Welding:

Repairing a car

The welding technique for repairing a car body would be a MIG weld. This is because a MIG weld can be done for a longer weld run than arc, as the electrode has to be replaced whereas the MIG does not need replacements. A MIG weld has no chance of slag in the weld as no flux is used, resulting in high quality welds. MIG can be used on a large variety of metals including steel of which a car repair will most likely be involving. The MIG welding can be operated manually, semi-automatic or fully automatic. This is useful in to the car industry as there are many cars on the road and so many repairs need to be done and not a huge amount of trained welders. Also getting a car to be welded automatically will reduce any chance of human error in the weld, which is critical in repairing something like a car. This is because a faulty weld could in the worst circumstance cause the car to crash and possibly kill or critically injure the occupants. However, automatic welding means programing the machine for different repairs so repairing is more likely going to be done manually rather than automatically. MIG welding has a shield of inert gas around it (usually argon) which limits the loss of alloying elements and so only a small amount of splatter is produced. This is good as is shows a clean finish and will make the job look more professional increasing the price of the repair. MIG welding is also portable which means that MIG welding can be transported to where the weld needs to be performed.
However MIG is not as portable as Arc.

MIG welders generally consist of:

Wire feeder: This feeds the wire out towards the MIG gun

Gas regulator: Gas regulator feeds the gas into the welder that goes to the MIG gun.

Figure 1

MIG gun: The MIG gun is where the inert gas and the wire leave the machine and make the weld.

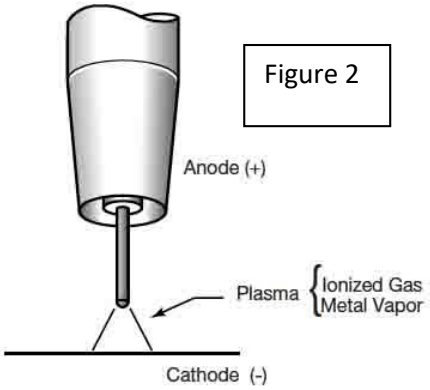


Figure 2

MIG welders are usually operated by a D.C power source. MIG welding uses an arc of electricity which creates a short circuit between a continuously feed anode and cathode.

A wheel of wire feeds the welder (as shown in figure 3) which pushes it through the rollers where it goes out to the welding gun.

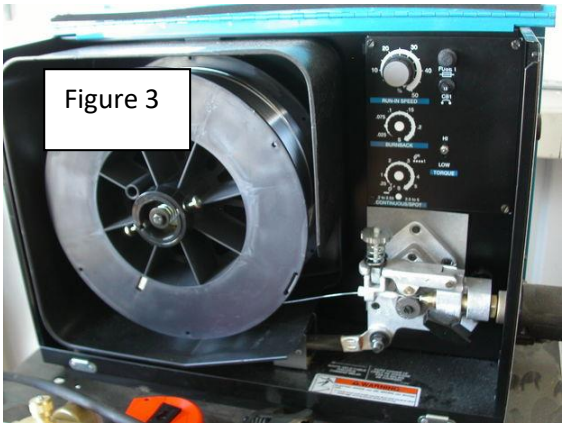


Figure 3

Whilst welding it is extremely important to stay safe. Welding is dangerous in different ways. One way that welding is dangerous is the high voltage that is used. This can happen when to conducting objects which have a current running through them touch. Electric shocks are very dangerous and can easily kill. However A.C current is more likely to stop the heart due to its constantly changing polarity. D.C current are generally considered less dangerous then A.C. Which is a slight advantage to MIG welding which uses D.C current. The most common type of electric shock is secondary voltage shock from an arc welding circuit which ranges from 20 – 100 volts. A shock of 50 volts is easily enough to kill or seriously injure the operator. Also fumes and gasses released from the welding can be harmful to the health. Make sure that there is enough ventilation in the workshop. Also make sure that you know what metal you are using. Some metals can be dangerous to weld this could be because it can give of fumes which are carcinogenic. Welding can reach extremely hot temperatures. This can cause fires is safety precautions aren't taken. All that is really needed is to make sure that the area has no flammable materials in the area. Also make sure that there is a full working fire extinguisher in the vicinity. You should be sure to stay near the welding area for at least 30 minutes to make sure that there are no smouldering fires.

Make sure that correct PPE is worn. Leather and flame resistant cotton material is generally recommended this is because it is safe to wear whilst welding. It is also sensible to wear protective boots and also make sure a mask

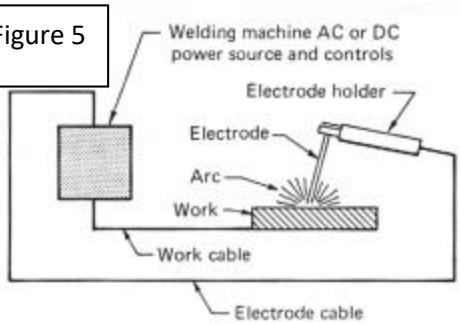
is worn. The mask is worn to protect you from the bright light which the welders produce. To make sure that the light does not spread you should make sure to have a protective curtain around you and the welder so that it does not harm the eyes of anyone else around.

Welding a 12mm steel flange

The welding technique I would use for welding a 12mm mild steel flange to a structural steel beam would be Arc welding. I would do this because arc welding is cheap and easy to perform. This is because there is little equipment as there is no gas. In addition, Arc Welding is versatile and can be used on dirty used metal. Arc Welding is easier to transport than MIG welding – no gas is needed in arc welding- and arc welding is also easy to adapt to difficult or hard to reach areas like when welding to an object that cannot be brought to the workshop like an already used structural beam. Also unlike MIG welding (which can only use DC current) arc welding can use AC and DC current, which makes it more versatile then MIG. Arc Welding defiantly has versatility over MIG welding due to its portability and is probably the easiest to get the hand of. However there is another form of welder out there in the form of TIG welding. TIG can be used on AC and DC currents and can be used on pretty much any metal. It also produces the highest quality welds. However TIG welding is very complicated and takes a large amount of practise and skill to perfect. TIG welding also uses an Argon gas to protect the weld and also uses tungsten. This means that TIG welding like MIG welding is portable, but not as portable as arc welding which does not use gas. Whereas MIG welders use a wire coil and TIG uses a Tungsten electrode, arc welding uses rods which melts off to become part of the weld. There are many different types of rods that you can get. The most common rods used are the 6011, 6013, 7014, and 7018. The most common of these is probably the 6013 general purpose rod as it is widely available and the most versatile.

Figure 4

Figure 5



The easiest way to start Arc welding is to strike the rod against the metal to start the welding. Making sure that you have set the correct amperage and you

are keeping the rod vertical move the rod in small circular motions along the joint. One way to tell if you have the correct amperage is to practice on a spare piece of the same metal. You will know if you have got amperage too high if the weld burns its way through the metal that you are welding. You will also know if you have set the amperage too low if the weld does not form properly. There are charts which you can use to determine the correct amperage that you need to use. Figure 7 shows what a good weld should look like Figure 8, 10 and 11. Show what happens with too much amperage. Figure 10 and 8 show the welder burning through the metal and figure 11 shows an excess amount of metal in the weld. Figure 9 shows what happens when there is not enough amperage on the weld and only splatter is produced.

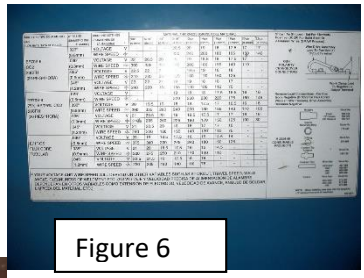
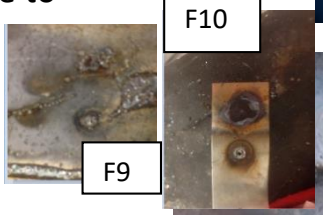


Figure 6



F10

F9

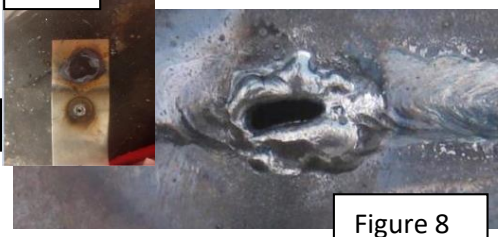


Figure 8

F11

While welding it is important that you make sure that your work is safely attached to the platform you are welding on. It is dangerous to balance you work precariously as there is a high chance of the weld falling and damaging your leg of foot or damaging itself. It is also important that you make sure there are no flammable materials around whilst you are welding. This could be from clothing to tools or even the platform/table that you are performing the weld on. As stated above in the report about MIG welding, safety is key. You must make sure to wear a mask to protect your eyes, you must also make sure that you wear full leathers – including gloves. Protective boots should be worn in case of falling objects as well. Make sure that you do not touch the weld until you have given it sufficient time to cool down. If you add cold water to the hot weld beware that it will steam and spit at you. You must also make sure that you have a protective screen around you and the weld so as to stop the light from being seen by anyone else. If you make sure that you follow these basic steps then there is a low chance that anything should go wrong.

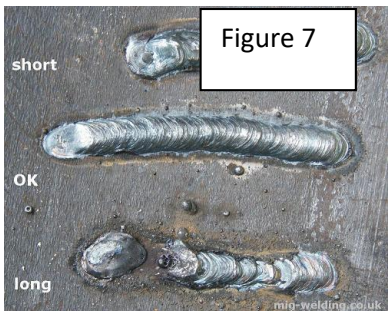


Figure 7

Glossary:

MIG: Metal Inert Gas welding.

Slag: A by product that can be produced from welding

Flux: Is a combination of carbonate and silicate materials used in welding processes to shield the weld from atmospheric gases.

Electrode: You can get a large variety of these. They clip onto the end of the arc welder and melt into the weld. Also known as 'rods'.

Inert (gas): A gas which does not react or undergo chemical reactions.

Alloy: a substance composed of two or more metals.

Arc: A technique in which metals are welded using the heat generated by an electric arc.

A.C: An electric current that reverses its direction many times a second at regular intervals.

D.C: An electric current flowing in one direction only.

Anode: The positively charged electrode by which the electrode leave an electrical device.

Cathode: The positively charged electrode by which electrons enter an electrical device.

Carcinogenic: Having the potential to cause cancer.

PPE: Personal Protective equipment.

TIG: Tungsten Inert Gas

Tungsten: The chemical element of atomic number 74, a hard steel-grey metal of the transition series. It has a very high melting point at 3410 degrees. Used in TIG welding.

Bibliography:

Figure 1

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Figure 2

http://weldguru.com/mig-welding-history/

Figure 3

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Figure 4

https://www.machinemart.co.uk/c/diy-arc-welders/

Figure 5

http://www.lincolnelectric.com/en-gb/support/process-and-theory/Pages/arc-welding-detail.aspx

Figure 6

http://www.gowelding.org/wp-content/uploads/Millermatic_250_Electrode_Voltage_Setting_Chart.jpg

Figure 7

http://air-con.us/mpipeswelding/

Figure 8

http://www.peachparts.com/shopforum/body-repair/309677-fun-games-welding-sheet-metal-arc-welder-learning-weld-2.html

Figure 9-11

Pictures of welds gone wrong

Figure 9 shows what happens when there is not enough amperage.

Figure 10 and 11 show what happens when there in too much amperage.