First Edition

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Glossary of Terms Commonly Found in Buggy Plans

- **Ø** Diameter
- **2D** Two Dimensional
- **3D** Three Dimensional
- **Ass'y** Assembly of Parts
- **CAD** Computer Aided Design
- **Chamfer** Beveled Edge
- **CL** Center Line
- **CNC** Computer Numeric Code
- **DIA** Diameter
- **DOM** Drawn Over Mandrel
- **.DXF** Drawing Exchange Format (Generic 2D CAD File)
- **ERW** Electric Resistance Welded
- **Fillet** Radius Edge (Curved Edge)
- **i.d.** Inside Diameter
- **IGES** Initial Graphics Exchange Specifications (Generic 3D CAD File)
- **In** Units of Measurement in Fractional Inches
- **Marry** Join parts, weldments or assemblies together
- **MDF** Medium Density Fibreboard
- **mm** Units of Measurement in Millimeters
- **o.d.** Outside Diameter
- **R** Radius
- **SHCS** Socket Head Cap Screw
- **.STEP** Standard for the Exchange of Product
- **THRU** Through
- **TYP.** Typical
- **UNC** Unified National Course Thread
- **UNF** Unified National Fine Thread
- **Wall** Thickness of tube or pipe
- **Weldment** A series of welded parts

Any terms or phrases contained in this drawing package that are unclear can also be looked up on www.wikipedia.org

Introduction

Welcome to the world of Badland Buggy, your number one source for premium off-road vehicle construction plans.

Thank you for purchasing this construction plan set. This booklet was developed over several years of feedback from our customers located all over the world. We use the feedback we receive from our customers to refine our plans to make them easier to construct by the average home buggy builder, just like yourself.

This booklet is divided into sections. Each section starts with its own material list followed by a series of step by step drawings, which should easily guide you through the whole process of fabricating a top quality off-road vehicle at home with a minimal amount of tools.

Each drawing can be easily identified with a unique "drawing number" located in the bottom right hand corner of the drawings title sheet. This drawing number will be useful when you label or identify your own parts at home.

Getting Started

Like any sports coach would tell you, a good game plan is the key to success. Start your buggy project correctly by first establishing a game plan. Think about the project as a whole then divide it down into manageable tasks, which will fit your budget & time schedule.

A sports team usually practices their skills in preparation for the big game. You may need to practice too. Ever MIG weld before? Yes? Great! Get a few practice welds in before you jump right into the final welding of your buggy. Never MIG weld before? No problem. Take a welding course or have a friend show you how to weld. Remember the old saying – practice makes perfect.

Establish your budget. How much do you want to spend? How much do you want to build yourself? How long do you want this project to take? What do you want to spend on the engine?

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Badland Buggy
info@badlandbuggy.com
1-780-298-1098
www.badlandbuggy.com

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Tools

We have listed examples of some of the core tools you will need to successfully fabricate your buggy. You will also need all of the appropriate mechanics tools; wrenches, sockets, pliers, etc.

Tubing/Piping Notcher

Part #HSN-500
www.pro-tools.com

This tool is required if you want to have tight fitting tube joints.

It consists of a T-handled clamp, which holds the tubing in place while you cut a semi-circle profile with a bi-metal hole saw.

An electric drill is attached to the end of the shaft holding the hole saw.

The tube notcher can be clamped or bolted to a tabletop or secured using a bench vise. You can also rotate the T-handle clamp assembly at different angles to create compound or angular profiles on the ends of your tubing.

Bi-Metal Hole Saw

The bi-metal hole saw is affixed to the end of the shaft of a tube/pipe notcher.

It is plunged through the tube to create a semi-circle profile for fitting one round tube to another round tube.

MIG Welder

MIG welding is probably the easiest & fastest welding process to learn.

MIG stands for Metal Inert Gas welding. We suggest 0.030" solid core wire & a mixture of CO2/Argon shielding gas.

Tube/Pipe Bender

Part # Model – 105
www.pro-tools.com

A tube bender is used to create the radius bends

The procedures involved in bending tubing accurately using this model of tube bender. You can use just about any other make or model of tube bender.

Bending Die

www.pro-tools.com

We suggest a 5” centerline radius in the die.

Consult with the tube bender manufacturer for the correct size of bending die suited to the outside diameter and was thickness of tubing.

Abrasive Cut-Off Saw

The cut-off saw used an abrasive circular disc to cut through steel.

Be sure to wear hearing, eye & hand protection when using this tool.

Metal Band Saw

Though not essential, a metal cutting band saw will increase your productivity & drastically reduce the harmful dust generated from cutting steel with other tools while also minimizing your material waste.

Bench Grinder

This commonly used tool will help you debur metal filings from the ends of your round tubes plus 1000+ more uses.

We like to attach a wire brush wheel to one side which helps in removing mill scale from round tubes prior to welding.

Drill Press

A drill press is the best tool to achieve the roundest holes in metal while making your drill bits last longer when compared to just using a hand operated drill. You will also require a variety of sizes of metal cutting drill bits. Cobalt or titanium bits work best & last the longest when drilling into metal.

Air Compressor & Air Tools

Again, not an essential tool, the air compressor & a variety of air tools will greatly improve the overall productivity in your shop by making repetitive tasks faster.

C-Clamps & Other Clamping Devises

You can never have too many clamping devices. As a general rule, it's always better to clamp a part that to attempt to hold it with your hands. Make sure you always have a variety of metal c-clamps, bar clamps, vise grips, drilling clamps, etc. on hand.

Personal Protection Equipment

Nothing is more important than your personal safety. Protect your eyes with appropriate safety glasses or full-face shields. Use hearing protection with all tools. Protect your hands with leather palmed gloves when handling freshly but metal and/or hot steel to avoid burns and cuts. Keep a first aid kit & fire extinguisher readily available in your work area. Think & work safely.

Measuring Devices

Measure twice – cut once. It's an old saying but one that is still true. Use the appropriate measuring tools for the right job. Machined surfaces require different measuring tools than other parts.

How to Bend Round Tubes

The successful & accurate bending of the round tubes for the chassis frame is an important step in the construction of off-road vehicles. This section will show you methods we have used to successfully fabricate vehicles. The methods shown are intended only as a guide for the home buggy builder who has little or no experience with bending round tubes.

The methods shown are also based on using a rotary drawn type tubing bending (Pro-Tools Model #105 www.pro-tools.com)

First you must obviously purchase your chassis steel. We have found it is best if you keep the original lengths of round tubes to optimize your cut lengths & reduce your waste. Most steel suppliers will provide either 20' (6.1m) or 24' (7.3m) lengths of steel tubing.

Once you have your steel ready, consider how to optimize your steel with the minimal amount of waste. To do this, we typically start with the longest cut lengths first & then you have shorter cut lengths remaining for other phases of your project.

If you have never bent round tubing before, we recommend you purchase one additional length of tube to use for practice bends prior to bending the final members.

Templates & Cut Lengths

Before bending any round tubes, you will need a "template" to compare your bent tube with. Purchase a 4'x8' (1.2m x 2.4m) sheet of plywood or medium density fibreboard (MDF) to draw your full scale bending templates on.

Carefully draw all of the bent tubes in full scale on the template board.

Next, prepare the slightly over sized cut length of all the tubes, as detailed in the Chassis section. These cut lengths are slightly longer than necessary & will be trimmed to length later. Each tube should now be clearly labeled with a unique tube number.

Marking the Cut Lengths

You need to place markings on the cut length of round tube to identify 3 key pieces of information:

1. Start of bend
2. Direction of bend
3. Angle of bend

The following photo shows an example of these markings on a round tube.

Using the Bender

The next step is to insert the marked tube into the bender. Align the start line with the end of the bending.

Illustration #1

Lubricate the backing block using white lithium grease only. This allows for easier removal of the bent tube & helps prevent scarring on the follower block.

Illustration #2

Insert the backing block into the bender & lock it in position using the round dowel pin.

Illustration #3

The backing block must sit snugly against the round tube. Use a wrench to tighten the bolt, which places pressure against the tube & the bending die. Tighten until all slack is taken out of bolt.

Illustration #4

Install the U shaped collar & pin.

Illustration #5

Insert the pin to lock the bending die to the bender's rotating arm.

Illustration #6

Set the degree pointer to 0 degrees.

Illustration #7

Bend the tube to the desired angle. You can use either a mechanical operated bender with a handle or a hydraulic type bender as shown here.

Illustration #8

Remove the tube from the bender. Clean off the white lithium grease & check the tube against the template.

Illustration #9

If the bend angle is slightly off when compared with the template then simply use an acetylene torch to apply heat to the bend.

Illustration #10

Once the tube is red hot, apply force in the direction you wish to make the slight chance in bend angle. Remove & recheck against the template.

Illustration #11

Use the template to mark the final cut lengths of each of the bent tube. Debur the ends. If required, notch the ends to fit the chassis framing.