

WELDING

Lexile 720L

Welding is a way to join two pieces of metal. It is used to build cars and tall buildings. Some artists weld metal to make sculptures. Welding may use heat or pressure to join pieces. Some types of welding use both heat and pressure.

Welding is stronger than other ways of joining metal. The places where the metal is joined are called **joins**. The joins are made of the same metal as the pieces. This means they are as strong as the pieces. The pieces of metal can be joined in many ways. This gives builders more choices.

Humans have been welding metal for thousands of years. Modern methods allow welders to work anywhere. Welders can join metal on the ground, underwater, and in space.

History

Humans began welding during the Bronze Age. This was from about 3000 to 1200 BCE. At this time, people began using more metal. They needed to make weapons and tools.

Early welders used forge welding to join metal pieces. A forge is a very hot fire or furnace used to heat metal. **Blacksmiths** heated the metal until it glowed red. Blacksmiths are people who shape metal in forges. The blacksmiths put two pieces on an **anvil**. An anvil is a block used to hammer and shape metal. The edge of one piece of metal covered the edge of the other somewhat. The blacksmith used a hammer to hit the pieces where they touched. Hitting the pieces joined the hot metal.

Forge welding is not good for all metal work. Only soft metals can be joined this way. Forge welding is still used in places that do not have electricity.

Welding became more important during the Industrial Revolution. The Industrial Revolution began in the late eighteenth century. This was a time when machines were being made. The machines were needed for factories and farms.

Welders began to use electricity during the nineteenth century. One method was electric arc welding. The welding torch was also invented. These methods were imperfect, however. One problem was oxidation. When oxygen in the air joins with the heated metals, oxidation may occur. These welds are breakable. Sometimes workers were hurt when welds on machines did not hold.

Methods

Arc welding uses an arc of electricity. The electricity melts the metals. Filler, called a welding rod, is used in the joins. The welder attaches a grounding wire to the metal. This keeps the welder from being hurt by electricity. Then a wire called an electrode is placed on the metal to



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be welded. The electrode conducts electricity. When the welder lifts the electrode, an electric arc melts the filler material and metal pieces.

Torch welding uses an oxyacetylene torch to melt the metal and a welding rod. The torch burns acetylene and oxygen. The flame is very hot. The welder moves the torch and rod together to make a join.

Flux cored arc welding (FCAW) uses a tube to feed flux to the electrode. Flux is made of carbonate and silicate. It produces gas when heated. The gas prevents the weld from oxidizing.

Workers can use other types of welding. But they are not as common. Explosion welding joins metals using pressure from explosives. Laser-beam welding uses a laser to heat the metal. Ultrasonic welding uses sound waves to join metal.

Safety

Welding can be dangerous. Workers should wear special safety gear. Welding produces bright light, which can harm the eyes. Workers should always wear special welder's masks. The masks have dark panels to protect the eyes.

A welder's mask will also protect the face from sparks. Welded metal can get very hot, up to 10,000 degrees F (5,538 degrees C). Sparks could cause serious burns. Welders should always wear special heavy gloves and long-sleeved shirts to protect their skin.

Welding can release dangerous fumes such as lead and mercury into the air. Workers should use vent hoods. These will carry the fumes safely away from people.

Underwater welding is very difficult. It is also dangerous. Divers are at risk of many dangers. Divers risk burns, electric shock, heavy currents, drowning, and other dangers. Underwater welders are very well paid. They are also in high demand.

Welding is an important skill. It is used to make and fix ships, buildings, bridges, underwater pipelines, and other objects. It is also a skill used to create art. Several methods of welding are used for different jobs. Welders must train in these methods to make strong joins. Skilled welders are needed in many kinds of jobs.

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COMPREHENSION TEST

Multiple-Choice Questions

1. When did humans begin welding?
 - A. Stone Age
 - B. Bronze Age
 - C. Middle Ages
 - D. Copper Age
 2. When did the Industrial Revolution begin?
 - A. during the early twentieth century
 - B. during the early nineteenth century
 - C. during the late nineteenth century
 - D. during the late eighteenth century
 3. What is oxidation?
 - A. oxygen used by underwater welders
 - B. oxygen added to make joins stronger
 - C. oxygen in the air joins with the heated metal
 - D. oxygen used to make a forge burn hotter
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Fill-in-the-Blank Questions

4. The earliest type of welding was _____ welding.
5. When flux is heated, it produces gas that prevents the weld from _____.
6. Blacksmiths hammer hot metal on an _____ to join and shape it.

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