

surface that prevents rust. I put a section of tunnel from a 68 VW floorpan into this solution to soak for several hours but the results weren't that encouraging, especially given that it would be practically impossible to dip an entire floorpan. On bar and sheet metal, however, it worked really well, and did everything that it claimed.

On to paint. Let's face it, most of the standard processes of cellulose and two-pack paints chip and scratch easily. Por 15 from the USA – a rust convertor and protective coating – gets great reports from many sources. I read on the Volkszone forum that a guy left his newly-painted chassis outside for a British winter and from his window could report that it was staying rust-free. I have used it to paint the underside of my 1967 split screen camper van. I had spent weeks wire brushing the underside and was ready to go. I had overalls done up to the neck, rubber gloves, mask, and a clear visor to protect myself from this evil liquid. The instructions say to pour out only enough to use in twenty minutes, so I three-quarter filled a cleaned vending machine coffee cup that I could throw away. (Many thanks to my wife who retrieved the used coffee cups from the trash at her workplace.) I worked quite quickly because this paint is not cheap. I did, however, give the underside a fairly good coating. It was summertime and,

due to my nervous painting frenzy, I was sweating like a comedian doing his first gig in a northern club. Time went by and, although I couldn't get to my watch, simply knew that much more than twenty minutes had passed. An hour and three quarters later, I finished the cup of paint, after covering a far bigger area than I had intended, and losing a lot of weight. The brush was a write-off and I had black specs everywhere. This paint covers really well and requires far less than other products. I had to lose the visor for the next session, so, of course, got black specs on my face: not a good look for the lecture that I was due to give the following day. The instructions say that the paint must be allowed to wear off but I found that a wet shave does the job.

Por 15 produces a strong film that needs to stick to the metal, so good preparation is essential. My only concern is that should water be able to penetrate anywhere, it would sit between the paint film and the metal and go about its nasty, rusty business undetected.

Cavities are best treated with a Waxoil-type preparation. On all of the rusty heaps that I've worked on, there has been an area contaminated with oil from the engine, gearbox or leaky differential. Road dust amalgamates with the oil and forms a protective film which, once cleaned off, revealed a pristine section of car which made the surrounding rusty areas look even worse. Follow the instructions on the tin which recommend that treatment takes place on a hot day so that it can run into all those little corners where thicker fluids can only dream of going. I guess we'll just have to make do with a warm workshop here in the UK!

*ON A SUNNY DAY TAKE THE FLOORPAN OUTSIDE AS THIS IS THE BEST PLACE TO WIRE BRUSH OFF THE SURFACE RUST.*

*ABOVE: NEWLY RUSTED METAL  
CLEANS REALLY WELL WITH POR 15.*



## GENERAL INFORMATION

This chapter takes a look at the options for shortening a floorpan, using methods that range from the straight cut to a beautifully engineered process based on the late 1960s method developed by Volkswagenwerks.

First, let's look at some basic information and techniques that apply to all of the processes.

Whilst those who carry out chassis work on a frequent basis will have a level floor and a jig to work on, those of us who are doing this as a one-off exercise will probably carry out the work with the floorpan supported on axle stands and on the only floor that we have. I have included an illustration of my version of the Volkswagenwerk jig for those who are interested. Raising the assembly on axle stands eliminates any movement by the suspension that would lead to misalignment. Axle stands are inexpensive today; you will need more than four of matching height.

### START FROM HERE

It is necessary to establish some datum points that you can refer to in order to check measurements and alignment, and to ensure the donor chassis is straight in the first place. Luckily, the Beetle suspension has torsion bar tubes at the front and cast body mounts at the rear, which are appropriate points from which to measure.

We must assume that these points were accurate when the chassis was built at Volkswagen factory, since one affects the steering geometry and both secure and dictate the position of the body in relation to the chassis floorpan. There are, of course, other locations from which to measure as either primary datum points or for double-checking measurements. The handbrake bracket is another popular point from which to begin the measuring procedure, and features in all of the methods detailed here.

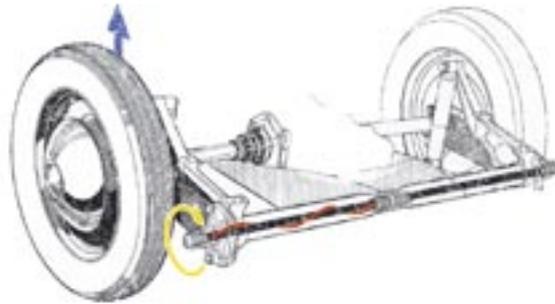
*OPPOSITE PAGE: BRUCE MEYERS' ORIGINAL ILLUSTRATION FOR SHORTENING THE BEETLE FLOORPAN.*

*BELOW: ALUMINIUM ANGLE BOLTED TO THE SUSPENSION AND BODY MOUNTING POINTS TO ALLOW CHECKS FOR LEVEL.*



## Chapter 14

### REAR SUSPENSION



At first glance the Beetle's rear suspension may look like a fairly simple system, but a lot of forces are at work there. Let's sort out some terminology and look at the components.

All Beetles have torsion bar rear suspension. This consists of two solid circular cross section torsion bars which are splined at both ends. They live in a single tubular housing that runs across the rear of the floorpan. The torsion bars are secured at the inner end by fitting into a splined socket. Early beetles (up to around 1957), had long torsion bars (approximately  $24\frac{11}{16}$ in/62.7cm) which give a less aggressive suspension action. These were followed by shorter torsion bars (approximately  $21\frac{3}{4}$ in/55.25cm). Volkswagen returned to the longer torsion bar for the final Beetle rear suspension design. The two types can be easily identified by the fact that the short version does not protrude much beyond the end of the torsion bar tube housing, whereas the longer bars protrude through the spring plate location cover by some 3in (75mm). Situated on the splines at the outer end of each torsion bar are the spring plates. These are located by rubber bushes that allow them to pivot on the torsion bar, thus transmitting the vertical movement of the wheel to the torsion bar. As the rear end of the spring plate rises due to vertical wheel movement, it twists the torsion bar and thus supplies the springing effect needed for suspension. So far, so good. This element of the suspension set-up is common to all Beetles. The components that fix to it, however, can be subdivided, and we need to identify the two main types of rear suspension. Whilst technically both types are independent rear suspension (IRS), in the quirky world of the VW enthusiast the earlier system is known as *swing axle suspension* and the later as *IRS*.

#### SWING AXLE SUSPENSION

The main design difference between swing axle and IRS is



BELOW & MIDDLE: HANGING PEDAL ASSEMBLY FOR CLUTCH AND BRAKE.

BOTTOM: AN HYDRAULIC HANDBRAKE FOR THIS SAND RAIL.

BOTTOM RIGHT: IT DOESN'T HAVE TO BE AN AFTERMARKET ASSEMBLY. THIS ONE CAME FROM A CITROËN DONOR VEHICLE.



to rust. Given that a large number of buggies will sit in the garage for a big part of the year, and probably the damp months, using a standard brake fluid that absorbs moisture from the atmosphere is not a good idea. When it's time to bring the vehicle out of hibernation it is entirely possible that a brake will be seized on, or the master cylinder stuck, resulting in unnecessary maintenance. Synthetic brake fluid is expensive compared to the regular kind, but doesn't absorb moisture and doesn't stop working under constant hard braking. It can be left in the system for extended periods, unlike standard fluid, which should be bled through and replaced. Many brake fluids are inflammable; more of a problem on cars that have reservoirs positioned over the exhaust system, as in an accident there could be a fire. Why risk it?

I have often wondered if brake pipe fitted to road cars is specially chosen to rust so that it can generate work for garages in later years, especially when non-corroding



alternatives are readily and cheaply available. Copper pipe is easy to bend and flare but will not corrode like steel pipe. It has a burst pressure more than twice that required for brake hoses. Copper nickel isn't as easy to bend as copper but makes nicer bends when a bending tool is used. It also has a much higher burst pressure than copper.

Brake pipe leads us to brake hoses and their options. Rubber hoses last for years and are really quite substantial. There are some areas, however, where braided hoses are a better bet as they are physically stronger. They give a harder feel to the pedal when it is depressed and, of course, are less likely to be destroyed by the elements. They also give a highly professional finish to your project.

The pedal assembly on the Beetle is another interesting piece of design. The pedals rotate on shafts that run inside each other on brass bushes. The downside is that, where muddy feet come into contact with them, dirt can get into the workings, although this does provide an interesting opportunity to modify the assembly for other purposes, such as to enable an hydraulic clutch system.

### WHAT ELSE IS NEEDED?

Whilst surfing the interweb searching for that elusive 'skull gearknob' complete with gemstone eyes, you might consider keeping an eye out for some other items.

### WINDSHIELD

Windshields come in various shapes and sizes. Some are from production cars, but by far the most common are those that consist of an aluminium frame and flat glass. There are, however, a variety of options here, too. Generally speaking, two main versions are currently available. The first has the section of a lower case 'h', which allows the flat part of the 'h' to take 'lift the dot' fasteners. The second is the 'Manx' type which has a groove around the front, that acts as a mounting for hard and soft tops. Look out for optional screen heights of between 12 and 16in.



### STEERING COLUMN

The steering column may seem rather obvious and less of an accessory than an essential. It is the business of how the column is mounted that requires some investigation and creativity. Better kits will include all the hardware to do this

