Light-Duty Welding for Builders

Add basic metal-working equipment to your toolbox to increase your versatility and become more productive

by Tom Hanson

Even though I'm a carpenter who loves working with wood, I've found that my welding equipment is as useful as many of my woodworking tools. With the right welder and a few basic metal-working tools, I can quickly make repairs to broken equipment or fabricate useful accessories. I don't make critical structural welds on building projects, though; for that I call on a certified welder.

I was first introduced to welding back in my high school metal shop, but it really isn't difficult to learn the basic skills. Our local community college offers noncredit welding classes at night, and there's probably a similar course for adults available in your area, either through a university cooperative extension service or a continuing education program at the local high school or vocational center. With YouTube and all the other online resources that are now available, you could probably teach yourself to weld. My MIG welder came with a useful video that shows how to set up the equipment and demonstrates basic welding techniques, and I've found many helpful basic welding books at the library.

Which Welder?

There are several different welding methods. In high school, we learned to arc weld with a stick welder. With arc welding,

Figure 1. Stick welders are often used with thicker metals and for outdoor work. To protect the weld puddle from contaminants in the atmosphere, electrode rods are typically coated with a flux that creates a shielding gas when it burns. The author's vintage unit (shown) is slow but usable.

current from an AC or DC power supply is used to create an electric arc between the base metal and a consumable electrode — the "stick." Made of a material that is compatible with the base metal, the electrode rod melts into a small puddle that is deposited in the weld area, fusing the joint together.

This process — also called shielded metal arc welding (SMAW) or manual metal arc welding (MMAW) — can create a lot of smoke that interferes with visibility and may make it difficult to get a clean weld. To protect the weld area from atmospheric contamination, electrode rods usually have a flux coating that creates a shielding gas and a layer of slag during the welding process.

I still have the 230-amp stick welder I purchased from a Montgomery Ward catalog some 30-plus years ago, which I use primarily when working with 3/8-inch or thicker metal (**see Figure 1**). It works fine but isn't very fast, because I have to constantly replace the electrode. Plus the slag has to be chipped away before the welded area can be painted.

Figure 2. MIG wire feed welders are well-suited for thinner materials and indoor work. The wire and shielding gas feed through a relatively short (about 10 feet) hose, so the machine can't be placed too far away from the work.

Wire welders. A few years ago I bought a Millermatic 175 220-volt continuous wire-feed MIG welder, paying about $1,000 for the outfit (920/734-9821, millerwelds.com). If I could own just one welder, this would be the one, because with it I can weld metals ranging in thickness from 22 gauge to 1/4 inch (the most common material thicknesses I work with) in a single pass (**Figure 2**).

Instead of an electrode rod, my MIG welder has a gun that feeds solid steel wire through an electrically charged contact tip. When I pull the trigger, the hot tip melts the wire, creating a weld puddle. The amp setting and wire feed rate are adjustable, and vary according to the thickness of the material being welded. A handy chart printed on the inside of the welder's access door shows these settings for different thicknesses of metal.

My welder is also equipped with a pressurized tank filled with an inert gas (typically 75 percent argon and 25 percent carbon dioxide — MIG stands for "metal inert gas"). When I pull the trigger to start the wire feed, gas flows out of the gun into the weld area to shield the weld puddle from atmospheric contamination. It costs about $200 to equip the welder with the optional tank, and about $30 to refill the tank.

The 175 has a duty cycle — the amount of time during a 10-minute period that a welder can operate at a given amperage without overheating — of 130A at 30 percent. This means I can weld for three minutes at 130 amps. By comparison, the less-expensive 115-volt Millermatic 135 has a duty cycle of 90A at 20 percent, but it requires only a conventional 110-volt outlet. In the seven years I've owned my Millermatic 175, the safety shut-off has engaged due to overheating only once (though this is partly because I seldom weld nonstop for long periods of time).

A MIG welder works great in a shop environment, but for outdoor work where wind is present, flux wire welding might

be a better choice. In flux-cored arc welding (FCAW), the weld pool is shielded by gas created by the flux contained in the wire, so it's less likely to be blown away by the wind. Dedicated flux wire welders are also a little more portable than other welders, because they don't require an external tank of shielding gas. However, the machine does need to be placed within a reasonably close distance — about 10 feet, depending on the length of the feed hose — of the weld site. Some wire welders — including the Millermatic 175 — can handle both MIG and flux-core welding.

Braze Welding

I also have a gas welding outfit that I mainly use for braze welding (**Figure 3**). Brazing is more like soldering in that the metal parts are not actually melted together. Instead, they're heated until they're red, and the braze filler rod melts, acting as a bonding agent. Braze welding is handy when working with small parts or joining dissimilar metals.

There are several types of gases that can be used in combination with oxygen when braze welding. I use acetylene, which has a neutral flame temperature of 5,720°F. Some builders consider MAPP gas (methylacetylene-propadiene propane) a safer option, but it's much more expensive than acetylene and has a lower flame temperature — about 5,300°F.

The biggest cost in buying a gas outfit is purchasing the tanks. I use a 75-cubic-foot acetylene tank, which costs about $150 to purchase and $35 to refill, and an 83-cubic foot oxygen tank, which costs about $210 to purchase and $22 to refill. Since I don't do a lot of braze welding, the small tanks last me a long time, and they're light enough for one man to lift into a pickup truck. When they're empty I simply trade them in at my local welding supply shop for full ones.

I have a Victor brand torch with tips ranging in size from 00 (for 1/32-inch metal) to 5 (for 1/4-inch metal). Since the majority of my gas welding and brazing is on small parts or thin metal, I mostly use my 00 or 0 tips. I paid about $250 for my Victor set, which also includes a cutting torch with a size 3 tip for cutting metal up to 2 inches thick. I mainly use the cutting torch to heat metal for bending, because the cuts aren't really clean enough for accurately cutting parts to size.

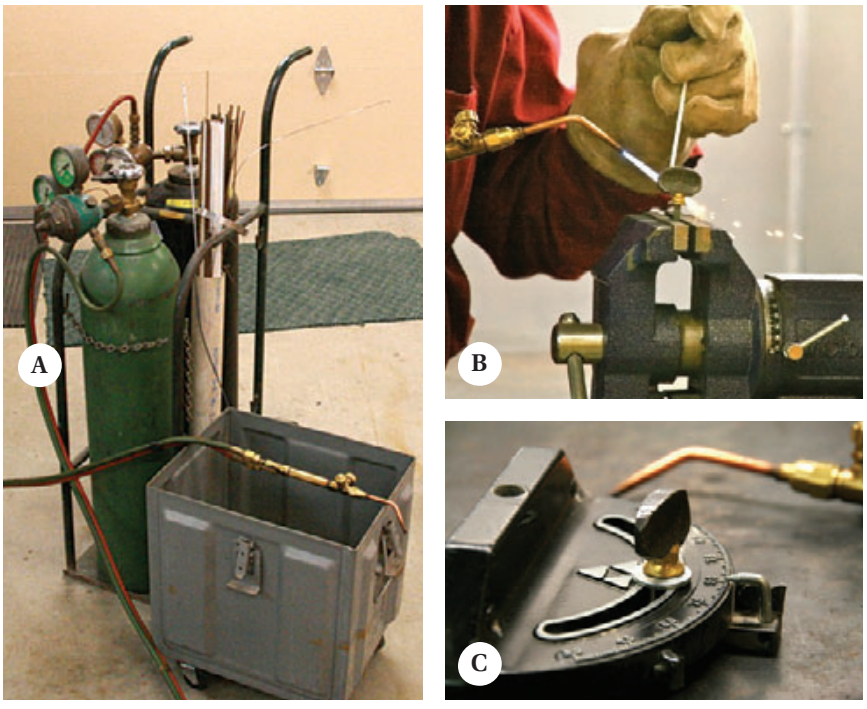

Figure 3. The author uses an oxyacetylene torch when working with dissimilar metals or making small repairs (A). Here, for example, he braze welds a new brass thumb screw to the existing steel bolt of his damaged miter gauge (B); a filler rod supplies the metal that joins the two components together (C).

Figure 4. The fastest way to size metal stock is with a cutoff saw, but an angle grinder equipped with a cutoff wheel can also be used. The author fits his angle grinders with various abrasive wheels to remove rust and slag and clean up welds.

Accessories

For years, I used an old-school welding helmet with a dark lens that left me basically blind until the light from the arc illuminated what I was welding. With this type of helmet, it's very easy to begin welding in the wrong place. I now use an ArcOne helmet (800/223-4685, arc1weldsafe.com), an auto-darkening welding helmet I bought

Figure 5. An assortment of clamps and magnetic welding holders is handy for holding metal parts square to each other while they're being welded together.

Figure 6. To haul long moldings or conduit, the author fabricated mini racks for his truck rack from a few sections of scrap metal (A). He first joined lengths of 1/2-inch by 1-inch stock to 1-inch-diameter steel tubing, then attached 1/4-inch band iron to the crosspieces to make the uprights (B). The fold-up table saw stand (C) was built from surplus 1 1/4-inch square tubing, while the tailgate bracket was also fashioned from scrap metal angle (D).

for about $150 on sale when I bought my MIG welder. There are probably cheaper Chinese off-brands, but I wouldn't trust my eye safety to them.

Cutting tools. For a carpenter or builder accustomed to working with wood, it's a bigger challenge to actually cut the metal than it is to weld it together. I'd love to have a metal-cutting band saw or plasma cutter, but just can't justify the cost for the amount of use they'd get. Fortunately, it's possible to do a lot of metal cutting with conventional woodworking tools.

For example, I use a Sawzall with well-oiled metal-cutting blades for some of my cutting. I also have metal-cutting blades for a wormdrive saw. Just recently, though, I finally gave in and bought a 14-inch cutoff saw, which admittedly speeds cutting considerably (**Figure 4, previous page**).

Angle grinders are useful for both cutting and dressing up the metal. Grinder wheels are fairly inexpensive, so I have a number of them, from thin cutoff wheels to thicker grinding wheels. Flap wheels — which look like multiple layers of sand paper — work well at removing grinder scratches before painting. And a wire wheel on the grinder helps remove rust from salvage metal before it's welded and painted.

To hold the metal securely while I'm working, I have a variety of clamps and magnetic welding holders (**Figure 5**).

Supplies

To find metal for my various projects (**Figure 6**), I often head over to my local salvage yard. Some of the metal in the yard is new, so if I have a specific need I can usually find exactly what I want. But the company also has a lot of used metal and cutoffs from metal fabricators, which they sell for around 30 cents per pound. This is about one-half to one-third the cost of new, nonsalvage metal.

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