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Jigs, Guides and Templates

Useful self-built tools

by Julian Edgar

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At a glance...

- More accurate work simply and cheaply
- Guides for cutting and drilling
- Jigs for 3-dimensional builds
- Templates for shapes and holes

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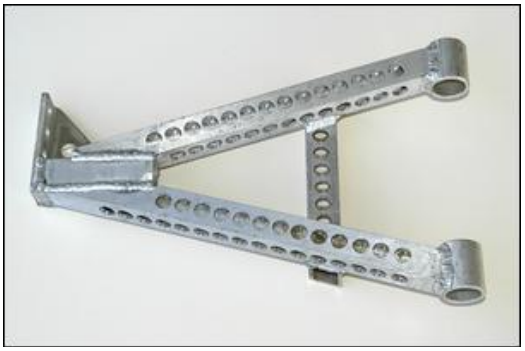
This article was first published in 2006.

If you want to impact someone with technical language, say: "Yeah, I jigged up for that." Either the person won't have a clue what you're talking about or, on the other hand, they might be quite impressed. Jigs are used whever objects are being made repetitiously, so that the results are as similar to one another as possible. Guides? Well, they're just a bit simpler than a jig. And a template? It's kind of a combination of a jig and a guide!

Guides



Let's take an example. You want to drill a line of holes just inside one edge of a flat plate (or square tube or...). The holes all have to be the same distance in from the edge and spaced evenly along the plate. You could mark out and centre-punch each hole, or you could bolt a guide to the drill-press table and push the work up against the guide. The guide could be as simple as a piece of straight timber.

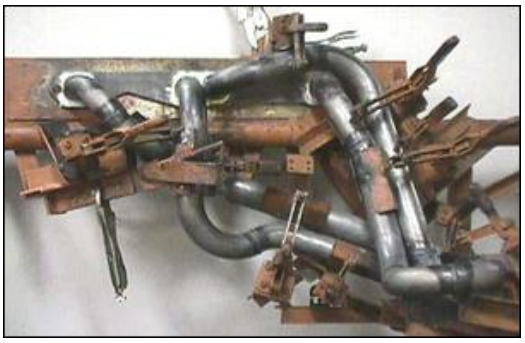
With the use of the guide you immediately know that all the holes will be the same distance in from the

edge – then it just becomes a case of getting their spacing in the other direction correct. It's even possible to mechanise this aspect if you make a guide and a pin, with the pin slotting into the hole just drilled and so creating the spacing to the next hole. Even a simple guide like this will provide much greater **consistent** accuracy than is possible by marking-out alone.

Another example of where guides can be used are when cutting material. An electric jigsaw is often used when cutting plastic, composite timber sheet and metals. When cutting straight lines, clamping a guide to the material being cut and then holding the jigsaw hard up against it will result in a far straighter cut than will be achieved free-hand. If cutting a circle, a guide that bolts to the jigsaw base (often there are slots provided for this) and then pivots from the centre of the circle will again give a much better result than doing it by hand alone.

Jigs

Jigs are more complex guides, sometimes even in three dimensions. Jigs also vary from guides in that usually a prototype of the item is made first, then the jig is matched to the prototype.



A good example of the use of a jig is in the construction of exhaust extractors (headers). Making a prototype set of extractors is a time consuming, laborious job where the snake-like bunch of pipes is made from short lengths of bends welded together. The way they connect to the head, the way they miss engine brackets and the sump and the bodywork – all requires lots of trial and error, cutting and welding. The time taken to build that first set of extractors might easily be three or four days – and if subsequent iterations took this long, each set would cost thousands of dollars.

But instead the prototype is used to make a jig.

Normally the jig consists of angle-steel uprights welded to a rigid steel base. Each pipe of the extractors is supported by U-shaped bits of steel of the jig, so that when the pipes are the right shapes and head in the correct directions, they nestle into the jig. Some jigs have removable sections that bolt or clamp back into place, while others are quite simple. When the pipes have been assembled in the jig, they're ready for welding.

Which brings us to the next point regarding jigs. Jigs are very often used when things need to be held in the right positions for welding. Especially if the person building the object is not the one who will be doing the welding, a jig ensures accuracy and location. If the jig is strong enough, it can also prevent distortion that almost inevitably occurs during welding. But that requires a very rigid jig – most jigs are for positional location rather than to prevent distortion.

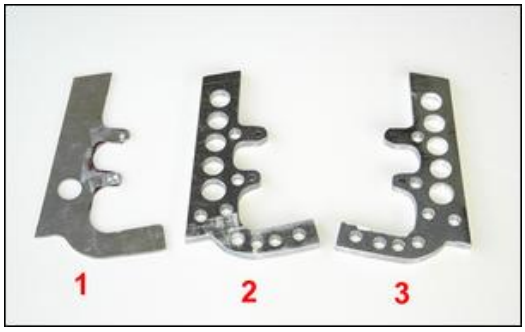
Jigs are used when hand fabricating suspension components – for example, even if only two wishbones are being made, it is usually worth jigging-up for it so that dimensional accuracy can be maintained. Note that a two dimensional jig can be as simple as some nails banged into a thick piece of particle board – especially if it is to be used only once or

twice, there's no need to spend a week making it.

Templates

Templates differ from jigs and guides in that they're usually used when a shape needs to be replicated. For example, if two brackets of a complex shape need to be cut from thick plate, a template can be made from thin material and then traced onto the thick material. The benefit is that the thinner material is easier to 'work' into the correct shape and that as the thinner material usually costs less, any mistakes made in the development of the template can be more cheaply remedied.

In some cases more than one template might be made. In this example, where a supercharger bracket was being developed, two templates were used. The first (1) was made from thin plastic sheet able to be cut with scissors. It underwent numerous changes and extensions, being stuck together with adhesive tape. Note also that the middle hole has been elongated to fit the engine block pick-up points. The second template (2) was made from thin aluminium sheet. It is one piece (no sticky tape here!) and the hole locations are now correct. The shape of the aluminium template was then traced onto 10mm thick steel plate to make the final part of the bracket (3).



Here's another example, this time the front suspension upright of a human-powered vehicle. In addition to supporting the stub axle, the upright had to locate and support the hydraulic brake caliper. This required absolute accuracy in the hole locations – a template (1) was a necessity. It was used to form the right-hand upright (2) and then by a mirror image reversal, the left-hand upright (3).

Another approach where two identical objects are being made is to produce the first and then use it as a template for the second.

A template is often used where holes need to be drilled. For example, in both cases shown here, the hole locations were specified by laying the template over the work and then drilling through the template's hole with the drill press. Care needs to be taken during this process that the template does not get distorted – you don't want the drill-bit rattling around in the template's holes.

Conclusion

They can be as simple or as complex as the situation requires, but jigs, guides and templates all make work more accurate and easier to accomplish.

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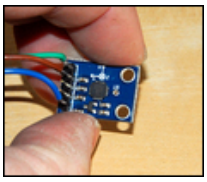

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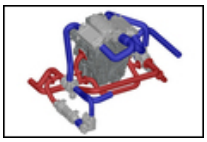

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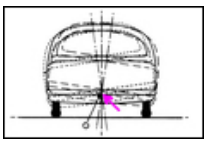

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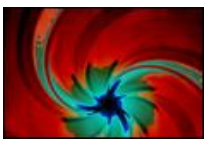

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