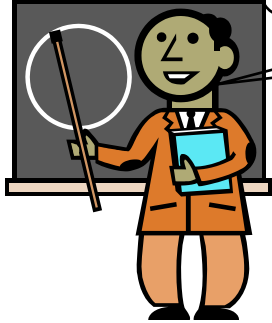


MetalWork

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There are many things that can be done to metal to change the strength of its structure



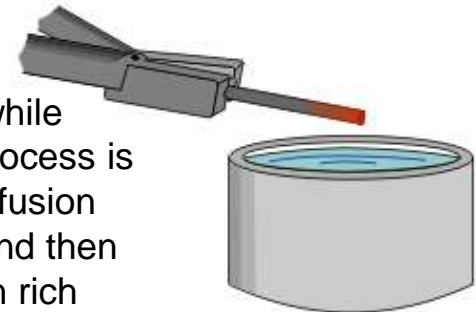
If we want to soften a piece of metal to make it easier to bend and shape with less risk of it breaking we can use a process called '**Annealing**' this is done by heating the metal and leaving to cool down on its own.

Rapidly cooling the hot metal (dipping in water after being heated), hardens the metal, this process is called '**Quenching**'

If we heat metal until it glows red and then quench in clean water immediately, it becomes very hard but also brittle, the process is called '**Hardening**'. However because the metal is now brittle it is likely to break or snap if put under great pressure

in order to remove the brittleness from the metal we must use a procedure called '**tampering**' this is done by applying heat to the metal so it turns a dark blue and then leaving the metal to cool down naturally.

'**case hardening**' can be used to produce a surface which is resistant to wear while maintaining the overall toughness and strength of the steel core. This type of process is normally used on a steel with a low carbon content and introduces carbon by diffusion (carburising) into the surface. This is done by heating the metal to a bright red and then placing in a carbon rich source such as, Kasenit (a company that make a carbon rich case hardening compound that can be used).



More carbon = harder steel

flux is a substance used which facilitates soldering, brazing, and welding by chemically cleaning the metals to be joined

Joining Metal

Soldering is a process where heat is applied to the parts to be joined, causing the solder to melt and be drawn into the joint by capillary action and to bond to the materials to be joined. After the metal cools, the resulting joints are not as strong as the base metal, but have adequate strength, electrical conductivity, and water-tightness for many uses such as joining copper, brass, tinfoil or light steelwork, and is the normal way of joining electronic circuit components.

Welding - Process of permanently joining two or more metal parts, by melting both materials. The molten materials quickly cool, and the two metals are permanently bonded. Spot welding and seam welding are two very popular methods used for sheet metal parts.

Oxy-acetylene welding uses a very hot flame.

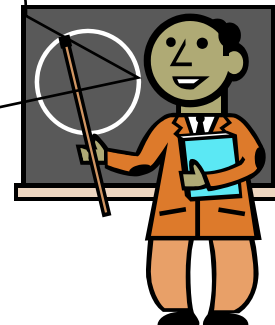
Electric arc welding a spark is used to heat the metal. In both processes a filler rod may be used as well to get a really strong joint.

Brazing is the joining of metals through the use of heat and a filler metal or alloy (acting like glue), which has a lower melting point than the base metals being joined. This is performed at reasonably low temperatures (between 450 – 1000°C) reducing the possibility of warping, overheating or melting the metals being joined. Brazing is ideally suited to the **joining of dissimilar metals**. You can easily join assemblies that combine ferrous with nonferrous metals, and metals with widely varying melting points. Braze joints are **strong**, i.e. on non-ferrous metals and steels, the tensile strength of a properly made joint will often last longer than **that of the metals joined**.

WARNING

After brazing the flux can often become glass like, care must be taken in removing this as it could shatter and harm you!

Be careful of unattended metal work as it may still be very hot!



N.B all other general notes

Tapes cut the internal thread of a screw and dies cut the outside thread.

Temps and colours of metals when brazing:

Light yellow 227° C or 440°

Dark Yellow 250° C or 480°

Brown-purple 270° C or 520°

Dark purple 288° C or 550°

Dark blue 300° C or 570° F

