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Welding Wages

There are a variety of jobs where metals need to be welded together to make a variety of different products from shipbuilding, to automobiles to buildings. Welding is a career where the demand outweighs qualified candidates.

When people go into welding they have to be ready to work long hours and to be in a profession that can be dangerous to their health and to their wellbeing at times. However, it is also a job that pays well and regularly.

Welding is a skilled trade and the better the welder the more money they can make. According to the 2008-2009 Occupational Outlook Handbook welders can expect to make anywhere from $10 an hour to $25.44 an hour depending on where they work and their skill levels.

Usually, these salaries are for those people who operate the machines like welders, brazers or solderers. Welders also belong to unions (some of them) which would possibly make their wages a bit higher. Also, an apprenticeship in some cases may make welding wages lower or higher, depending on experience and what they do.

The top wage earner categories annually for welding seems to be electric power ($51,640) both transmission and generation, Federal branches ($49,600) and pipeline transportation ($47,890). These earnings were current to 2007 and were found through a survey by the Occupational Employment and Wages office.

There are other factors that can make welding salaries higher. Some of these factors include certifications, specialties and the ability to do more than one type of welding. As an example, an individual who has a current commercial diving certificate, has the qualities of endurance and has dexterity that is
above what people generally have, could become an underwater welder and earn between $20,000 and $100,000 a year, depending on their experience and set of skills.

According to a Wall Street Journal article, there is more demand for welders than there are welders to fit the jobs, especially when they have an education. The reason is because there has been a resurgence of the need for welders especially in the manufacturing trades. Also, there are a new group of welders who realize that although the job can be a dirty and dangerous one, a person who is willing to work can make a decent living.

As an example, this articles states that an individual graduate of a university who completed a 4-year welding degree, was offered a job just before graduation of $55,500 annually, and they would pay for his relocation and also give him a bonus for signing of $2,500.

Another reason why welders are currently in demand is because many are retiring. The article states that most welders are around 54 years old and will eventually leave the trade.

Welders typically work 60 or 70 hours a week which means they will get overtime pay and there may be bonuses along the way. Someone who has experience and is highly skilled in this trade can make about $60,000 per year. When you add dangerous situations like oil rigs on the ocean or out of the way places, a welder can receive more than $100,000 in welding wages.
Welding Organizations

When you are looking for welding jobs it is a good idea to look at trade organizations because many have job postings. The more skilled you are as a welder, the more work you will fine.

Here is a list of organizations, what they do and how they can help you when you are pursuing a career in welding:

**American National Standards Institute (ANSI)**
http://www.ansi.org/

This organization creates the standards for the United States in terms of what welders are to do and how they are supposed to be paid. They provide the body of information that will make sure that welders are safe and do their work responsibly. They oversee most groups that have to do with welding and provide the educational accreditation for welding programs; they also create global program standards.

**American Welding Society**
http://www.aws.org/w/a/

The American Welding Society provides a body of knowledge about the welding profession. Their mission is to advance all aspects of welding starting with the technology, science and application of the various processes. They create the best practices and help develop the different ways of doing the job. If you are looking for historical information about the profession, this is where to go.

**Edison Welding Institute (EWI)**
http://www.ewi.org/
The Edison Welding Institute (EWI) is the development and research arm for those who are interested in welding. They lead technology and engineering and help develop materials for joining and welding. They consult with their members on how to do their jobs more effectively. They also train welder in a variety of people in automotive, aerospace, energy and chemical and more.

**Divers Academy International (DAI)**
http://www.diversacademy.com/

One of the foremost schools for training of commercial divers, DAI prepares and places commercial divers globally. Divers train for five months and then are ready to be placed in a variety of employment opportunities. When they finish their training they have not only acquired classroom skills, they have acquired several certificates and hundreds of hours in hands on experience.

**The Canadian Welding Bureau**
http://www.cwbweb.org/

If you are in Canada this is an important organization to know about because they provide certifications for welders in Canada that meet standards for welders in Canada.

**Fabricators & Manufacturers Association, International (FMA)**
http://www.fmametalfab.org/

This organization provides companies with the resources and tools they need to continue improvements in their operations. They provide programs, publications and an event once a year that is considered the largest welding, fabricating and metal forming event in North America. Their goal is to educate
people in the fields of metal forming and fabricating through volunteerism, award programs and networking.

**Society of Manufacturing Engineers**
http://www.sme.org/cgi-bin/getsmepl?/new-sme.html&&&SME&

For welders in manufacturing, the SME provides education on every facet of manufacturing and welding. Their primary mission is to create learning experiences through publications, professional development and a conference once a year to keep their members abreast of new technologies and current trends in the field.

**Welding Research Council**
http://www.forengineers.org/wrc/

Pressure vessel technology and joining are the concerns for the welding research council. They too are an educational arm of welding and they provide information for a variety of welders including Equipment Fabricators, Designers, Standards Developers, Consultants and more.
Overview of a Welder

When you are thinking about purchasing a welder it is very important to know the type of welder you will need for your particular job. What you buy really depends on what it is you are going to do with it.

As an example, if you were going to weld jewelry, you might use an acetylene torch with a small nozzle that would heat the metal enough for thin to medium metal. However, if you want to build large structures for a job or do underwater welding work, what you purchase will be very different.

Types of materials
You will need to determine the types of materials you will be welding most of the time. Are you going to work with thick or thin material? Will you be working on this material in the same location all the time? How much experience in welding do you have? Do you need your welder to be portable? When you have answered these questions, it's time to look at the different styles of welding you need.

Types of welding
There are several types of welders to choose from and it all depends on what type of welding you do as to which one you choose:

Oxyacetylene Welding -- this is a torch and it burns a mix of oxygen and acetylene gas. The heat gets to 6,300 degrees Fahrenheit in most torches like this. You can use this to solder, weld or braze. Sometimes these are used to cut some types of steel. This is generally the first type of welding a student will do and the first welder they will use.

Stick / Arc Welding (SMAW) -- this type of welder works with an electrode called a "stick" and it creates an arc with the welding material. It works by
putting the stick inside the machine, the stick melts and it produces material as filler in the weld. This is a difficult type of welding, so the welder itself may be difficult to use and control for the beginner.

**Mig Welding (Wire feed / GMAW)** -- this system also uses an electrode that is fed in a wire, pushed through a gun and it makes a weld puddle. They use either a shielding gas or a wire cored with flux. Many people use these types of welders for home projects and they are easily found at hardware stores. This one is easy to use.

**Tig Welding (GTAW)** -- this type of welding also uses an electrode but it is used with a shielded gas (inert) which makes a weld puddle. It uses a welding rod also that makes a weld bead when a rod is stuck in the arc. This makes good welds and is a higher level of welder.

Commercial welders may be a larger machine that does the same as hand held ones but on a much larger scale.

Before you purchase any welder it is a good idea to check the Internet for reviews of the different types of welders to get an idea of their cost and how they are used.
What to Look for When Buying a Welder

There are so many welders on the market it can be confusing to the average person as to which one to buy. For the most part, what you buy will be determined by the kind of project you will be doing most of the time.

If you are new to welding your first welder will probably be a stick or a wire feed welder because they are the easiest to use. A wire welder sometimes is easier because you will use a continuous feed into your gun as you continue to weld. In a stick welder, you'll need to change the electrode or "stick" periodically as it runs out. Also, the wire welder will be easier to use, give you better welds from the beginning and you can learn it relatively quicker than stick welding.

The next thing you will have to decide is the type of welding you will do most of the time. Generally there are two types: Either Gas Metal Arc Welding (MIG) or flux cored wire welding. These two are very different in their delivery so it is important to know the difference between the two. When you are going to be doing welding for small repairs, you probably will want to get an MIG welder because it is very versatile in the types of materials it can weld.

If you are going to use it in your garage at home or the same location, the MIG welder will be perfect. It is not very portable because you have to also use a container of shielding gas with it. If you are going to do a lot of outside welding, then you will probably want to use the flux cored wired welding. Since flux is already in your machine, you won't need a shielding gas and this makes it more portable. The only problem is that with this type of welder, you can only weld one type of steel.

Another idea is to go online and check out the many welding forums and ask about the various welders. You can read archives and ask specific questions
about your needs, and receive guidance from other welders.

If you buy your welder through an industrial products manufacture you may find a welder that does both.

When you buy your welder it is also important to make sure you purchase the safety equipment need. For some you will need a full safety helmet and for others you will need at least safety goggles. However, you can be exposed to fumes, arcs that go haywire, electric shock and other hazards so you will want to make sure that you have what you need.

Other ideas for getting the welder you need include renting or buying used. In some situations either of these options can be a good idea. If you are only going to use a welder occasionally, you might consider renting one. If you are going to purchase a used one, it is a good idea to go with upper end purchases because they are made better than the cheaper models.
Overview of Acetylene Torches

Acetylene torches are one type of welding torch that is used to weld some metals. The process for these torches is that they contain inside them two things that burn - acetylene and oxygen. The acetylene and oxygen mix can reach hot flames of about 6300 degree Fahrenheit.

Most of the time these acetylene torches are used to weld iron and it can cut steel. They are mostly used in production and manufacturing companies, aerospace, civil engineering and other industries. Some are used for small work that can be done as a hobby at home.

Acetylene torches can also be found in kits and sold separately. They are designed so that they will mix the right amount of fuel gas with oxygen from the atmosphere. Acetylene torches contain two types of flames: one for cutting the other for welding.

The one for welding is called Oxy-fuel welding and the process works to take two pieces of metal and weld them together using the torch. These welds will hold strong because the metals are heat to a point that they create a weld pool that contains both metals.

Acetylene torches are also used in Oxy-fuel cutting where the torch heats the metal until the oxygen makes a steam that combines with creates an oxide slag that is produced by the seam and the metal that it hits.

Some of the ways that acetylene torches have been used include:

- **Stone work** -- can be used for "flaming". The torch heats the stone to a point where the layer on top breaks and cracks. Then, a round, steel brush is used that is attached to an angle grind. This removes this first layer of the stone to get a "hammered bronze" look.
- **Glass** -- this industry will use an acetylene torch to produce an effect called "Fire polishing" which is a way that heats glass in order to give it a smooth appearance that looks like it has been polished.

- **Jewelry** -- many people produce jewelry using a technique called "water welding" that actually gives the effect to the jewelry of annealing.

In order to use an acetylene torch there needs to be a cylinder that contains fuel gas, an oxygen source, two hoses that are flexible so that each cylinder has one, two regulators that regulate the pressure in the two cylinders and a torch.

The torch itself is the tool that the welder uses to actually do the welding. There are several different types of acetylene torches. The welding torch has no oxygen trigger but it has a nozzle with one or two pies.

The cutting torch has both oxygen and acetylene and has a nozzle that produces three pipes that go into the torch at a 90 degree and has a trigger for the oxygen blast.

When a welder wants to bend or straighten metal or they need to weld a large area, they will most often use a rose-bud torch because it is the best one for this type of job. They call it this because the flame actually looks like the bud of a rose.
What to Look For when Buying Acetylene Torches

When you want to buy an acetylene torch there are a variety of types of on the market. One of the first things you will want to do is research to see the type of torch that best meets your needs.

You must first determine what you are going to be doing with this torch and how often it will be used. This is a good indicator about whether you want to purchase one, rent it or lease it for a period of time. Sometimes renting different types and seeing which one works the best on your product is a way to go.

What you will need for the acetylene is two tanks - one that has oxygen, one that has acetylene. You will also need a regulator that regulates each tank and the amount of oxygen/acetylene that goes to your torch. Most torches will be some sort of copper at the end. Many have different types of tips, so you will want to make sure that those tips are the type and the size you need.

Usually a torch will come with a main handle and along with several tips that are changeable, depending on the type of torch you purchase. Each tip will provide a type of flame for the specific work you are doing. Make sure that you understand how to use each of these tips before you use them because you could put yourself into a dangerous situation if you use the wrong tip.

You should also know that when you purchase a torch it is part of a total setup. You will also need connectors and hoses that go on your acetylene and oxygen bottles and then to your torch. These accessories are part of what makes the torch work.

Another thing to take into consideration when buying an acetylene torch is
what you will do with it most of the time. If you are only going to do repairs on small pieces of metal or jewelry, you will want a different torch than if you are going to do larger pieces of metals. You also will need to decide whether you are going to use the torch for cutting or for welding; this will make a difference in the type of set up you purchase.

With acetylene you also need to think about safety. You will need a mask so that you are not looking directly at the fire from the torch, and you will want to understand the safety restrictions on this type of torch. Anytime you are using fire, you will want to make sure that it is away from debris that could catch on fire easily. Also, do not use the torch in a confined area because it can take oxygen away from the area if released too quickly.

You will also want to find a torch that is versatile and that can do many things. As you get into working with it you may find that you want to explore other areas and you will need a torch that can accommodate your purpose.
Overview of Plasma Cutter

A plasma cutter is a tool that is used in the type of welding called PAW or Plasma Arc Welding. Plasma in this case is actually a gas and it has been ionized by heating it to a high temperature. Plasma at this point is actually able to conduct electricity and it uses a small hole to transfer an electric arc to the piece that the welder is welding.

Plasma is a gas and it automatically happened when you put gas under very high temperatures. Heat actually will create a chemical reaction with the gas and the welder gets a very strong tool that can cut through many things.

Although this may seem mysterious, plasma also is the power within neon signs, plasma displays and even fluorescent lights. All of these things use what is called "cool" plasma and this type is not the type that cuts metal.

The welder will find that plasma cutters come in a variety of sizes and shapes. Some use robotic arms so they can make more precise cuts. Others are handheld units and very compact which are the type that some people use in their home shops.

The way a plasma cutter works is like this; it sends a pressurized gas through a channel that is very small. The gas that it uses could be anything from oxygen to argon. There is an electron in the middle of the channel that is negatively charged. When power is applied to this electrode, and the tip of the nozzle from the plasma cutter is touched onto the metal a circuit is created.

This connection then creates a spark between the metal and the electrode. Finally, the gas is heated by the spark and you get a plasma stream that is directed to the metal, reducing it to a metal slag. After this, you have a piece of metal that has been cut to your specification by a plasma beam.
There are a variety of uses for plasma cutters. Many automobile shops use them to create frames and chassis especially when they want to customize them. You will them in construction companies because they are adaptable to fabricate and cut the very large beams for constructing buildings or to cut large sheets of metals. Some locksmiths will use a plasma cutter to help a customer who has inadvertently locked their keys in their safe.

Although plasma cutters were originally very expensive and only used in large industrial shops, they have become a staple of use for some types of hobbies in home shops. There are metal workers and artists who use them to create interesting looking art. They use the more portable, hand held plasma cutters.

Plasma cutters can be fast or slow to cut the metal, but it will depend more on the thickness of the material as to how quickly it performs the cut. Also, the type of cutter purchased will depend on what it is to do. In choosing one, you have to make sure that it will cut a variety of sizes; choose one that is capable of cutting something larger than what you would normally want it to cut.
What to Look For When Buying a Plasma Cutter

Plasma cutters come in a variety of shapes and sizes so it can be confusing as to what one to buy. Generally speaking, the first thing to take into consideration is what you want it to do most of the time. This will determine the type and the size of your need.

For some people, a plasma cutter may seem slow, depending on the material you will cut. You need to know that they will cut precisely and some thicknesses of metals may take longer than others to cut in this way.

Some plasma cutters will need a compressor for some things so you will need to know whether you need this before you purchase one. You will also want to choose one that can cut thicknesses greater than what you expect to do most of the time, so you have some flexibility.

You might also find it helpful to know that any metal that is a conductor of electricity can be cut by a plasma cutter. These are metals like copper, aluminum, stainless and other types of steel.

You will need some type of gas for cutting and most people use compressed air. This type of air comes as an air compressor or you can by it by the bottle. You will want to know the Cubic Foot per Minute (CFM) that the compressor will do because this is what keeps your plasma machine consistently running. You will also want to check the plasma cutting machine’s Pounds Per Square Inch (PSI) because it tells you how much pressure you need to run your machine.

Another thing you will want to purchase for your plasma cutter is dry air because it keeps moisture out of the line by traveling with it and helping it get out of the end of your torch. This can help you maintain your consumables.
To figure out how large a machine you need, you will want to determine the speed you want the machine to cut your metal. You will also want to decide the type of metal and its thickness because these will determine the overall speed of your plasma cutter's performance.

You will also want to know the power that you will need to run your particular machine; this also varies depending on what you are doing. Depending on the plasma cutter, you can get small voltages or ones that are specifically created for a wide range of voltages and some can be used in the field. If you need a plasma cutter that is portable, then the weight and the size of the machine will be important.

Finally, be sure to wear proper safety equipment and clothing when you are using the plasma cutter. As an example, you will want to use a full face shield to protect you from the beam of light; usually a number 5 or 6 shade protection will work. Make sure you the area where you are working is ventilated and take precautions for noise, temperatures, high voltages and fumes.
Welding Safety General

Welding is a very difficult and dangerous profession so it is important for each welder to make sure they follow general safety guidelines. In this way, you can insure not only your safety but the safety of others around you.

There are a variety of hazards that a welder will face under the normal performance of their job. Here we list a few of the hazards you may encounter and what you can do to protect yourself.

Electric Shock
Most welders will have to deal with some form of electric shock throughout the time that they weld. Although you can take precautions to keep you as safe as possible, this can happen even when you are careful.

What to do: Make sure that you weld in an area that is free of wet areas and outlets that are faulty. Use gloves where practical when you are using the torch and make sure that you are grounded by standing on rubber or wearing boots that are shock resistant. Do not touch electrical parts, including electrodes, with your bare hands.

Fumes and gases
Most welding by the nature of the way the process works will create noxious gases and toxic fumes. This is something that is necessary for the process to do what it is supposed to do.

What to do: Make sure that the area is well ventilated where you will work and make sure that you weld in an open space. Areas that are confined make it easier to inhale the fumes and gases, which can cause the welder to pass out.
**Welding Sparks**
Welding sparks are a fire hazard but they are a necessary part of the job because it is the nature of how a welding torch works when it hits metal.

What to do: make sure that you weld in an area that is free of debris or materials that can cause a fire. Keep a fire extinguisher nearby just in case. Wear clothing that is fire retardant, and do not weld around container that had flammable material in them.

**Arc Rays**
In arc welding, the arc rays can actually burn the welder's eyes and skin if they get near them. It is a good idea to make sure you wear safety equipment for any of these jobs.

What to do: make sure you have a comfortable filter lens and when welding, always use a helmet. Make sure the clothes you wear are fire retardant and that you protect your skin. Also, if you are working around others, make sure you put up a non-flammable shield in the area where you are working.

Hazards in general work area
There can be many hazards in your general work area that you may not be aware of because you may not be conscious of the problem. Make sure the area is clear of clutter.

What to do: clean up the area; make sure any debris or clutter that could catch on fire is removed. Make sure any materials or tools and cables are organized neatly. Make sure your equipment is grounded or insulated well.
Welding Arc Flash and its Affects

When you are working with a welder there is always the potential for Arc Flash. Anything that you do that works with electricity can do this and it can be a deadly process. Arc flash can happen on a large or small scale, and depending on the welder's safety precautions, it can cause severe burns or be deadly.

An Arc flash happens when there is a fault somewhere in an area where the welder is working. A quick and sudden amount of light energy and heat are released and if the welder is standing in the way, they can receive intense burns or the arc flash can be fatal.

This flash can also destroy equipment, cause eye problems and hurt people within a large radius from where it happened. In order to understand what this may look like, think about a large bolt of lightening that comes down and hits something on the prairie. This arc of light could explode the material that it hits upon and cause a lot of damage to that material.

This is basically what happens in an arc flash. This does not have to happen on a large scale only because you can also suffer from it when you are not using the correct safety equipment when you are welding.

The welder will expose themselves to UV rays that can hurt the surface of your cornea. Sometimes you don't know that this has happened until your eyes begin to feel warm. You may not know it until the next day when you have pain in the eyes. This pain can feel as though you have fractured glass in your eyes.

When you are doing welding it is very important to use a welding lens shade that is at least a number 5 and should be worn within 20 feet of the welding that is being done. If you are standing within 10 feet then you should use a
number 9 lens.

Normal arc flashes can also expose you to fumes and toxic gases so it is crucial to your survival to make sure you are in an area that is well ventilated when you are doing your work.

It is equally important to make sure that your equipment is functioning properly because often an arc flash is cased by faulty equipment. You will need to check enclosed systems also because these can cause a problem because some electrical equipment can become energized when it is faulty.

There are a variety of products that can help you resolve issues of arc flash as long as the equipment is working properly, but they only work if the welder will use them. You can get specially insulated gloves, rubber roll blankets (that allow you to isolate the area that you are working within) and carbonX clothing for protection.

Although arc flash can be deadly when it happens, knowing the safety precautions needed can help you get out of the way and be safer. It is wise to know the consequences of arc flash and how to prevent it as much as possible.
Welding Gear and Personal Protective Equipment

Beyond the welding torch and equipment that the welder uses to do their work, there is also a need for specific welding gear and personal protective equipment to make sure that welder is safe. There are a variety of things that are important to safety. Here are some of the most important:

**Gloves** -- although you may see some welders who do not use gloves, they are an essential part of any welder’s clothing. These protect your hands from sparks, burns and electric shock. You can find them in form fitting models that help your hands stay flexible and you can get them lined or unlined. Gauntlet gloves will also protect your wrists and upper arms.

**Hats or doo rags** -- both of these types of things are worn for the same purpose. A doo rag is just the wrap that looks like a scarf that wraps around the head. A welding hat or doo rag is worn to absorb sweat and resist sparks from your welding work. Usually you can get these in a variety of colors and patterns. Most hats will protect your ears as well as your head.

**Helmets** -- a welding helmet has several functions for your safety. It protects your head and face from sparks and provides protection to your eyes from the flash and intense heat of the flame. You are also protected in some respects from breathing in the fumes. Some are solar powered or darken as a result of the exposure to the flare of the flame. According to OSHA standards, the helmet shell has to be resistant to electricity and heat, and it has to be opaque so it protects your eyes from the light. The cover plate on the outside has to be made of plastic that is polycarbonate because this is the only type of plastic that will protect from UV rays.

The helmet should have a lens filter that is glass that has a filler that protects
you from the light that goes through your eyes. The filters range from #2-#14 with the helmet being darker as the numbers get higher. This is a matter of preference in terms of how dark you want the helmet filter.

**Boots** - make sure your boots are fire retardant and that they are high tops because they will protect you from sparks. Make sure also that you lace them all the way and put your pant legs into the boots. These are extra precautions that will keep you safe when you are welding.

**Respirators** -- when you are in an environment where ventilation isn't good, you need to use a respirator. If they do not provide them they should be able to tell you the type you need for compliance.

**General safety precautions** -- Be sure that you are wearing the right clothes when welding. Make sure clothes are made from a heavy 100% cotton or wool and that the fabric is woven tightly. This will protect against open flames and any hot metal that sparks. Do not wear synthetics as they are easy to catch on fire.


Welding Helmets and Types

Welding helmets are one of the most important aspects of the safety equipment that a welder must wear. They protect the welder from UV rays, sparks and the bright light of the torch fire.

According to OSHA a welding helmet should have several components:

- **The shell** -- the shell of the helmet should have an eye piece that is resistant to electricity, heat and impact. It should be opaque so that light will be dimmed by it.
- **Outer cover plate** -- this should protect from scratches, impact and UV rays (radiation). This should also be made of polycarbonate plastic because this is the protection from UV.
- **Filter lens** -- this should be made from glass and contain a filter that controls the light that passes through the eyes. Each filter will have a different amount that it will let through and they come in shades from 2-14. As the numbers get higher, the filter gets darker and lets less light got through the lens.
- **Retainer lens** -- this should be plastic so that it stops pieces from the filter lens that might break from getting into the eyes.
- **Gasket** -- this should be made from a material that is insulated against heat and should be between the filter lens and the cover lens. This will protect the welder and the lens from any heat changes that may be sudden that might cause it to break.

A good helmet will have all of these features and comply with the standards that OSHA requires. There is a wide variety of helmet types and many are a matter of preference to the welder. All are geared to keep your eyes and your head safe from the sparks and UV radiation.
There are many different styles of auto darkening helmets and they are good if you don't want to have to take your helmet off to change a lens. They will darken automatically as soon as the welder strikes the ark and then when the welding stops, it goes back to a light state. Some welding helmets have a manual feature where you have to change the amount of darkness as you go, which may mean you have to take the helmet off to do this.

Passive welding helmets are ones that you will see some of the older welders using because they are the traditional helmet. These do not darken automatically and they include a sweat band for your sweat but nothing fancy.

Helmets come in a variety of colors and styles so that most welders will find something they like. There is a brand called "monster helmets" that look like you should wear them during Halloween. There is a Pro-Hobby Series of manual welding helmets that are for lighter projects and are suggested for hobby projects, farm projects or small home projects.

It is a good idea to look on the Internet for the various helmets so you can see their different specifications and styles. This will help you pick one that is right for you.
General Welding Equipment

In addition to your personal gear and torches there is a variety of welding equipment in use today. The type of equipment a welder uses will depend on what they are going to use it for and the type of welding they will do.

Welding equipment will be used to do whatever type of welding the welder does. They can include customized accessories or it can mean you will use a special type of brazer or cutting tool, depending on the type of metal you will work with or the type of welding to be done.

You may need a welding machine or other accessories depending on what you need. As an example, you might want lift devices tables or turntables and special fixtures or heating devices for bigger projects. This will all depend on what you are welding.

It may seem obvious that the individual who does welding as a hobby to perform small repair or restoration projects at home would use different equipment from the person who does welding as a profession. However, some of the types of equipment will be the same but it just might be in a different form.

As an example, an acetylene torch is used in welding whether the individual is doing a job or making jewelry. However, the type of torch will be different, but it will provide the same function.

Welding equipment will include torches, but also gasses and safety equipment, and all of this will depend on the type of welding the welder will do. Arc welding will require different equipment than someone who is a plasma cutter. Both will require helmets of some sort that stop UV radiation and sparks from getting onto clothing and into the eyes or on the skin.
There are also gases that some forms of welding use and these will depend on the type of welding that is being done. However, they can be bought as single tanks or duo tanks and they can contain one gas or a mixture of gasses.

Welding wire and electrodes are an important part of welding equipment because they are what create the spark that is needed in the torch. Depending on the welding gun and the process you are doing, you will either use an electrode that goes into the gun and is continuously fed for the entire process or a wire that does the same.

When you are considering welding equipment you can buy it new or used and you can lease or rent it. This will depend on the type of job that you are doing. If you have a temporary job to do it may be better to rent or lease the equipment. If you are going to work over time in the same type of welding, you may want to purchase your equipment new or used.

When you are first starting out as a welder, it may be a good idea to talk to people who have been in the trade longer to see what types of equipment they use. They can be of help to you with what you should purchase for the job.
Welding Gases

There are a variety of different types of gases that are used in welding. One of the major ways that gases are used is for shielding the area to be welded from gases that come from the atmosphere. The reason the shielding area needs to be welded is because these other gases can change the way the weld looks or make it difficult to use.

Whether a gas is used, the type of gas, and how it is used will be determined by the welding process that is used. Some of the most common gases and their uses are listed here:

**Acetylene Gas** -- this is a flammable gas that is also colorless and some people say it smells like garlic. The periodic table designation is C2H2. This gas gets the hottest of all hydrocarbon gases because it has a structure that is called triple bond. When you combine this gas with oxygen, which is how it is often used, the temperature of the flame can get as high as 5580 degrees Fahrenheit. This gas can be used for small or large projects. This gas is often called Oxyacetylene when it is also combined with oxygen.

Uses: bracing, welding, cutting and soldering and they are usually stored in pressurized steel cylinders.

**Air** -- believe it or not air is considered a gas in a welding situation. Air is found in bottles and is often compressed for the purpose needed in welding.

**Argon** -- this is a nontoxic, nonflammable and inert gas which means that it doesn't have a chemical reaction when it comes in contact with metal or other material. This is also a colorless gas and doesn't carry an odor.

Uses -- it is basically used for arch welding, the manufacturing of electronics,
making steel and heat treating. Also used to weld aluminum and stainless steel (when combined with oxygen).

**Oxygen** -- is primarily used to work with other gases where high heat is necessary to do the weld. It is most often used with acetylene but it can also be mixed with argon and other types of gases.

**Uses** -- necessary when you want to use a high heat on metal.

Gases are most often used with a torch that has a regulator that can control the amount of gas that is distributed at any given time. The torch itself is attached to the regulator through hoses and the regulator is attached to the cylinders that hold the gas. Some gases like propane are in cylinders that have a short torch at the end; the torch is connected directly to the cylinder.

There are many safety precautions one should use with gases so that you cut down the risk of being hurt. Some things are common sense but it is a good idea to mention them anyway. Some of the precautions you should take include:

Store the cylinders in a place where they won't be damaged or over heated. If they are large cylinders make sure they are chained in a way that stops them from falling. If you have extra gas or cylinders with oxygen they should be stored separately.
Welding on Mild Steel

Mild steel is defined as any steel that has low carbon in it and about 85% of welding is done using this type of steel. Usually these steels have an AISI series of C-1008 through C-1025. They are the steels that are most often used in construction or industrial fabrication. They are welded through the use of gas, arc or resistance welding.

Mild steels are resilient and they can be bended or twisted or moved into other shapes as they are welded. You can use mild steel sheets or wire to do this type of welding. You can also use it to weld pipes. As an example, you can use mild steel pipes when you want to work within air conditioning or refrigeration. This can also be used for heating when you want a low pressure.

You can also use steel wire or steel sheets to do welding on mild steel. Mild steel can be used in the following types of welding:

Gas Metal Arc Welding (GMAW)-- this is a type of welding that uses a solid electrode wire that is continuously used as a filler metal. It also uses a shielding gas. The wire that is used is mild steel, and it can be a copper color to protect it from rusting. This will also improve the way that it conducts electricity.

Flux-Cored Arc-Welding -- this type of welding uses a wire that is covered with flux so that it will automatically give you the shielding gas. This is the favored way of doing welding on mild steels in an outdoor environment.

MIG Welding -- this is one of the easier forms of welding and is also a good idea for welding on mild steel in an indoor environment. It is one of the first types of welding that beginners learn how to do and it is a bit more flexible than other types of welding. You can also use it to weld other materials like
aluminum, nickel or stainless steel.

There are advantages and disadvantages of welding many different types of wire and it is important to know what you want to do before you start. Here are a few tips as you decide to work with welding on mild steel:

Before you start working with mild steel make sure you clean the surface first. Make sure the clamp that you have on the work is tight so that it is a solid connection for the electricity to flow through it. You will also want to make sure that your steel is free of rust, paint or any other debris. Paint or rust will insulate your steel and you won't get the solid connection.

Many people forget that the welder should be put on a different circuit breaker than other things you are doing, especially when you are working at home. The reason to do this is because you are working with higher heat and it needs more power.

Make sure that the two pieces you want to weld are flush with each other or at least have a solid joining to prevent any problems with the weld.
Welding on Aluminum

Many professional welders say that aluminum is the hardest metal to weld on because they are alloys and have many physical and chemical properties that are to be understood before they can be worked with effectively.

Some of the properties that make aluminum harder to work with are the fact that it is difficult to see. There is no color change to see when it is heated and it has a wider range of melting temperatures than other metals. The oxide in the aluminum also has different characteristics and the thermal, electrical and other characteristics like nonmagnetic are different.

This means that an individual working with aluminum must know what to expect with this metal before they begin. Some of the things to know are included here:

Melting point of aluminum oxide -- it is important to know that aluminum oxide has a higher point of melting than the base alloys. In fact, it doesn't melt until it reaches 3722 degrees Fahrenheit (2050 degrees Centigrade). You will also get a fusion that is incomplete if you don't displace the oxide.

When aluminum isn't welded correctly taking into consideration these different properties, the weld can crack, break or shrivel in size. This is what makes it so difficult to figure out how to do it.

The effect of hydrogen on aluminum -- although hydrogen dissolves quickly when aluminum is in its molten stage, it has little solubility when the aluminum is solid which causes problems with porosity in the aluminum welds.

Higher electricity necessary -- if you are doing arch welding aluminum has to have a higher level of heat because it conducts electricity at a higher level than
other metals. This higher conduction of electricity allows the welder to use guns that contain longer contact tubes because the electrode doesn't get heated the way it does with ferrous electrodes.

Thermal conductivity is higher -- When you are working with aluminum the thermal conductivity is higher because it works with specific heat. In fact, it is about 6 times hotter than steel. This means that aluminum is more sensitive to the different heat fluctuations that the welding process can have and may make the metal crack or warp.

After taking this information in mind, most of the forms that you find aluminum in can be welded.

**Tools you need**

There are a variety of tools you will need when working with aluminum, some of which are the same as you would use for any other type of metal. You'll need a TIG Welder (Tungsten Inert Gas Welder), a pair of good gloves, and a good helmet.

You will need a gas other than Argon by itself -- many welders say that a Argon and Helium mix works best. Aluminum welding rods of about 4043 seem to be best with aluminum, and it is important to use a steel brush for cleaning that you only use for aluminum.

Also, make sure to wear a cotton shirt for the work that is long sleeved. The reason is because the TIG welding process can produce more UV radiation and if you are not protected, it can burn you easily.
**Welding on Stainless Steel**

Stainless steel resists corrosion and it is one of the iron based alloys. They usually do not rust and they are able to withstand certain types of liquids, chemicals or gases without corroding. They are versatile in their ability to withstand high temperatures and have some iron in them.

Stainless steel melts at a lower temperature, is more resistant to electricity and transfers heat at a lower level. They also expand at a higher rate when heated than other metals. This can cause problems when welding because it has different reactions than other metals.

Stainless steel reacts differently to heat temperatures and if it is given too much heat, it can warp or create other distortions as it cools. Also, it is not as forgiving as mild steel so any mistakes you make along the way will show up and you can scratch it easily.

Rather than to use metal tables that can scratch the metal some welder use an aluminum or brass heat sink. This can prevent burn through because it actually will absorb the heat. When you are working the metal it is good to use the least amount of heat that you can.

There are several varieties of stainless steel and they are more difficult to engage in the welding process than mild steels made from carbon, basically because their physical properties are different. Here are a few:

Austenitic stainless steel -- they are ones that weld easier because they have a lower thermal conductivity and they have a higher "coefficient of expansion" than other types of stainless steels.
**Ferritic stainless steels** -- these are harder than other stainless steels and they do not become harder with heat. They also have the power to create their own magnetism called, "ferromagnetism" that can get in the way of the meld. In order to stop this, these types of stainless steels use a ferritic filler when necessary especially in arc welding.

**Martensitic Stainless Steels** -- these are similar to the ferric stainless steels in that they are also magnetic but they will become harder when heated. Some of these will also have different percentages of carbon in them and if you have over a 0.15% of carbon, they will have to be preheated and post heated in order to make them work properly.

You will find stainless steel used in a variety of ways to build many products. You can look in your kitchen and find it in sinks in your breaker boxes and with some of your electronic counter appliances.

It is a major material that is used in construction of buildings, particularly with roofing, elevator doors or signage. You will also find it in the building of bridges and barrier walls.

Farming is another area where you will find stainless steel applications because they are used for milk silos, juice tanks and piping. The makers of beer and whine will use stainless steel vats to ferment wine and display it once it is ready. This type of equipment is easier to clean than others and is easily sanitized.
**Welding on Copper**

Copper alloys and copper are often used in many environments where manufacturing is done. It is a material that resists corrosion, can be easily fabricated, is strong and resists fatigue. Also, it has both thermal and electrical conductivity.

Copper is a metal that is also resistant to sparks, has a distinctive color and is resistant to wear when it is used with other metals. Arc welding uses a lot of copper in most of the various types of arc welding including gas metal, plasma or submerged arc welding. Copper also uses a shielding gases in some of the arc welding processes and it is usually either argon, helium or a mixture of the two.

When copper is welded in order to have a complete fusion of the metals, the arc's intensity will be important. It has to have base metal that is highly conductive and a narrow HAZ. This very important if the copper has been hardened by precipitation.

When you need to weld copper that has less than 3mm in thickness, it is recommended to use gas metal arc. This can also be used to join bronzes of aluminum or silicon and allows that are comprised of copper and nickel.

The use of plasma welding for cooper is also done and helium, argon and mixtures of these two gases are used. There is a caution though that you should never use hydrogen gas to weld copper.

In order to produce different copper allows, there are other metals that are alloyed with it. Usually these metals include nickel, tin, zinc, aluminum or silicon. There are other smaller bits of metals that are used to encourage the copper to be resistant to corrosion or to be able to be used with a machine.
Sometimes welders find that their copper welds don't take and this can be largely due to several different issues:

**Thermal conductivity** -- it is important to make sure that any shielding gas that is used and the type of current is hot enough to provide enough heat to the joint you are welding. If you have copper alloys that have a low thermal conductivity, you may need to preheat the joint.

**Position for welding** -- copper is a very fluid alloy so it has to be welded in a flat position. Otherwise it is going to run all over. In some cases like fillet welding in T-joints or corner joints, a horizontal position can be used.

**Hot Cracking** -- copper and its alloys is susceptible to this experience when they are coming back to a solid state. This can happen especially with copper/tin or copper/nickel alloys. You can minimize this if you reduce the restraint when you are welding and preheat the metal to slow down the rate of cooling.

**Problems with porosity** -- this challenge can happen when you have zinc, cadmium or phosphorous as part of the copper alloys mix. They have low points of boiling and have a tendency to vaporize. It is a good idea to have a higher speed of welding and a filler metal that has a small amount of these other metals in it.
Metal Art

Metal art has been a very important part of many cultures; it dates back 3000 B.C. when Indians discovered it. Bronze sculptures have been found in Delhi and a variety of metals were used including bronze, bell metal, copper, iron and silver.

Metal sculpture is usually done differently in each region and as an individual travels the world they will find a variety of unique art. From sculptures of deities to intricate etchings, metal has been used to create fancy pieces.

In Africa the Yoruba tribe is famous for its hand hammered, pounded and welded metal sculptures of everyday tools that were needed for farming. Today, metal is used to enhance many home decorations, tables and chairs. They can even be used to take a step back in time to the 1950s look of décor.

Metal is also used as enhancements both inside and outside houses. You will see them as garden sculptures, on the sides of buildings and as decorative wall hangings. Metal can be welded to take a variety of different shapes and can enhance the look of just about anything.

A nice effect for metal work is when more than one type of metal is welded or woven together in able to create a two tone affect. Often stainless steel and copper are brought together to create an effect like basket weaving. Metal can also be bent and shaped in a variety of ways to give an effect as though it had several colors instead of two. This type of effect is created by power coating to prevent the metal from losing its color so it makes it a more vibrant color.

Another way that metal is being used for metal art is through plasma cutting. By using a plasma cutter artists are able to make more intricate patterns that is similar to the old fashioned block metal stamping that was done in many
people's homes. These give the effect of silhouettes.

A popular item for metal art is farming art. Items like animals and intricate weathervanes are created through the use of metal art. Intricate wind chimes make a different kind of sound when it is metal instead of glass or other types of materials.

There are a variety of websites that offer many different kinds of metal art. Some of them produce art through the use of foundry processes and others make more intricate details with an acetylene torch or other process. Some sites offer everything from Christmas ornaments to fine sculptured clocks, etchings and full scenes in nature.

The machinations of metal art show the versatility of metals, welding processes and the creative spirit of the artists. Some people even create very interesting and sometimes strange sculptures using scrap metal. They use welding torches to weld together pieces and parts of this and that in whatever the creative spirit asks them to do.

Jewelry makers also use metal art to create broaches, beautiful earrings and a variety of smaller metal objects that are appealing to those who are looking for something new and unique. Metal art has enough variety to meet anyone's taste.
Welding Art

Although most people think of welding as a way to build buildings and other shapes, there are many people who have chosen to use welding as an art form that is as creative as any inventor.

Generally speaking welding art comes in large pieces where people use scrap metal to form objects that they are interested in. As an example, one artist may use sculptures to create animals or other scenes in nature. Another may use welding to make a statement about something through their art.

One idea that is very popular is the making of sculpted iron gates that are uniquely ornamented. They are very large and can enhance either the entrance to an estate or the entrance to a particular garden or other area within an estate.

Another area where welding art is common and interesting is in the building of temporary stage structures for musical extravaganzas. As an example, one welding artist, Kenny Baird created this type of stage for Kenny Rogers. Baird is also a master welder.

Some of the welding art is experimental to see what types of metals can be welded together in an art form. An example of this is work by Wylie Mitchell of Texas, where he created a sculpture using copper, mild steel and stainless steel. This created an effect that looked weathered and interesting. The contrast in colors made this an attractive piece.

For some welders, traditional welding became too confining and they were bored with construction of buildings and wanted to do something more. They saw the potential to work with the metals to bring them into a fuller way of expression.
Welding art uses the same processes as other welding. Many artists are skilled in arc welding and others use plasma cutters to produce intricate patterns. Still others use lasers to produce certain forms of welding art. This type of art is only limited by the imagination.

Many artists specialize in certain things. Some will create sculptures, others altars and tables and some will concentrate on building large sculptures that sit in front of office buildings or in parks. It will depend on the artist's tastes and interests as to what they decide to do.

Wall sculptures are very popular with welding because they can be decorative especially when other types of metals are welded to them or they can be shaped through hammering, cutting and shaping the metal into unique shapes.

Many welders who also do art specialize in repair work. They attempt to create that same effect as the original piece wherever possible. The materials used in welding art can be everything from iron to other forms of steel. This really depends on the artist and their preference and skill at using specific materials. Stone and bronze seem to also be popular materials for some welders who do art.

Many art welders use simple and inexpensive tools to get their artwork done. The same equipment that they would use for other welding projects are part of the art toolkit as well.
Ornamental Ironwork and Welders

Ornamental Ironwork is basically an architectural feature of a structure that is used for decoration. Usually there are two types of iron that is used -- wrought iron which is iron that is a pure commercial grade and cast iron that has a white or gray color.

Ironwork is generally considered to be of a decorative nature and can be done as artwork, some types of utensils and used to create weapons. Between the 16th and the 19th Centuries, iron became all the rage for decoration. The use of ornamental ironwork for architecture came later.

Wrought ironwork is made through the use of blacksmithing procedures. It is forged with an anvil. Cast iron on the other hand is the type of iron that is put into a furnace and "stoked" using different layers of coking iron and then it is poured into various molds.

Another type of wrought ironwork is actually done by hand and is called hand wrought ironwork. The blacksmith who creates this process actually uses an anvil then heats and hammers the iron so that they can create various designs and textures in the iron.

Today, the ironwork is often used with mild steel because true carbon is difficult to find in the United States, and what little is available comes from England. This type of ironwork makes it inexpensive compared to what it would cost for true wrought iron.

A variety of different types of designs can be created in this way from the very elaborate to very simple. Most ironwork is custom designed to fit the needs of a customer. Many times these are made for mirrors and frames or for railings, tables or chairs.
Usually this type of ironwork is larger and is used for practical uses and decoration. Some scrollwork in iron can be found in this type of ironwork. Welding pieces of metal together to make an even flow is an expertise area for many of the welders who work with ornamental ironwork projects.

Many blacksmiths who do this type of ironwork can create anything that their customers can design on paper because they are skilled in the use of blacksmithing and welding. Usually someone who does both welding and blacksmithing is very skilled and has had years of experience in both methods.

Many welders will work with repairs and with ornamental ironwork. They fabricate and install their work and they create something that will enhance the yards or homes of the different people who enjoy this type of work. Many handcraft everything rather than get some parts from a kit. Some welders do use machines to produce some of their work to save time.

Welding with cast iron or wrought iron takes special skill because these are not easy metals to work with so many welders specialize in several aspects. They have reached a skill level that allows them to easily produce this type of work. Also, they have been in this field for many years so they know how to work with the iron.
Cutting Metals Overview

When we talk about cutting and welding processes this usually refers to as work that is done with very hot flames. It is usually done by machine shops, construction and small laboratory type situations like torch soldering or blowing glass.

This is a dangerous area of welding because it creates fumes, sparks and gases and you have to be careful of hot metal. Cutting is done with special cutting equipment that can be lasers, plasma cutters or some welding torches; acetylene torches work well for cutting depending on the material that needs to be cut.

There are several different types of cutting metals:

**Carbon Arc cutting** -- metals that are cut in this way use the heat of the carbon arc to melt them. The metal that is molten is then hit with a blast of air to remove it. The gas jet will be independent and outside the electric arc. Usually a welding machine is used to do this and it has to have current that is constant. There is an electrode holder that is specifically designed for this type of cutting and it has all the necessary pieces that are needed to do this cutting including a circular grip head, air jets and the compressed air.

**Oxyfuel Cutting** -- this is a type of cutting that uses an acetylene torch that brings together acetylene and oxygen to form the cuts. The difference between this torch and a regular acetylene one is that the cutting torch has another tube for a higher pressured oxygen in addition to the oxygen and acetylene that is already there. It also has a tip with a center hole that allows a jet of the pure oxygen to pass through the torch, which preheats flames.

**Plasma cutting** -- this method actually uses a plasma arc to melt the metal.
This method also uses a high flow of hot ionized gas. There are actually three ways for cutting with plasma that include a low current, high current or a current with water added to it. Plasma cutting allows a more precise cut than some of the other cutting methods. Modifications in plasma cutters have been created to allow oxygen to also be used in cutting steel.

When metal has to be cut it will consisted of using a machine of some type to remove metal. Machines like drill presses, lathes or milling machines will also do some of the cutting. In order to successfully cut metal it is necessary to know how the materials the welder is cutting works.

It is important to note that you must take more safety precautions when using cutting machines because they are so quick to cut. They perform a high heat operation and sometimes there can be more sparks generated and the metal is always hot.

Any machine or welding torch that sends out hot metal and sparks can cause fires and can create problems if the hot metal lands on the skin. It can also cause problems of an arc flash if proper safety equipment isn't used.
Oxy-fuel Cutting Overview

In Oxy-fuel cutting fuel gases and oxygen are used to cut and weld metals. This type of cutting is also called gas welding or oxy welding. In this method of welding, the welder will use a welding torch that welds the metals.

Welding is created when two pieces of metal are put under extreme heat that presents a pool of molten metal that is shared between the two. This pool has other metal in it that is called "filler" metal and type of filler will depend on whatever material that is going to be welded.

When the welder is going to weld in Oxy-fuel welding, they use a welding torch. However, in Oxy-Fuel cutting, they use a cutting torch. This torch is used to heat the metal to a hotter temperature called a kindling temperature. This creates a stream of oxygen that is then placed on the metal and as the metal combines with the steam of oxygen it flows from the cut that was made and becomes an oxide slag. The cut is also called a kerf.

It is important to note in this discussion that some torches don't mix oxygen with fuel so they are not oxy-fuel torches. They will use atmospheric air instead. These use only a single tank torch and metals can't be melted with a single tank torch.

Oxy-fuel cutting has four requirements that are basic to doing it. These include:

- The temperature ignition of the material that is going to be cut has to be lower than the material's melting point. If not, it will melt before the welder is able to cut it and it will flow into the melting pool.

- The melting point of the oxide has to be lower than the material that surrounds it so that the oxygen jet can mechanically blow the oxide away.
• The reaction of the oxidation between the metal and the oxygen jet has to be strong enough to maintain the temperature ignition.

• There should be a small amount of gaseous reaction products so that these gases don't dilute the oxygen for cutting.

The oxygen stream's purity will determine the cutting speed and the edge of the cut's quality. This means that the way the nozzle is designed will play a role in the protection of the oxygen stream which is prone to air entrainment.

Also, the oxygen should be pure to 99.5% or higher. When the purity of the oxygen is lower, it will also lower the speed of cutting. As an example, a decrease of only 1% will cause the cutting speed to be lower by 25% and it also increases the consumption of gas by 25%.

Fuel gases that are most used in Oxy-fuel cutting are MAPP (methylacetylene-propadiene), natural gas, propylene, acetylene and propane. The way the gas that is chosen performs in cutting speed, pierce time and edge quality will depend on the way heat is distributed within the two flame cones (inner and outer) and the flame temperature. In this case, acetylene will be the hottest flame for this cutting process.
**Plasma Cutting Overview**

Plasma cutting uses a plasma torch to cut metals like steel and other metals. It uses an inert gas which is blown out of a nozzle at a high speed (sometimes compressed air is used). As this happens it forms an electrical arc that goes through the nozzle to the surface that the welder is cutting which turns part of the gas into plasma.

Plasma is very hot and it easily cuts metal and it quickly blows the metal that has melted away from the cut that is made. Plasma is also used in the art of plasma arc welding. There are different ways this process works depending on the machine that is used. Two types are used for plasma cutting:

**HF Contact** -- this can found in some of the low budget models of machines. This uses a high voltage spark and a high frequency to ionize air. This goes through the torch head and initiates an arc when the torch comes in contact with the material to be cut. These machines will not cut CNC applications.

**Pilot Arc** -- these use two cycles to produce plasma. They first use a high voltage, low current circuit that starts a small spark that has a high intensity. This starts inside the body of the torch and generates a small pouch of plasma gas called a pilot arc. There is an electrical path return that is already built into the head of the torch. The pilot arc holds back until it comes into contact with the piece to be cut. At this point it triggers a response to ignite the main plasma arc for the cutting. The arc is extremely hot at this point.

Plasma will cut thin and thick materials effectively and sometimes a hand held torch can be used to cut some things. The thicker the metal to be cut though, the easier for a computer controlled torch to cut; these can cut with very close precision.
In the past plasma cutters would only work on materials that could conduct electricity, but today they can work on all types of metals because of the ignition arc that is already built into the nozzle of the cutters.

The pilot arc is started by a plasma cutter in many different ways that is determined by the environment that the cutter is in and its age. The older plasma cutters start the arc through a high voltage, high frequency circuit. These are units that are often difficult to repair and welders using the machine risk electrocution; these also have a higher amount of admissions that are at a radio frequency. However, those plasma cutters that work near CNC hardware or near computers will use this method.

There are analog plasma cutters that use a mains-frequency heavy transformer. Inverter plasma cutters will use more complicated transistors.

New technology has made plasma cutters better in creating a better plasma torch that has a small nozzle and a plasma arc that is thinner. This creates the ability for the plasma cutter to cut almost as well as a laser.
Carbon Cutting or Carbon Arc Overview

Carbon cutting or air carbon arc cutting uses an electric arc to melt metal. It blows away the melted or molten metal through the use of compressed air that is sent out in a high velocity jet. Instead of being a chemical reaction as in many processes it is a physical one and can be used with most metals.

Generally this type of cutting is used by industries like mines, construction and quarries to remove stainless welds or hard surfaces. They also use this method when they are preparing cast iron or manganese steel for repairs. Other uses for this method are to cut steel plates that may have been imbedded into concrete or to cut pilings where you don't want to remove back fill.

This method only needs a regular power source for the cutting with sufficient amperage -- between 150 -600 amps depending on the electrode size, and Direct Current Reverse Polarity. Cutting can be made on most metals including iron, steel, stainless steel, copper and nickel alloys and iron; it can also be used with aluminum. The air pressure needed is generally provided by any canister of compressed air that is 80-100 psi for air pressure.

In most cases a heavy duty welding machine will do this cutting and has to have a constant current. Some applications of this cutting do use alternating currents and they must use an AC type of carbon electrode.

Carbon arc cutting is used to cut metal but it is also used to gouge out any defects in a metal, it can remove bad welds and it can prepare grooves that are waiting for welding. This cutting produces a small cut so that the metal that surrounds the area that is being worked on doesn't go to high temperatures because the metal is removed quickly after it is melted. Also, because this process is quick, it reduces the tendency of the metal to crack or become distorted. The process usually is a manual process rather than an
automated one.

Carbon Arc Cutting isn't recommended if the welder is going to do weld preparation for the following metals: titanium, stainless steel, zirconium or other types of metals that need cleaning before they are cut. They will have to be cleaned thoroughly through grinding so that any carbonized material next to the cut is completely cleaned away. However, when these materials need to be scraped to remelt them, this process can be used.

There are a few safety precautions that must be taken into consideration when dong carbon arc cutting. Metal deflection plates must be put up if the welder is gouging because the air blast that is used can make molten metal travel over several feet.

It is important to also move any materials that are combustible because the molten metal can become a fire hazard since it travels at such a high level. This is also a very loud process so some type of ear protection should be worn by the person cutting the arc.