

Building a Custom Motorcycle – Dry Build

Building a custom motorcycle may seem daunting to a virgin builder. What to do first, second, third etc, etc. This document covers the first and most important stage and is a very brief introduction to getting started. It assumes you have decided on a design, have the necessary finances, made your choice of parts, have all the correct tools and secured a dry and safe environment in which to build your bike. This brief is based on a bike involving the least amount of fabrication and the assumption you will get help with welding, machining, electrical wiring and painting. This brief also omits much detail.

Dry Build

This is the most important stage when building your dream custom motorcycle.

This is when you make your first parts purchases with the aim of:

- Bolting frame to forks and wheels and suspension
- Welding any brackets onto frame and swingarm for brakes, gas tank, oil tank, kickstand, and exhaust system. You can't do any welding or frame mods after painting.
- Installing engine, transmission, primary along with carb and air cleaner and exhaust. This is to ensure all these parts fit, drive train lines up and the engine works. If you don't ensure the engine and drivetrain is set up, you don't want to experience having to remove and repair any of these items after the paint job has been completed. At this stage it would be advisable to start the motor and run it for a few minutes. This is not a must do thing, if you don't have the facilities.
- this should include everything you need to do prior to painting and final assembly including wiring
- Get it right at this stage will save you both time and money!

Summary of what to do

1. front and rear wheel aligned
2. engine and transmission aligned
3. transmission and rear wheel pulley/sprocket aligned
4. buy the correct parts and make/buy the correct spacers to ensure alignment
5. Make mounting tabs and weld these to frame/swingarm
6. Failure to do this means your bike wont work!
7. mount starter motor with oil tank in place
8. mount seat, fenders, gas tank and oil tank
9. check riding position

Frame choice

Whatever your choice of frame with whatever rake, top tube stretch or neck height you choose

- Check out if the engine is offset
- Check out what rear tyre and rim widths can be accommodated
- Check out if Primary has to be offset and by how much
- Check out if transmission has to be offset
- Check out if an offset transmission pulley/chain sprocket is needed

Check out these details before you buy frame. Ensure your chosen tyre size both front and rear can be accommodated and these tyres are available to buy. Whatever tyre you may see listed does not mean it will be on sale as manufacturers can suddenly decide to stop making it and replace(or not) it with another. Having an offset engine/primary/transmission will alter the riding balance and reducing the offset will reduce this affect. Choose the right combination of parts to allow for this. Right side drive is useful for wide tyre bikes because the engine remains central and no offset is required for the primary or transmission. Any offset components can mean additional cost – something to bear in mind during budgeting! All these parts have to work together and you will have to plan all this out and select the appropriate parts before you order the frame. The information below assumes you have purchased the right combination of frame/tyres/wheels/primary with any necessary offsets. If you are not sure, then stop, think, re-plan and avoid an expensive cock-up.

Initial Dry Build Parts List

Frame and swingarm

Headstock neck cups and bearings (some frames have integral neck cups)

Swingarm pivot, pivot bearings and nuts

Rear suspension

Rear wheel axle. Rear disc/rotor. Rear calliper and mounting bracket

Rear belt pulley and belt or chain sprocket and chain. Buy the longest standard chain. Check with frame builder what pulley size/belt length is required

Rear wheel and tyre

Rear fender, belt or chain guard. Sissy bar if used.

Seat. Front forks. Front fender

Front brake caliper and mounting bracket

Front wheel, tyre and disc spacer

Oil tank. Gas tank

Engine. Ignition, charging system, regulator, motor mount and coil mount

Primary transmission and transmission mounting plate. Some frames have integral transmission plates.
Transmission

Mounting Tyres

Take the wheels and tyres to a tyre fitter with tyre fitting machine that mounts the tyre without applying any marks to the wheel. You may have to look for such a service, but it is worthwhile. It might be possible to have the tyres mounted by the wheel supplier.

Front forks and wheel axle

Determine fork length only after the rear wheel has been mounted in the frame/swing arm.

Fender and brake caliper mounts

Front wheel and tyre

Front disc/rotor

Correct Fork Length

- Mount swingarm and install rear wheel(with inflated tyre)
- Install neck cups.
- Jack up the frame and use a builder's spirit level to ensure bottom frame tubes are horizontal.
- Measure vertical height from headstock neck cups to the ground
- Measure the diameter of front wheel(with inflated tyre)
- Use the rake of the frame along with these other measurements to ascertain the correct fork length and rake of triple trees. You may need to have increased rake triple trees to ensure you maintain correct trail for safe riding

Measurements can be given to fork supplier, who will accurately work out the correct fork length and advise on triple tree rake..

Spacers

You will need accurate measuring instruments such as vernier calliper and engineers ruler

You will need to make the following

- Front wheel axle spacers. You will need two, one for each side of the wheel between the wheel hub and the fork leg. A disc spacer may be needed to space the disc out. Standard size disc spacers are often available
- Fender spacers. Take measurements. Most of the big catalogues have a selection of fender spacers to choose from or you may have to have some machined up.
- Rear wheel axle spacers. You will need two, one for each side. A disc spacer and pulley or sprocket spacer will also be needed.
- If you are using a transmission chain sprocket for chain drive in place of a belt, you may need an offset sprocket. Measure any offset and source the correct sprocket from suppliers. This may not be possible and be prepared to have a spacer machined to allow the correct alignment

Frame Tabs

You will need to obtain or make various tabs or brackets to weld to the frame and swing arm. Some frames come with some or all tabs already welded and some frame manufacturers offer the option to have tabs welded on during the frame manufacturing process. Check this out during the ordering process. The following tabs will be needed

- Gas tank
- Oil tank
- Mounting point for rear brake anchor
- Rear fender
- Sissy bar
- Chain or belt guard
- Anchor point for rear pulley/disc or sprocket disc
- Electrical relay
- regulator
- seat
- oil and brake line guides/supports
- Any other

After the rolling chassis has been assembled along with the engine/transmission/primary

- Mount and centre the front wheel along with disc. Take measurements for axle spacers, have them machined and installed
- Mount fender, measure for fender spacers and install
- Mount calliper on forks and line up onto disc. If disc spacer is needed, measure up, obtain/machine, install and line up calliper with disc. If the correct disc spacer is absent measure for disc spacer and install. You can usually buy calliper shims to enable accurate lining up of calliper and disc
- Jack the rear frame up to allow rear wheel to spin round when installed
- Mount rear wheel along with disc, pulley, brake calliper. Put long pulley mounting bolts
- Centre the rear wheel by lining up with front wheel. Note that if the rear wheel has to be slightly offset, you will also have to offset the fender
- Put the final drive belt on and get the belt to be free running. You should then be able to measure the axle, pulley and disc spacers.
- Install all spacers, check alignment of final drive and brake calliper/disc and modify if required

- Obtain or make all frame tabs and weld on. Use good quality mig or tig welding. When mounting the gas and oil tanks ensure they are both rubber mounted. The gas tank must be mounted in such a way to avoid any unnecessary strain on the gas tank mounting points as this can cause them to break later. Any re-welding later may require tank to be expensively re-painted.
- Now is the time to make a steel or fibre glass seat base, plus any welded tabs to secure it to the frame. Covering the seat can come later
- Riding position. With seat base mounted, put some temporary padding on it if permanent cover is not yet in place. With riser, handlebars and forward controls bolted on, sit on the bike to see if riding position is comfortable. With a friend to help take measurements to allow the risers/bars to be changed if necessary.

Frame Modifications

If you need to cut/weld parts of the frame to provide clearances for any feature that needs to appear on the finished bike, now is the time to do this. This brings to mind someone I know who never tried to fit the starter motor during the dry build and after the frame had been painted he discovered the starter motor fouled the frame tubes. He then had to strip the bike and blast the paint off, modify the frame, repaint and rebuild it causing frustration, cursing and of course the additional unplanned costs.

Nuts and Bolts and Washers

With the dry build complete and just before you pull the bike apart to send all the relevant bits to the painter, go round the bike and list all the nuts/bolt/washers you will need to complete the build. This is the best time and the last time to do this before you get all the painted parts back and you complete the final assembly. The final assembly will go smoothly now that you have all the parts you need.

Mistakes to avoid

These are just two expensive examples of what not to do.



This bike was taken through the dry build stage without checking that the engine/transmission/starter could be mounted into frame. Picture on the left shows the starter touching the frame and not mounting correctly. Solution was to strip bike apart, strip the paint off, modify the vertical frame tube, repaint and rebuild the bike. Expensive!



No frame stops had been made for the frame so that every time the fork stops hit the frame tube, the paint would be damaged. Solution was a total strip down, modification and rebuild and repaint. Expensive!

Plan it correctly and get it right first time!!

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