Acetylene: A gas composed of two parts of carbon and two parts of hydrogen. When burned in the atmosphere of oxygen, it produces one of the highest flame temperatures obtainable.

Acetylene Cylinder: Acetylene is a versatile industrial fuel gas used in cutting, heating, welding, brazing, soldering, flame hardening, metalizing, and stress relieving applications. It is produced when calcium carbide is submerged in water or from petrochemical processes. The acetylene gas produced is then compressed into cylinders or fed into piping systems. Acetylene becomes unstable when compressed in its gaseous state above 15 PSIG (103 kPa). Therefore, it cannot be stored in a "hollow" cylinder under high pressure the way oxygen, for example, is stored. Acetylene cylinders are filled with a porous material (calcium silicate) creating, in effect, a "solid" as opposed to a "hollow" cylinder. The porous filling is then saturated with liquid acetone. When acetylene is pumped into the cylinder, it is absorbed by the liquid acetone throughout the porous filling. It is held in a stable condition (see Figure Below). Filling acetylene cylinders is a delicate process requiring special equipment and training. Acetylene cylinders must, therefore, be refilled only by authorized gas distributors. Acetylene cylinders MUST NEVER be transfilled.

Acetylene: A gas composed of two parts of carbon and two parts of hydrogen. When burned in the atmosphere of oxygen, it produces one of the highest flame temperatures obtainable.

Acetylene Cylinder Interior

Porous filler (calcium-silicate) 8% - 10%
The filler, which completely occupies the steel shell, is 50% - 10% composed of millions of interconnected pores.

Acetone: 42%
Acetone is equal to 42% of the internal volume, and is dispersed throughout the filler.

Acetylene Gas: 36%
The acetylene gas is uniformly absorbed by the acetone. The resulting mixture occupies 78% of the internal volume.

Reserve Volume at 70°F: 10% - 12%
Since acetone and acetylene gas will expand as temperature rises, a safety reserve must be present even at 100%.

Acetylene Regulator: A device used to reduce cylinder pressure to torch pressure and to keep the pressure constant. They are never to be used as oxygen regulators. (See Figure Below)

Air Carbon Arc Cutting (CAC-A): A carbon arc cutting process that removes molten metal with a jet of air. Also referred to as air carbon arc gouging.

Alloy: A substance with metallic properties and composed of two or more chemical elements of which at least one is a metal.

Annealing: Softening metals by heat treating. This most commonly consists of heating the metals up to a critical temperature and then cooling them slowly.

ANSI: Abbreviation for “American National Standards Institute”.

Arc Length: The distance from the tip of the welding electrode to the adjacent surface of the weld pool.

Arc Voltage: The electrical potential between the electrode and work piece.

Arc Welding: A group of welding processes that produces fusion of work pieces by heating them with an arc. The processes are used with or without the application of pressure and with or without filler metal.

Arc Welding (MIG) Gun: A device used to transfer current to a continuously fed consumable electrode, guide the electrode, and direct the shielding gas.

Arc Welding (TIG) Torch: A device used to transfer current to a fixed welding electrode, position the electrode and direct the shielding gas.

Autogenous Weld: A fusion weld made without filler metal.

Automatic Welding: Welding with equipment that requires only occasional or no observation of the welding, and no manual adjustment of the equipment controls.

AWS: Abbreviation for “American Welding Society”.

Axis Of Weld: (See Weld Axis)

Back Gouging: The removal of weld metal and base metal from the weld root side of a welded joint to facilitate complete fusion and complete joint penetration upon subsequent welding from that side.

Backhand Welding: A welding technique in which the welding torch or gun is directed opposite to the progress of welding.

Back Gouging

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Backhand Welding
design required, butt welding of material 3/8” (9.5mm) or thicker often requires some sort of edge preparation before welding.

Blowpipe: Another term used for cutting torch. (See Cutting Torch)

Bond: To join (metals) by applying heat, sometimes with pressure and sometimes with an intermediate or filler metal having a high melting point.

Brazing: A welding process that produces coalescence of materials by heating them to the brazing temperature in the presence of a filler metal having a liquidus above 450°C (900°F) and below the solidus of the base metal, is used. Unlike brazing, in braze welding the filler metal is not distributed in the joint by capillary action.

Brazing: A group of welding processes that produce coalescence of materials by heating them to the braze welding temperature in the presence of a filler metal having a liquidus above 450°C (900°F) and below the solidus of the base metal. The filler metal is distributed between the closely fitted surfaces of the joint by capillary action.

Buildup: A surface variation in which surfacing metal is deposited to achieve the required dimensions.

Burned Metal: Term occasionally applied to the metal which has been combined with oxygen so that some of the carbon changed into carbon dioxide and some of the iron into iron oxide.

Burnout: A non-standard term for oxygen cutting.

Butt Joint: A joint between two members angled approximately the same plane.

C

Cap: A non-standard term for the final layer of a groove weld.

Capping Action: A phenomenon in which a liquid’s surface area falls, or becomes distorted in shape where it is in contact with a solid. It is caused by the difference between the relative attraction of the molecules of the liquid for each other and for those of the solid.

Carbon: An element which, when combined with iron, forms various kinds of steel. In steel, it is the changing carbon content which changes the physical properties of the steel. Carbon is also used in a solid form as an electrode for arc welding and as a mold to hold metal.

Carbon Electrode: A non-filler metal electrode used in arc welding and cutting, consisting of a carbon or graphite rod, and can serve as a source of metallic additions to the weld.

Carbonizing Flame: An acetylene-flame in which there is an excess of acetylene. Also a non-standard term for Reducing Flame.

Cone Hardening: Adding of carbon to the surface of a mild steel object and heat treating to produce a hard surface.

Costs: Metallic forms that are produced by pouring molten metal into a shaped container (mold).

Cylinder: The growing together or growth into one body of the materials being joined. (See Fusion)

Cold Crack: A crack which develops after solidification.

Cold Lap: A non-standard term. A joint with incomplete coalescence (fusion) caused by insufficient application of heat to the base metal.

Collet: A mechanical clamping device used to hold the electrode in position within the welding, cutting or spraying torch.

Combustion: The process of burning a fuel with oxygen in which the products are energy, in the form of light and heat, and by products such as water and carbon dioxide.

Concrete Filler Weld: A weld that has a concave face (may result in cracking).

Cone: The conical part of an oxy-fuel flame next to the orifice of the tip.

Constant Current (CC) Power Source: An arc welding power source with a volt-ampere relationship yielding a small welding current change from a large arc voltage change.

Constant Voltage (CV) Power Source: An arc welding power source with a self-inset relationship yielding a large welding current change from a small arc voltage change.

Contact Tip: A component of a MIG gun that delivers welding current to, and guides, a continuous electrode.

Continuous Weld: A weld that extends continuously from one end of the joint to the other. Where the joint is essentially circular, it extends completely around the joint.

Cover Filler Weld: A fill weld having a convex face (a good weld with no undercut).

Corner Joint: A joint between two members located approximately at right angles to each other to form an “L”.

Covered Electrode: A composite filler metal electrode consisting of a core of a base electrode or metal cored electrode to which a coating sufficient to provide a slag layer on the weld metal has been applied. The covering may contain materials providing such functions as shielding from atmospheric elements, deoxidizing, and can serve as a source of metallic additions to the weld.

Crack: A fracture type of discontinuity characterized by a sharp tip and high ratio of length and width to opening displacement.

Cracking: Action of opening a valve slightly and then closing the valve immediately.

Crater: A depression in the weld face at the termination of the weld bead.

Crater Fill Time: The time interval following weld time but prior to melt back time during which arc voltage or current is directed toward the progress of welding. This angle can also be used to partially define the position of guns, torches, rods, and beams.

D

D D:

Defect: A discontinuity or discontinuities that by nature or accumulated effect render a part or product unable to meet minimum applicable acceptance standards or specifications. The term designates receptibility. See also discontinuity and flaw.

Deposition Rate: The amount of material deposited in a unit of time.

Direct Current electrode Positive (DCeP): The arrangement of direct current arc welding leads in which the electrode is the negative pole and the work piece is the positive pole of the welding arc.

Direct Current electrode Negative (DCen): The arrangement of direct current arc welding leads in which the electrode is the positive pole and the work piece is the negative pole of the welding arc.

Discontinuity: An interruption of the typical structure of a material, such as a lack of homogeneity in its mechanical, metallurgical or physical characteristics. A discontinuity is not necessarily a defect.

DOT: Abbreviation for “Department of Transportation”.

Downslope Time: The time during which the current is changed continuously from final taper current or welding current to final current.

Drag Angle: The travel angle when the electrode is moving in a direction opposite to the progression of welding. This angle can also be used to partially define the position of guns, torches, rods, and beams.

Duty Cycle: The percentage of time during a specified test period that a power source or its accessories can be operated at rated output without overheating.

E

Edge Joint: A joint between the edges of two or more parallel or nearly parallel members.

Electrode: A component of the electrical circuit that terminates at the arc, molten conduction slag or base metal.

Electrode Extension (See Also Stickout): The length of electrode extending beyond the end of the contact tip.

Elongation: Percentage increase in the length of a specimen when stressed to its yield strength.

Erosion: A condition caused by the continuous metal being removed in a process such as by a cutting torch, by erosion of a cutting torch, or by erosion caused by molten metal or molten metal by molten metal resulting in a reduction in the thickness of the base metal.

F

Face Of Weld (See Weld Face)

Fill Pass: A non-standard term when used for intermediate weld pass.

Filler Material: The material to be added is making a brazed, soldered or welded joint.

Filling Wire: A non-standard term for welding wire.

Fillet: Weld metal in the internal vertex, or corner, of the angle formed by approximately two pieces of metal, giving the joint additional strength to withstand unusual stress.

Fillet Weld: A weld of approximately triangular cross section joining two surfaces approximately at right angles to each other in a lap joint, T-joint or corner joint.

Filter Lens: A colored glass used in goggles, helmets, and shields to exclude harmful light rays.

Flat Position: The position used to weld from the upper side of the joint; the face of the weld is approximately horizontal.

Flux: A material used to bind or prevent the formation of oxides and other undesirable substances in molten metal and on metal surfaces, and to dissipate or otherwise facilitate the removal of such substances.

Flux Cored Arc Welding (FCAW): An arc welding process that uses an arc between a continuous filler metal electrode and the weld pool. The process is used with shielding gas from a flux contained within the tubular electrode, with or without additional shielding from an externally supplied gas and without the application of pressure.

Flux Cored Electrode: A composite tubular filler metal electrode consisting of a metal steel and a core of various powdery materials, producing an extension slag cover on the face of a weld bead.

Forehand Welding (Non-Standard Term: Push Technique): A welding technique in which the welding torch or gun is directed toward the progress of welding.

Fusion: The melting together of filler metal and base metal, or of base metal only, to produce a weld.
Gas. The state of matter in which molecules move freely, so allowing it to expand completely to fill any space that it occupies.

Gas Cylinder. A portable container used for transportation and storage of compressed gas.

Gas Lens. One or more fine mesh screens located in the gas nozzle to produce a stable stream of shielding gas. This device is primarily used for gas tungsten arc welding.

Gas Metal Arc Welding (GMAW). An arc welding process that uses an arc between a continuous filler metal electrode and the weld pool. The process is used with shielding gas from an externally supplied gas and without the application of pressure.

Gas Nozzle. A device at the exit end of the torch or gun that directs shielding gas.

Gas Packs. Cavities in weld metal caused by entrapping gas (possibly argon).

Gas Regulator. A device for controlling the delivery of gas at some substantially constant pressure.

Gas Shielded Arc Welding. A group of processes including, flux cored arc welding, gas metal arc welding, gas tungsten arc welding and plasma arc welding.

Gas Shielded Flux Cored Arc Welding (FCAW-G). A flux cored arc welding process variation in which shielding gas is supplied through the gas nozzle, in addition to that obtained from the flux within the electrode.

Gas Tungsten Arc Welding (GTAW). An arc welding process that uses an arc between a tungsten electrode (non-consumable) and the weld pool. The process is used with shielding gas and without the application of pressure.

Globular Transfer, Gas Metal Arc Welding. The transfer of molten metal in large drops from a consumable electrode across the arc. See also short circuiting transfer and spray transfer.

Gouging. A thermal cutting process variation that removes metal by melting or burning the entire removed portion, to form a bevel or groove. For more information on gouging metal by melting or burning the entire removed portion, to form a bevel or groove, see Gouging Techniques for Specific Materials.

Groove Angle. The included angle between the groove faces of a weld groove.

Groove Weld. A weld in a weld groove on a work piece surface, between work piece edges, between work piece surfaces, or between work piece edges and surfaces.

Ground Clamp. A non-standard and incorrect term for work piece connection.

Ground Connection. A non-standard and incorrect term for work piece connection.

Gouging Techniques for Specific Materials. A group of processes including, gas metal arc welding, gas tungsten arc welding and plasma arc welding.

Granular Powder. A device at the exit end of the gun that directs the atomizing air or other gas.

Ground Lead. A non-standard and incorrect term for work piece lead.

I

Ignition: The action of firing an explosive mixture of gases or vapors by means of a flame, electric spark, heating of sudden pressure change.

Included Angle. The angle of the groove between the two work pieces that are welded together. A non-standard term when used for groove angle.

Incomplete Fusion. A weld discontinuity in which fusion did not occur between weld metal and fusion faces or adjoining weld beads.

Inert Gas. A gas that normally does not combine chemically with materials (Argon and Helium are inert gases).

Inside Corner Weld. Two metals fused together: one metal is held 90° to the other. The fusion is performed inside the vertex of the angle.

Intermediate Weld Pass. A single progression of welding along a joint subsequent to the root pass(es) and prior to the cover pass(es).

Intermittent Weld. A weld which the continuity is broken by rewelded spaces.

Interpass Temperature. In a multi-pass weld, the temperature of the weld area between weld passes.

Interpass Temperature. In a multi-pass weld, the temperature of the weld area between weld passes.

Interrupting Temperature. The temperature at which a substance will catch fire and continue to burn, also referred to as the “ignition point”.

K

Knee. The supporting structure of the lower arm in a resistance welding machine.

Knurling. A device at the exit end of the torch or cutting torch in which the fuel gas and oxygen are mixed.

Liquidus. The liquidus temperature is the higher temperature at which the filler metal is completely melted. This is minimum temperature at which brazing will take place.

Liquidus. The liquidus temperature is the higher temperature at which the filler metal is completely melted. This is minimum temperature at which brazing will take place.

L

Land. A non-standard term for root face.

Lap Joint. A joint between two overlapping members in parallel planes.

Layer. A certain weld metal thickness made of one or more passes.

Lens. A device at the exit end of the gun that directs the atomizing air or other gas.

Liquified Gas. A substance which is gaseous at ambient temperature and atmospheric pressure but has been transformed into liquid by changing its temperature and/or pressure. If the critical temperature for the substance is above the ambient temperature it can be liquefied by either lowering the temperature or increasing the pressure. If its critical temperature is below ambient it cannot be liquefied by applying pressure alone, it must also be cooled.
Contents

Pass: (See weld pass)

Penetration: A non-standard term for joint penetration.

Pilot Arc: A low current arc between the electrode and the conducting nozzle of the plasma arc torch to ionize the gas and facilitate the start of the welding or plasma cutting arc.

Plasma Arc Cutting (PAG): An arc cutting process that uses a constricted arc and removes the molten metal with a high-velocity jet of ozone gas issuing from the constricting orifice.

Plug Weld: A weld made in a circular hole in one member of a joint fusing that member to another member.

Polarity: See direct current electrode negative and direct current electrode positive.

Porosity: Cavity type discontinuities formed by gas entrapment during solidification.

Perforation: The protrusion of weld metal beyond the weld toe or weld root.

Quickesium: A gas formed of oxygen and other substances. For example, a metal is oxidized when it is burned, i.e., oxygen is combined with all the metal or parts of it.

Root Bead: A weld bead that extends into or overlaps the weld root.

Root Of Weld: (See Weld Root)

Root Weld: A weld made to hold the parts of a weldment together until the final welds are made.

Self-Shielded Flux Cored Arc Welding (FCW): A flux cored arc welding process in which shielding gas is obtained exclusively from the flux within the electrode.

Semi-Automatic Welding: Manual welding with equipment that automatically contends one or more of the welding conditions.

Shielded Metal Arc Welding (SMAW): An arc welding process with an arc between a covered electrode and the work piece. The process is used with shielding from the decomposition of the electrode covering, without the application of pressure and with filler metal from the electrode.

Shimming Gas: Protective gas used to prevent or reduce arc contaminations.

Short Circuiting Transfer, Gas Metal Arc Welding: Metal transfer in which molten metal from a consumable electrode is deposited during repeated short circuits.

Sling: A non-metallic product resulting from the mutual dissolution of flux and non-metallic impurities in some welding and braze processes.

Slip Inclusion: Non-metallic solid material entrapped in the weld metal or between weld metal and base metal.

Soldering: A group of welding processes, soldering uses metal to join two pieces of metal. However, the metal added during the process has a melting point lower than that of the work piece, so only the added metal is melted, not the work piece. Soldering uses metals with a melting point below 800°F (427°C). The filler metal is distributed between the closed fitted surfaces of the joint capillary action.

Solvent: The highest temperature at which a metal or an alloy is completely solid.

Spatter: The metal particles expelled during fusion welding that do not form a part of the weld.

Spot Weld: A weld made between or upon overlapping members in which coalescence may start and occur on the facing surfaces or may proceed from the outer surface of one member.

Spray Transfer, Gas Metal Arc Welding: Metal transfer in which molten metal from a consumable electrode is propelled axially across the arc in small droplets.

Standard Cubic Feet Per Hour (SCFH): USC unit for volumetric flow rate of air or gas (same as free air or free gas) at a temperature of 1.57 °C (50°F) and an absolute pressure of 101.3 kPa (14.7 psig), expressed in cubic feet per hour.

Stickout, Gas Metal Arc Welding: Gas shielded flux cored arc welding, the length of ungrounded electrode extending beyond the end of the gas nozzle.

Stickout, Gas Tungsten Arc Welding: The length of tungsten electrode extending beyond the end of the gas nozzle.

Stinger: Term used for stick electrode holder.

Strain: Reaction of an object to a stress.

Stress: Load imposed on an object.

Stress Relaxing: Even heating of a structure to a temperature below the critical temperature followed by a slow, even cooling.

Contents

Open Circuit Voltage (OCV): The voltage between the output terminals of the power source when no current is flowing to the torch or gun.

Open Root Joint: An unwelded joint without backing or consumable.

Orifice: Opening through which gas flows. It is usually the final opening controlled by a valve.

OSHA: Abbreviation for “Occupational Safety and Health Administration”.

Outside Corner Weld: Fusing two pieces of metal together with the fusion taking place on the under part of the seam.

Overhead Position: The position in which welding is performed from the underside of the joint.

Overlap: The protrusion of weld metal beyond the weld face or weld root.

Oxidizing Combining oxygen with other substance. For example, a metal is oxidized when it is burned, i.e., oxygen is combined with all the metal or parts of it.

Oxidizing Flame: A fuel gas flame having an oxidizing effect due to excess oxygen.

Oxy-Acetylene Cutting: An Oxy-fuel gas flame having an oxidizing effect due to excess oxygen.

Oxy-Acetylene Welding: An Oxy-fuel gas cutting process used to burn metals to be cut from the reaction of oxygen with the base metal at elevated temperatures. The necessary temperature is maintained by gas flames resulting from the combustion of acetylene with oxygen.

Oxy-Fuel Cutting: The process used to sever metals by means of the reaction of oxygen with the base metal at elevated temperatures. The necessary temperature is maintained by gas flames resulting from the combustion of fuel with oxygen. An Oxy-fuel gas welding process that produces fused metals by heating them with a gas flame or flames obtained from the combustion of acetylene with oxygen. The process may be used with or without the application of pressure and with or without the use of a filler metal.

Oxy-Fuel Cutting Torch: A device used for directing the preheating flame produced by the controlled combustion of fuel gases and to direct and control the cutting oxygen.

Oxygen: A gas formed of the element oxygen. When oxygen very actively supports combustion it is called burning; when oxygen is slowly combined with a substance it is called oxidation.

Oxygen Cutting: A process of cutting ferrous metals by means of the chemical action of oxygen on elements in the base metal at elevated temperatures.

Oxygen Cylinder: (See Gas Cylinder)

Oxygen Hose: (See Hose)

Oxygen Hydrogen Flame: The chemical combining of oxygen with hydrocarbons.


Oxygen Regulator: A device used to reduce cylinder pressure to torch pressure and to keep the pressure constant. They are never to be used as gas regulators.
**Tungsten Inclusion**. A discontinuity consisting of tungsten entrapped in weld metal.

**Undercut**. A groove melted into the base metal adjacent to the weld toe or weld root and left unfilled by weld metal.

**Vertical Position**. The position of welding in which the weld axis is approximately vertical.

**Weld Axis**. A line through the length of the weld, perpendicular to and at the geometric center of its cross section.

**Weld Bead**. A weld deposit resulting from a pass.

**Weld Face**. The exposed surface of the weld on the side from which welding was done.

**Weld Metal**. Metal in a fusion weld consisting of that portion of the base metal and filler metal melted during welding.

**Weld Pass**. A single progression of welding or surfacing along a joint or substrate. The result of a pass is a weld bead or layer.

**Weld Pool**. The localized volume of molten metal as a weld prior to its solidification as weld metal.

**Weld Reinforcement**. Weld metal in excess of the quantity required to fill a joint.

**Weld Root**. The points, as shown in cross section, at which the back of the weld intersects the base metal.

**Weld Toe**. The junction of the weld face and the base metal.

**Welding**. A joining process that produces coalescence of materials by heating them to the welding temperature, with or without the application of pressure or by the application of pressure alone, and with or without the use of filler metal.

**Welding Arc**. Controlled electrical discharge between the electrode and the work piece that is formed and sustained by the establishment of gaseous conductive medium, called arc plasma.

**Welding Electrode**. A component of the welding circuit through which current is conducted and that terminates at the arc, molten conductive slag, or base metal.

**Welding Helmet**. A device equipped with a filter plate designed to be worn on the head to protect eyes, face, and neck from arc radiation, radiated heat, spatter or other harmful matter expelled during some welding and cutting processes.

**Welding Leads**. The work piece lead and electrode lead of an arc welding circuit.

**Welding Power Source**. An apparatus for supplying current and voltage suitable for welding.

**Welding Procedure Specification (WPS)**. A document providing the required welding variables for a specific application to assure repeatability by properly trained welders and welding operators.

**Welding Rod**. Filler metal in wire or rod form, used in gas welding and brazing processes and in those arc welding processes in which the electrode does not provide the filler metal.

**Welding Sequence**. The order of making welds in a weldment.

**Welding Torch**. A device used in gas cutting for controlling the gases used for preheating and the oxygen used for cutting the metal.

**Welding Wire**. Metal wire that is melted and added to the welding puddle to produce the necessary increase in bead thickness.

**Weldment**. Assembly of component parts joined together by welding.

**Whipping**. A manual welding technique in which the arc or flame is oscillated backwards and forwards in the direction of travel as it progresses along the weld path.

**Wire Feed Speed**. The rate at which wire is consumed in arc welding.

**Wire Stick Out**. The distance from the contact tip of a MIG gun to end of the welding electrode protruding from it.

**Work Lead**. A non-standard term for work piece lead.

**Workpiece**. The part that is welded, brazed, soldered, thermal cut or thermal sprayed.

**Workpiece Connection**. The connection of the work piece lead to the work piece.

**Workpiece Lead**. The electrical conductor between the arc welding current source and work piece connection.

**Yield Strength**. Stress at which a specimen assumes a permanent set.