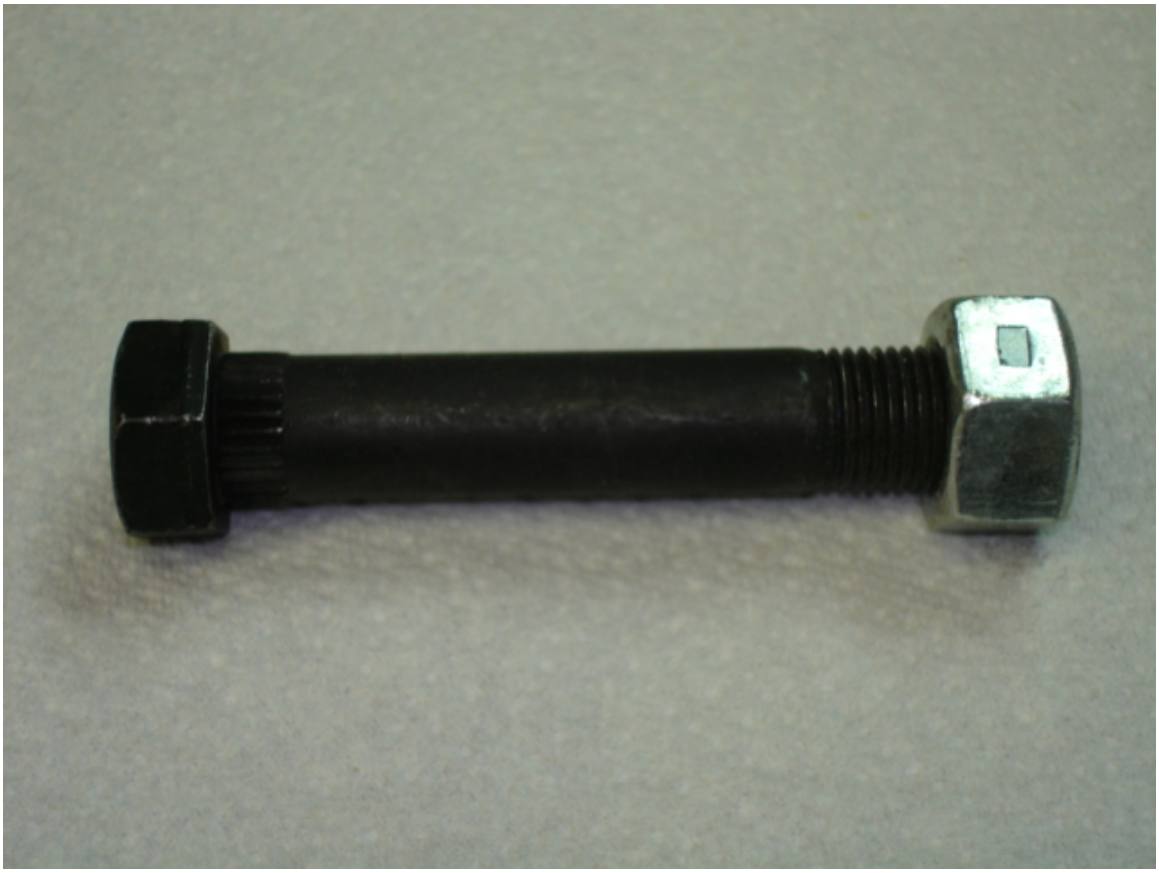
Here again I'll throw in my 2 cents worth.
If you built your frame nice and square and got the tongue on straight there is a simple way to mount your hangers. First determine where your axle goes as stated above then measure back from the front of the frame to the front of one of your front hangers. Measure back the same distance on the other side; your axle should now be straight. Most spring hangers are made so close to the same that measuring down the frame rails should get you within 1/16" of square, which is more than close enough.
After you have them tacked in place you can check them as explained above.

Now assemble the rear shackles. Make sure to install the nylon bushings. Lift the rear of the axle and spring assembly and position the hangers so that the shackles have approx. 5-10 degrees of back angle to them. This will allow the springs to always move to the rear of the trailer as they flex.

I will add here that I have always mounted my shackles angled the other way so the hanger is just behind the spring, this way even if it's overloaded it shouldn't allow the spring to drop all the way and get stuck. I will admit that even after building and repairing 100's of trailers I've never seen any proof that either way is better than the other. Even straight up and down will work just fine.
If using a slipper type spring setup be sure you allow yourself some extra slip room in the hanger so that when you jack the trailer up, the slipper doesn't want to fall out of the hanger. Position the eye bracket on the frame so that both sides have the same angle in the shackles. Firmly clamp the brackets to the frame. Now unbolt the shackles and remove the nylon bushings. This step isn't necessary if you have a bronze bushing, but the nylon will melt when you weld it up.
Weld the brackets to the frame.

At this point, the axle is installed and all you need to do is do the final bolt up on it. Install all the nylon bushings, 1 on each end of the spring, and 1 in the rear eye that is welded to the frame.

When installing the bolts please note that there are a variety of bolts available. Some will have a shoulder on them, some will be splined, and some may have grease fittings on them. The nuts typically are self-locking type.



Please note that I am using the splined shaft bolt. Stamped mark on the nut is the self-locking stamp.

I put the bolts in from the outside in, so that the nuts fall on the inside. I think it's a good idea to protect the threads as much as possible, and installing them this way keeps them away from rocks thrown off the tires, especially if you are using the bolts with the grease fittings on them. The bolts need to be tapped into the hangers on the front and the shackles on the rear so that the spline works its way into the metal. Once it starts, you can tighten them up and seat them completely. If using a shouldered bolt, it should be torqued to 30ft/lbs min. to 50 ft/lbs max as per Dexter handbook. On a splined bolt, I seat them completely, then, back the nut off enough so that I can get good movement on the springs. If you have air and a ½" impact gun you can spin the nuts on and pull the splines in until there is about a 1/16" gap between the bolt head and the shackle/hanger then smack the head with a heavy hammer, that will give you your gap for your spring movement. Remember, the springs should be allowed to flex within the hanger assembly, so they will need to swing on the shackles and pivot on the front hanger. Failure to do so will basically give you no suspension.

At this point you've got the frame built, tongue installed, and axle hung in it. I build in other options, as they are a lot easier to do at this point rather than when the tear is finished. These other options will be covered in the next chapter

Stabilizer Jacks

There are a number of options available for stabilizer jacks. I prefer the Atwood brand for their retractability. They also come in a couple of different lengths depending on the height of your tear. I use the short ones. They tuck completely under the tear. Coleman and Fleetwood have used these jacks for years and I've had good luck with them. Another option is to use a screw jack. The advantage to the screw jack is that it provides more lifting power than the Atwood and you can use it to change the tire on the tear if need be. Just remember to keep the handle with you at all times, as it's a drag trying to run a jack like that up without the appropriate tool. Same thing with the Atwoods, get the appropriate handle, too small and it will distort the lifting holes and cause the jack to bind up if you tweak them out of shape. Please search for different threads concerning the stabilizers. Everyone has his or her preference.

I install 2 pieces of 1"x 1/8" angle on a 45-degree corner on the rear of the tear. This strengthens the corner as well as supports the jack. These stabilizers can be either welded to the frame, or bolted up. Since access is going to be difficult later, I weld a couple of nuts to the angles; drill a hole through the angle and then bolt up the jack to the angle. I also use locktite on the bolts.

Want a tongue wheel?

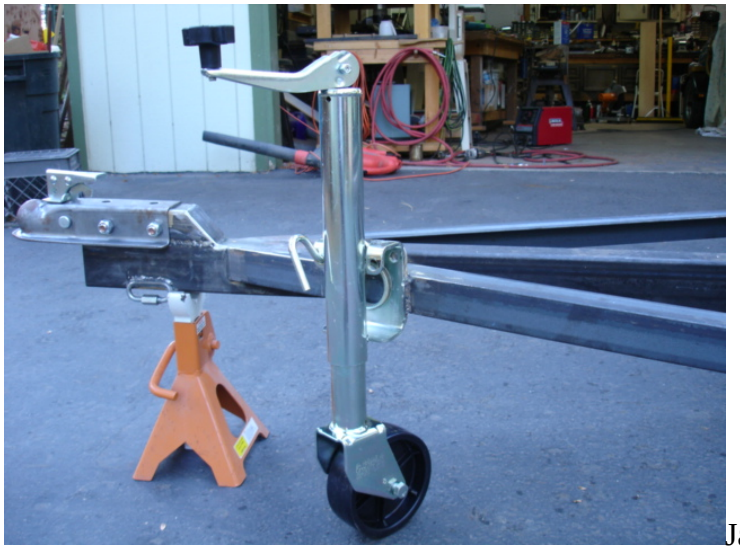
If you have moved a tear around without one on uneven ground, you'll probably want one. All in all, it's just more convenient when hitching one up, storage and just moving around, besides, after a couple of trips to the Chiropractor, it's cheaper.

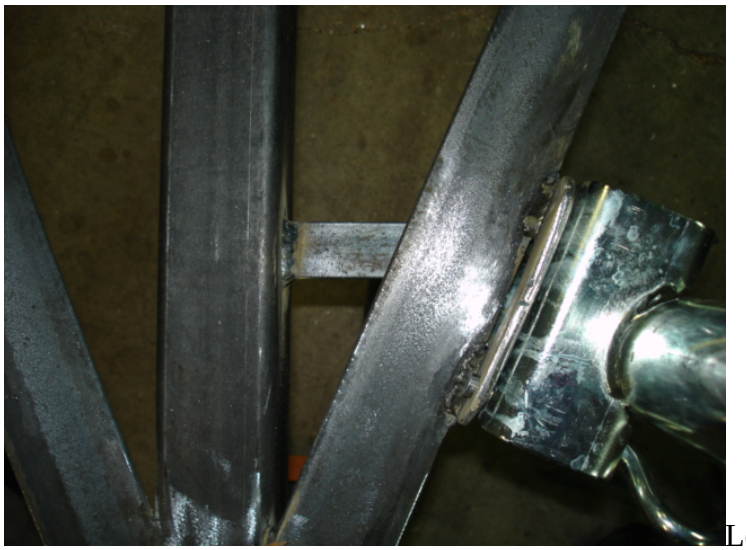
There are a variety of tongue wheel/jacks available. Some are swing aways some are fixed vertical with detachable wheel. I prefer the swing away and feel that it is the most user friendly, opinions may vary. I use about the lightest ones I can find, typically rated for 500-600 pounds. The tongue weight on the tear isn't that much so this jack can handle the weight with no problems. You also need to consider the length of the jack too, yep, they come in different lengths. Knowing your approximate tongue height when you buy the jack will save you taking it back because it's either too long or too short. A couple of things to consider are first the height of your tongue. You don't want a jack that you have to put blocks under to get it off of your ball, you also don't want one that you have to lift the trailer to get the jack to swing down, this one really sucks. You also want to consider where you are going to mount the jack. If you want it on the straight part of the tongue you need to make sure it will come up past you're A-frame if you

went that route. If you want to mount it on the A brace you should really brace it like it is shown below.
The closer you get the tongue wheel to the coupler, the more stable the trailer will be, and at least it will be on an A-framed tongue. I retract the jack completely and roughly position it as far up the tongue A-member as I can. You don't want to get it so far however that the handle gets into the way of the operation of the coupler or so far forward that it hits when you are backing up the trailer in a turn however.

Typically they come with bolt up mounts for the lighter ones but the weld on ones are common too. I prefer a cleaner install, so will remove the mounting plate from the jack body, with the help of some C-ring pliers and cut the plate down. Clean up the mounting plate with a grinder and weld the plate to the A-member. The weld on mounting plates can sometimes be purchased from trailer parts suppliers but you need to make sure the hole is the same size.
Since the wheel isn't directly centered on the tongue, and the fact that angle used in the A member may want to twist, I weld up a small stub of iron to stiffen the angle. This will assure that the jack will remain vertical when wheeling it across rough terrain. Remember, the higher you raise the tear when moving it, the more torque will be put on the jack and excessive height combined with a large rock or obstacle could damage the jack. I usually keep it down low when moving it on the ground.


Jack in folded position


Jack in upright position.


Leg stiffener for jack

Other options

Now is the time to consider any other options that you may want to install on the frame. It's just a lot easier to do it all now than trying to weld it all up later and cook off the paint and worry about burning the tear.

Side table bracket

I use side table brackets that attach under the frame of the tear. I like this option as I can hide all the brackets and not have anything hanging on the side of the tear. Also by installing one on each side, I can move the table from side to side. It can also rotate 90 degrees and has adjustable height. Again, this is just what I do; others may not care for this type of table. IMPORTANT: If you do this type table, make sure that you get the appropriate sized tubing so that the table leg

will slip into the socket you have welded up. It should fit tightly and have no free play in it. If it does, you won't be happy with it and the table will lose a lot of stability.

I cut a couple of pieces of the larger tubing to about 5" in length. Then drill a couple of holes about 5/8" in diameter through 1 side. Weld a ½" nut over the hole, making sure you get the nut centered over the hole. I do this by running a bolt through the nut, and then push down on the bolt to hold the nut in place while I weld it up.

I then position the bracket to the underneath side of the frame wherever you want your table. Weld up the bracket. I then take the bolt that I used to center the nut, typically something like a 1" long bolt, and weld a small piece of flat stock to the head on the bolt. What you want to do is basically make your own large sized wing nut. The wing will allow you to either tighten it by hand or use a wrench on the bolt head.

Side table socket welded in place.

Hidden light brackets

In addition to the sidelights that I have on the tear, I also put a set of LED's underneath as a backup set. I weld up a couple of tabs to each side as far out as possible, and a bracket in the center that will have 3 LED's on it as a running light. The advantage to this is that it does give you some extra visibility at all times, and I have 2 right turns and brakes on each side. Tucked under the frame like this on a welded bracket gives a lot of protection to the light, and when looking at the tear from walking around it, they can't be seen. When following from behind however, there is a lot of illumination.

I make them out of a piece of 1 ½" x 1/8" flat strap. I just cut a 45-degree angle on each end, round the points with a grinder and weld them to the bottom of the 2x2 tube.