

Terms and Definitions

(from “Welding terms and definitions” published by American Welding Society)

A

all-weld-metal test specimen. A test specimen with the reduced section composed wholly of weld metal

arc blow. The deflection of an electric arc from its normal path because of magnetic forces.

arc force. The axial force developed by a plasma.

arc seam weld. A seam weld made by an arc welding process.

arc spot weld. A spot weld made by an arc welding process.

arc time. The time during which an arc is maintained in making an arc weld.

arc voltage. The voltage across the welding arc.

arc welding (AW). A group of welding processes which produces coalescence of metal by heating them with an arc, with or without the application of pressure and with or without the use of filler metal.

as-welded. The condition of weld metal, welded joints, and weldments after welding but prior to any subsequent thermal, mechanical, or chemical treatments.

autogenous weld. A fusion weld made without the addition of filler metal.

automatic welding. Welding with equipment which performs the welding operation without adjustment of the controls by a welding operator. The equipment may or may not perform the loading and unloading of the work. See machine welding.

axis of a weld. A line through the length of a weld, perpendicular to and at the geometric center of its cross section.

B

back gouging. The removal of weld metal and base metal from the other side of a partially

welded joint to assure complete 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. Sometimes referred to as the “pull gun technique” in GMAW and FCAW. See travel angle, word angle, and drag angle.

backing. A material (base metal, weld metal, carbon, or granular material) placed at the root of a weld joint for the purpose of supporting molten weld metal.

backing pass. A pass made to deposit a backing weld.

backing ring. Backing in the form of a ring, generally used in the welding of piping.

backing strip. Backing in the form of a strip.

backing weld. Backing in the form of a weld.

backstep sequence. A longitudinal sequence in which the weld bead increments are deposited in the direction opposite to the progress of welding the joint. See block sequence, cascade sequence, continuous sequence, joint building sequence, and longitudinal sequence.

bare metal arc welding (BMAW). An arc welding process which produces coalescence of metals by heating them with an electric arc between a bare or lightly coated metal electrode and the work. Neither shielding nor pressure is used and filler metal is obtained from the electrode. (This process is now obsolete in industrial applications).

base metal (material). The metal (material) to be welded, brazed, soldered, or cut. See also substrate.

base metal test specimen. A test specimen composed wholly of base-metal.

bevel. An angular type of edge preparation.

bevel angle. The angle formed between the prepared edge of a member and a plane perpendicular to the surface of the member.

blind joint. A joint, no portion of which is visible.

block sequence. A combined longitudinal and buildup sequence for a continuous multiple pass weld in which separated lengths are completely or partially built up in cross section before intervening lengths are deposited. See also backstep sequence, longitudinal sequence, etc.

boxing. The continuation of a fillet weld around a corner of a member as an extension of the principal weld.

burn-thru. A term erroneously used to denote excessive melt-thru or a hole. See melt-thru.

burn-thru weld. A term erroneously used to denote a seam weld or spot weld.

buttering. A form of surfacing in which one or more layers of weld metal are deposited on the groove face of one member (for example, a high alloy weld deposit on steel base metal which is to be welded to a dissimilar base metal). The buttering provides a suitable transition weld deposit for subsequent completion of the butt weld.

butt joint. A joint between two members aligned approximately in the same plane.

button. That part of a weld, including all or part of the nugget, which tears out in the destructive testing of spot, seam, or projection welded specimens.

butt weld. An erroneous term for a weld in a butt joint. See butt joint.

C

carbon arc cutting (CAC). An arc cutting process in which metals are severed by melting them with the heat of an arc between a carbon electrode and the base metal.

carbon arc welding (CAW). An arc welding process which produces coalescence of metals by heating them with an arc between a carbon electrode and the work. No shielding is used. Pressure and filler metal may or may not be used.

cascade sequence. A combined longitudinal and buildup sequence during which weld beads are deposited in overlapping layers. See also

backstep sequence, block sequence, longitudinal sequence.

chain intermittent fillet welding. Two lines of intermittent fillet welds on a joint in which the fillet weld increments on one side are approximately opposite to those on the other side of the joint.

clad metal. A composite metal containing two or three layers that have been welded together. The welding may have been accomplished by roll welding, arc welding, casting, heavy chemical deposition or heavy electroplating. See cladding, surfacing.

cladding. A relatively thick layer (> 1 mm (0.04 in.)) of material applied by surfacing of the purpose of improved corrosion resistance or other properties (see coating, surfacing, and hardfacing).

coalescence. The growing together or growth into one body of the materials being welded.

coated electrode. See preferred terms covered electrode and lightly coated electrode. See electrode.

coating. A relatively thin layer (> 1 mm (0.04 in.)) of material applied by surfacing for the purpose of corrosion prevention, resistance to high temperature scaling, wear resistance, lubrication, or other purposes. See cladding, surfacing, and hardfacing.

coil without support. A filler metal package type consisting of a continuous length of electrode in coil form without an internal support. It is appropriately bound to maintain its shape.

coil with support. A filler metal package type consisting of a continuous length of electrode in coil form wound on an internal support which is a simple cylindrical section without flanges.

complete fusion. Fusion which has occurred over the entire base material surfaces intended for welding, and between all layers and passes.

complete joint penetration. Joint penetration in which the weld metal completely fills the groove and is fused to the base metal throughout its total thickness.

composite joint. A joint produced by welding used in conjunction with a non-welding process.

concave fillet weld. A fillet weld having a concave face.

concave root surface. A root surface which is concave.

concavity. The maximum distance from the face of a concave fillet weld perpendicular to a line joining the toes.

concurrent heating. The application of supplemental heat to a structure during a welding or cutting operation.

consumable guide electro slag welding. A method of electroslag welding in which filler metal is supplied by an electrode and its guiding member. See electroslag welding (ESW).

consumable insert. Preplaced filler metal which is completely fused into the root of the joint and becomes part of the weld.

contact tube. A device which transfers current to a continuous electrode.

continuous sequence. A longitudinal sequence in which each pass is made continuously from one end of the joint to the other. See backstep sequence, longitudinal sequence. etc.

continuous weld. A weld extends continuously from one end of a joint to the other. Where the joint is essentially circular, it extends completely around the joint.

convex fillet weld. A fillet weld having a convex face.

convex root surface. A root surface which is convex.

convexity. The maximum distance from the face of a convex fillet weld perpendicular to a line joining the toes.

corner-flange weld. A flange weld with only one member flanged at the location of welding.

corner joint. A joint between two members located approximately at right angles to each other.

cover lens (eye protection). A round cover plate.

cover plate (eye protection). A removable pane or colorless glass, plastic-coated glass, or plastic that covers the filter plate and protects it from weld spatter, pitting, or scratching when used in a helmet, hood or goggle.

crack. A fracture-type discontinuity characterized by a sharp tip and high ratio to length and width to opening displacement.

crater. In arc welding, a depression at the termination of a weld bead or in the molten weld pool.

crater crack. A crack in the crater of a weld bead.

cylinder. A portable container used for transportation and storage of a compressed gas.

D

defect. A discontinuity or discontinuities which by nature or accumulated effect (for example, total crack length) render a part or product unable to meet minimum applicable acceptance standards or specifications. This term designates rejectability. See discontinuity and flaw.

defective weld. A weld containing one or more defects.

deposited metal. Filler metal that has been added during a welding operation.

deposition efficiency (arc welding). The ratio of the weight of deposited metal to the net weight of filler metal consumed, exclusive of stubs.

depth of fusion. The distance that fusion extends into the base metal or previous pass from the surface melted during welding.

dilution. The change in chemical composition of a welding filler material caused by the admixture of the base material or previously deposited weld material in the deposited weld bead. It is normally measured by the percentage of base material or previously deposited weld material in the weld bead.

direct current electrode negative. The arrangement of direct current arc welding leads in which the work is the positive pole and the electrode is the negative pole of the welding arc. See also straight polarity.

direct current electrode positive. The arrangement of direct current arc welding leads in which the work is the negative pole and the electrode is the positive pole of the welding arc. See also reverse polarity.

direct current reverse polarity (DCRP). See reverse polarity and direct current electrode positive.

direct current straight polarity (DCSP). See straight polarity and direct current electrode negative.

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

double-welded joint. In arc and oxyfuel gas welding, any joint welded from both sides.

drag angle. The travel angle when the electrode is pointing backward. See also back-hand welding. Note: This angle can be used to define the position of welding guns, welding torches, high energy beams, welding rods, thermal cutting and thermal spraying guns.

drop-thru. An undesirable sagging or surface irregularity, usually encountered when brazing or welding near the solidus of the base metal caused by overheating with rapid diffusion or alloying between the filler metal and the base metal.

drum. A filler metal package type consisting of a continuous length of electrode wound or coiled within an enclosed cylindrical container.

duty cycle. The percentage of time during an arbitrary test period, usually 10 min. during which a power supply can be operated at its rated output without overloading.

E

edge flange weld. A flange weld with two members flanged at the location of welding.

edge joint. A joint between the edges of two or more parallel or nearly parallel members.

edge preparation. The surface prepared on the edge of a member for welding.

edge weld. A weld in an edge point.

effective length of weld. The length of weld throughout which the correctly proportioned cross section exists. In a curved weld, it shall be measured along the axis of the weld.

effective throat. The minimum distance from the root of a weld to its face less any reinforcement. See also joint penetration.

electrode

arc welding electrode. A component of the welding circuit through which current is conducted between the electrode holder and the arc. See arc welding.

bare electrode. A filler metal electrode consisting of a single metal or alloy that has been produced into a wire, strip, or bar form and that has had no coating or covering applied to it other than that which was incidental to its manufacture or preservation.

carbon electrode. A non-filler material electrode used in arc welding or cutting, consisting of a carbon or graphite rod, which may be coated with copper or other coatings.

composite electrode. Any of a number of multicomponent filler metal electrodes in various physical forms such as stranded wires, tubes, and covered wire.

covered electrode. A composite filler metal electrode consisting of a core of a bare electrode or metal cored electrode to which a covering sufficient to provide a slag layer on the weld metal has been applied. The covering may contain materials providing such functions as shielding from the atmosphere, deoxidation, and arc stabilization and can serve as a source of metallic additions to the weld.

flux cored electrode. A composition filler metal electrode consisting of a metal tube or other hollow configuration containing ingredients to provide such functions as shielding atmosphere, deoxidation, arc stabilization and slag formation. Alloying materials may be included in the core. External shielding may or may not be used.

metal cored electrode. A composite filler metal electrode consisting of a metal tube or other hollow

configuration containing alloying ingredients. Minor amounts of ingredients providing such functions as arc stabilization and fluxing of oxides may be included. External shielding gas may or may not be used.

stranded electrode. A composite filler metal electrode consisting of stranded wires which may mechanically enclose materials to improve properties, stabilize the arc or provide shielding.

emissive electrode. A filler metal electrode consisting of a core of a bare electrode or a composite electrode to which a very light coating has been applied to produce a stable arc.

lightly coated electrode. A filler metal electrode consisting of a metal wire with a light coating applied subsequent to the drawing operation, primarily for stabilizing the arc.

metal electrode. A fillet or non-filler metal electrode, used in arc welding or cutting consisting of a metal wire or rod that has been manufactured by any method and that is either bare or covered with a suitable covering or coating.

tungsten electrode. A non-filler metal electrode used in arc welding or cutting, made principally of tungsten.

electroslag welding electrode. A filler metal component of the welding circuit through which current is conducted between the electrode guiding member and the molten slag. Note: Bare electrodes and composite electrodes as defined under "arc welding electrode" are used for electroslag welding. A consumable guide may also be used as part of the electroslag welding electrode system.

electrode extension (GMAW, FCAW, SAW). The length of unmelted electrode extending beyond the end of the contact tube during welding.

electrode holder. A device used for mechanically holding the electrode while conducting current to it.

electrode lead. The electrical conductor between the source of arc welding current and the electrode holder.

electroslag welding (ESW). A welding process producing coalescence of metals with molten slag which melts the filler metal and the surfaces of the work to be welded. The molten weld pool is shielded by this slag which moves along the full cross-section of the joint as welding progresses. The process is initiated by an arc which heats the slag. The arc is then extinguished and the conductive slag is maintained in a molten condition by its resistance to electric current passing between the electrode and the work. See electroslag welding electrode and consumable guide electroslag welding.

exhaust booth. A mechanically ventilated, semi-enclosed area in which an air flow across the work area is used to remove fumes, gases, and material particles.

F

face of weld. The exposed surface of a weld on the side from which welding was done.

face reinforcement. Reinforcement of weld at the side of the joint from which welding was done. See also root reinforcement.

face shield (eye protection). A device positioned in front of the eyes and a portion of, or all of, the face, whose predominant function is protection of the eyes and face. See also hand shield and helmet.

faying surface. That mating surface of a member which is in contact or in close proximity with another member to which it is to be joined.

feed rate. The rate at which material passes through a gun in a unit of times. (See preferred term wire feed speed).

ferrite number. An arbitrary, standardized value designating the ferrite content of an austenitic stainless steel weld metal. It should be used in place of percent ferrite or volume percent ferrite on a direct one to one replacement basis. See the latest edition of AWS A4.2 Standard Procedures for Calibrating Magnetic Instruments to Measure the Delta Ferrite Content of Austenitic Stainless Steel Weld Metal.

filler metal (material). The metal (material) to be added in making a welded, brazed, or soldered joint. See electrode, welding rod.

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 (eye protection). A round filter plate.

filter plate (eye protection). An optical material which protects the eyes against excessive ultraviolet, infrared, and visible radiation.

finer. Any or all material finer than a particular mesh under consideration.

fissure. A small crack-like discontinuity with only slight separation (opening displacement) of the fracture surfaces. The prefixes macro or micro indicate relative size.

fixture. A device designed to hold parts to be joined in proper relation to each other.

flange weld. A weld made on the edges of two or more members to be joined, at least one of which is flanged.

flat position. The welding position used to weld from the upper side of the joint: the face of the weld is approximately horizontal.

flaw. A near synonym for discontinuity but with an undesirable connotation. See defect and discontinuity.

flowability. The ability of molten filler metal to flow or spread over a metal surface.

flux. Material used to prevent, dissolve, or facilitate removal of oxides and other undesirable surface substances.

flux cored arc welding (FCAW). An arc welding process which produces coalescence of metals by heating them with an arc between a continuous filler metal (consumable) electrode and the work. Shielding is provided by a flux contained within the tubular electrode. Additional shielding may or may not be obtained from an externally supplied gas or gas mixture.

flux cored arc welding-electrode gas (FCAW-EG). A variation of the flux cored arc welding process in which molding shoes are used to confine the molten weld metal for vertical position welding. Additional shielding may or may not be obtained from an externally supplied gas or gas mixture.

forehand welding. A welding technique in which the welding torch or gun is directed toward the progress of welding. See also travel angle, work angle, and push angle.

full fillet weld. A filler weld whose size is equal to the thickness of the thinner member joined.

fusion. The melting together of filler metal and base metal (substrate), or of base metal only, which results in coalescence. See depth of fusion.

fusion face. A surface of the base metal which will be melted during welding.

fusion welding. Any welding process or method which uses fusion to complete the weld.

fusion zone. The area of base metal melted as determined on the cross section of a weld.

G

gas metal arc welding (GMAW). An arc welding process which produces coalescence of metals by heating them with an arc between a continuous filler metal (consumable) electrode and the work. Shielding is obtained entirely from an externally supplied gas or gas mixture. Some methods of this process are called MIG or CO₂ welding (non-preferred terms).

gas metal arc welding-electrode gas (GMAW-EG). A variation of the gas metal arc welding process using molding shoes to confine the molten weld metal for vertical position welding.

gas metal arc welding-pulsed arc (GMAW-P). A variation of the gas metal arc welding process in which the current is pulsed. See also pulsed power welding.

gas metal arc welding short circuiting arc (GMAW-S). A variation of the gas metal arc welding process in which the consumable electrode is deposited during repeated short circuits. See also short circuiting transfer.

gas shielding arc welding. A general term used to describe gas metal arc welding, gas tungsten arc welding, and flux cored arc welding when gas shielding is employed.

gas tungsten arc welding (GTAW). An arc welding process which produces coalescence of metals by heating them with an arc between a tungsten (non-consumable) electrode and the work.

Shielding is obtained from a gas or gas mixture. Pressure may or may not be used and filler metal may or may not be used. (This process has sometimes been called TIG welding, a nonpreferred term.)

gas tungsten arc welding-pulsed arc (GTAW-P). A variation of the gas tungsten arc welding process in which the current is pulsed. See also pulsed power welding.

globular transfer (arc welding). A type of metal transfer in which molten filler metal is transferred across the arc in large droplets.

gouging. The forming of a bevel or groove by material removal. See also back gouging.

groove. An opening or channel in the surface of a part or between two components which provides space to contain a weld.

groove angle. The total included angle of the groove between parts to be joined by a groove weld.

groove face. That surface of a member included in the groove.

groove radius. The radius used to form the shape of a J- or U-groove weld joint.

groove type. The geometric configuration of a groove.

groove weld. A weld made in the groove between two members to be joined. The standard types of groove welds are as follows:

- double-bevel-groove weld
- double-flare-bevel-groove weld
- double-flare-V-groove weld
- double-J-groove weld
- double-U-groove weld
- double-V-groove weld
- single-bevel-groove weld
- single-flare-bevel-groove weld
- single-flare-V-groove weld
- single-J-groove weld
- single-U-groove weld
- single-V-groove weld
- square-groove weld

ground connection. An electrical connection of the welding machine frame to the earth for safety. See also work connection and work lead.

gun

arc welding gun. In semi-automatic, machine and automatic welding, a manipulating device to transfer current and guide the electrode into the arc. It may include provisions for shielding and arc initiation.

H

hand shield. A protective device, used in arc welding, for shielding the eyes, face and neck. A hand shield is equipped with a suitable filter plate and is designed to be held by the hand.

hard facing. A particular form of surfacing in which a coating or cladding is applied to a substrate for the main purpose of reducing wear or loss of material by abrasion, impact, erosion, galling, and cavitation. See coating, cladding, and surfacing.

heat-affected zone (HAZ). That portion of the base metal which has not been melted, but whose mechanical properties or microstructure have been already altered by the heat of welding, brazing, soldering, or cutting.

helmet (eye protection). A protection device, used in arc welding, for shielding the eyes, face, and neck. A helmet is equipped with a suitable filter plate and is designed to be worn on the head.

horizontal fixed position (pipe welding). In pipe welding the position of a pipe joint in which the axis of the pipe is approximately horizontal and the pipe is not rotated during welding.

filled weld. The position in which welding is performed on the upper side of an approximately horizontal plane and the face of the weld lies in an approximately vertical plane.

horizontal rolled position (pipe welding). The position of a pipe joint in which the axis of the pipe is approximately horizontal, and welding is performed in the flat position by rotating the pipe.

I

inadequate joint penetration. Joint penetration which is less than that specified.

incomplete fusion. Fusion which is less than complete.

indentation. In a spot, seam, or projection weld, the depression on the exterior surface or surfaces of the base metal.

inert gas. A gas which does not normally combine chemically with the base metal or filler metal. See also protective atmosphere.

infrared radiation. Electromagnetic energy with wavelengths from 770 to 12000 nanometers.

intergranular penetration. The penetration of a filler metal along the grain boundaries of a base metal.

intermittent weld. A weld in which the continuity is broken by recurring unwelded spaces.

interpass temperature. In a multiple-pass weld, the temperature (minimum or maximum as specified) of the deposited weld metal before the next pass is started.

J

joint. The junction of members or the edges of members which are to be joined or have been joined.

joined buildup sequence. The order in which the weld beads of a multiple-pass weld are deposited with respect to the cross section of the joint. See also block sequence and longitudinal sequence.

joint clearance. The distance between the faying surfaces of a joint. In brazing this distance is referred to as that which is present either before brazing, at the brazing temperature, or after brazing is completed.

joint design. The joint geometry together with the required dimensions of the welded joint.

joint efficiency. The ratio of the strength of a joint to the strength of the base metal (expressed in percent).

joint geometry. The shape and dimensions of a joint in cross section prior to welding.

joint penetration. The minimum depth a groove or flange weld extends from its face into a joint, exclusive of reinforcement. Joint penetration may include root penetration. See also complete

joint penetration, root penetration, and effective throat.

joint welding procedure. The materials, detailed methods and practices employed in the welding of a particular joint.

K

kerf. The width of the cut produced during a cutting process.

L

lap joint. A joint between two overlapping members.

layer. A stratum of weld metal or surfacing material. The layer may consist of one or more weld beads laid side by side.

leg of a fillet weld. The distance from the root of the joint to the toe of the fillet weld.

liquidus. The lowest temperature at which a metal or an alloy is completely liquid.

local preheating. Preheating a specific portion of a structure.

local stress relief heat treatment. Stress relief heat treatment of a specific portion of a structure.

longitudinal sequence. The order in which the increments of a continuous weld are deposited with respect to its length. See backstep sequence, block sequence, etc.

M

machine welding. Welding with equipment which performs the welding operation under the constant observation and control of a welding operator. The equipment may or may not perform the loading and unloading of the work. See automatic welding.

manual welding. A welding operation performed and controlled completely by hand. See automatic welding, machine welding, and semi-automatic welding.

melting range. The temperature range between solidus and liquidus.

melting rate. The weight or length of electrode melted in a unit of time.

melt-thru. Complete joint penetration for a joint welded from one side. Visible root reinforcement is produced.

metallic bond. The principal bond which holds metals together and which is formed between base metals and filler metals in all welding processes. This is a primary bond arising from the increased spatial extension of the valence electron wave functions when an aggregate of metal atoms is brought close together.

method. An orderly arrangement or set form of procedure to be used in the application of welding or allied processes.

molten weld pool. The liquid state of a weld prior to solidification as weld metal.

N

nozzle. A device which directs shielding media.

O

open-circuit voltage. The voltage between the output terminals of the welding machine when no current is flowing in the welding circuit.

overhead position. The position in which welding is performed from the underside of the joint.

overlap. The protrusion of weld metal beyond the toe, face, or root of the weld.

P

partial joint penetration. Joint penetration which is less than complete. See also complete joint penetration.

pass. A single progression of a welding or surfacing operation along a joint, weld deposit, or substrate. The result of a pass is a weld bead, layer, or spray deposit.

peel test. A destructive method of inspection which mechanically separates a lap joint by peeling.

peening. The mechanical working of metals using impact blows.

plano lens (eye protection). A lens which does not incorporate correction.

plasma. A gas that has been heated to an at least partially ionized condition, enabling it to conduct an electric current.

plasma arc welding (PAW). An arc welding process which produces coalescence of metals by heating them with a constricted arc between an electrode and the workpiece (transferred arc) or the electrode and the constricting nozzle (non transferred arc). Shielding is obtained from the hot, ionized gas issuing from the orifice which may be supplemented by an auxiliary source of shielding gas. Shielding gas may be an inert gas or a mixture of gases. Pressure may or may not be used, and filler metal may or may not be supplied.

plug weld. A circular weld made through a hole in one member of a lap or T-joint fusing that member to the other. The walls of the hole may or may not be parallel and the hole may be partially or completely filled with weld metal. (A fillet welded hole or a spot weld should not be construed as conforming to this definition.)

polarity. See direct current electrode negative, direct current electrode positive, straight polarity and reverse polarity.

porosity. Cavity type discontinuities formed by gas entrapment during solidification.

positioned weld. A weld made in a joint which has been so placed as to facilitate making the weld.

position of welding. See flat, horizontal, vertical, and overhead positions and horizontal rolled, vertical pipe welding positions.

postheating. The application of heat to an assembly after a welding, brazing, soldering, thermal spraying or cutting operation. See postweld heat treatment.

postweld heat treatment. Any heat treatment subsequent to welding.

preheating. The application of heat to the base metal immediately before welding, brazing, soldering, thermal spraying, or cutting.

preheat temperature. A specified temperature that the base metal must attain in the welding, brazing,

soldering, thermal spraying, or cutting area immediately before these operations are performed.

procedure. The detailed elements (with prescribed values or ranges of values) of a process or method used to produce a specific result.

procedure qualification. The demonstration that welds made by a specific procedure can meet prescribed standards.

progressive block sequence. A block sequence during which successive blocks are completed progressively along the joint, either from one end to the other or from the center of the joint toward either end.

protective atmosphere. A gas envelope surrounding the part to be brazed, welded or thermal sprayed, with the gas composition controlled with respect to chemical composition, dew point, pressure, flow rate, etc. Example are inert gases, combusted fuel gases, hydrogen and vacuum.

pulse. A current of controlled duration through a welding circuit.

pulsed power welding. Any arc welding method in which the power is cyclically programmed to pulse so that effective but short duration values of a parameter can be utilized. Such short duration values are significantly different from the average value of the parameter. Equivalent terms are pulsed voltage or pulsed current welding; see also pulsed spray welding.

pulsed spray welding. An arc welding method in which the current is pulsed to utilize the advantages of the spray mode of metal transfer at average currents equal to or less than the globular to spray transition current.

pulse time. The duration of a pulse.

push angle. The travel angle when the electrode is pointing forward. See also forehand welding.

Note: this angle can be used to define the position of welding guns, welding torches, high energy beams, welding rods, thermal cutting and

thermal spraying torches, and thermal spraying guns.

Q
qualification. See preferred terms welder performance qualification and procedure qualification.

R
reaction stress. The residual stress which could not otherwise exist if the members or parts being welded were isolated as free bodies without connection to other parts of the structure.

reactor (arc welding). A device used in arc welding circuits for the purpose of minimizing irregularities in the flow of welding current.

reinforcement of weld. Weld metal in excess of the quantity required to fill a joint. See face reinforcement and root reinforcement.

residual stress. Stress remaining in a structure or member as a result of thermal or mechanical treatment or both. Stress arises in fusion welding primarily because the melted material contracts on cooling from the solidus to room temperature.

reverse polarity. The arrangement of direct current arc welding leads with the work as the negative pole and the electrode as the positive pole of the welding arc. A synonym for direct current electrode positive.

root crack. A crack in the weld or heat-affected zone occurring at the root of a weld.

root edge. A root face of zero width. See root face.

root face. That portion of the groove face adjacent to the root of the joint.

root of joint. That portion of a joint to be welded where the members approach closest to each other. In cross section the root of the joint may be either a point, a line or an area.

root of weld. The points, as shown in cross section, at which the back of the weld intersects the base metal surfaces.

root opening. The separation between the members to be joined at the root of the joint.

root penetration. The depth that a weld extends into the root of a joint measured on the centerline of the root cross section.

root reinforcement. Reinforcement of weld at the side other than that from which welding was done.

root surface. The exposed surface of a weld on the side other than that from which welding was done.

S

scarf joint. A form of butt joint.

seal weld. Any weld designed primarily to provide a specific degree of tightness against leakage.

seam weld. A continuous weld made between or upon overlapping members, in which coalescence may start and occur on the faying surfaces, or may have proceeded from the surface of one member. The continuous weld may consist of a single weld bead or a series of overlapping spot welds.

seam welding. The making of seam welds.

secondary circuit. That portion of a welding machine which conducts the secondary current between the secondary terminals of the welding transformer and the electrodes, or electrode and work.

selective block sequence. A block sequence in which successive blocks are completed in a certain order selected to create a predetermined stress pattern.

semi-automatic arc welding. Arc welding with equipment which controls only the filler metal feed. The advance of the welding is manually controlled.

semi-blind joint. A joint in which one extremity of the joint is not visible.

series submerged arc welding (SAW-S). A submerged arc welding process variation in which electric current is established between two (consumable) electrodes which meet just above the surface of the work. The work is not in the electrical circuit.

shielded carbon arc welding (SCAW). A carbon arc welding process variation which produces coalescence of metals by heating them with an electric arc between a carbon electrode and the work. Shielding is obtained from the combustion of a solid material fed into the arc or from a blanket of flux on the work or both. Pressure may or may not be used and filler metal may or may not be used.

shielded metal arc welding (SMAW). An arc welding process which produces coalescence of metals by heating them with an arc between a covered metal electrode and the work. Shielding is obtained from decomposition of the electrode covering. Pressure is not used and filler metal is obtained from the electrode.

shielding gas. Protective gas used to prevent atmospheric contamination.

short circuiting arc welding. See gas metal arc welding-short circuit arc (GMAW-S).

short circuiting transfer (gas metal arc welding). A type of metal transfer in which melted material from a consumable electrode is deposited during repeated short circuits.

shrinkage void. A cavity-type discontinuity normally formed by shrinkage during solidification.

sieve analysis. A method of determining particle size distribution, usually expressed as the weight percentage retained upon each of a series of standard screens of decreasing mesh size.

single-welded joint. In arc and gas welding, any joint welded from one side only.

size of weld

groove weld. The joint penetration (depth of bevel plus the root penetration when specified). The size of a groove weld and its effective throat are one and the same.

fillet weld. For equal leg fillet welds, the leg lengths of the largest isosceles right triangle which can be inscribed within the fillet weld cross section.

For unequal leg fillet welds, the leg lengths of the largest right triangle which can be inscribed within the fillet weld cross section. Note: When one member makes an angle with the other member, greater than 105 degrees, the leg length (size) is of less significance than the effective

throat which is the controlling factor for the strength of a weld.

flange weld. The weld metal thickness measured at the root of the weld.

skull. The unmelted residue from a liquated filler metal.

slag inclusion. Nonmetallic solid material entrapped in weld metal or between weld metal and base metal.

slot weld. A weld made in an elongated hole in one member of a lap or T-joint joining that member to that portion of the surface of the other member which is exposed through the hole. the hole may be open at one end and may be partially or completely filled with weld metal. (A fillet welded slot should not be construed as conforming to this definition).

slugging. The act of adding a separate piece or pieces of material in a joint before or during welding that results in a welded joint not complying with design, drawing, or specification requirements.

solidus. The highest temperature at which a metal or alloy is completely solid.

spacer strip. A metal strip or bar prepared for a groove weld, and inserted in the root of a joint to serve as a backing and to maintain root opening during welding. It can also bridge an exceptionally wide gap due to poor fitup.

spatter. In arc and gas welding, the metal particles expelled during welding and which do not form a part of the weld.

spatter loss. Metal lost due to spatter.

spool. A type of filler metal package consisting of a continuous length of electrode wound on a cylinder (called the barrel) which is flanged at both ends. The flange extends below the inside diameter of the barrel and contains a spindle hole.

spot weld. A weld made between or upon overlapping members in which coalescence may start and occur on the faying surfaces or may proceed from the surface of one member. The weld cross section (plan view) is approximately circular. See also arc spot weld.

spot welding. The making of spot welds.

spry transfer (arc welding). A type of metal transfer in which molten filler metal is propelled axially across the arc in small droplets.

square-groove weld. A type of groove weld.

staggered intermittent fillet welding. Two lines of intermittent fillet welding on a joint in which the fillet weld increments in one line are staggered with respect to those in the other line.

stitch welding. The use of intermittent welds to join two or more parts.

straight polarity. The arrangement of direct current arc welding leads in which the work is the positive pole and the electrode is the negative pole of the welding arc. A synonym for direct current electrode negative.

stress corrosion cracking. Failure of metals by cracking under combined action of corrosion and stress, residual or applied. In brazing, the term applies to the cracking of stressed base metal due to the presence of a liquid filler metal.

stress relief cracking. Intergranular cracking in the heat-affected zone of weld metal that occurs during the exposure of weldments to elevated temperatures during postweld heat treatment or high temperature service.

stress relief heat treatment. Uniform heating of a structure or a portion thereof to a sufficient temperature to relieve the major portion of the residual stresses, followed by uniform cooling.

stringer bead. A type of weld bead made without appreciable weaving motion. See also weave bead.

submerged arc welding (SAW). An arc welding process which produces coalescence of metals by heating them with an arc or arcs between a bare metal electrode or electrodes and the work. The arc is shielded by a blanket of granular, fusible material on the work. Pressure is not used and filler metal is obtained from the electrode and sometimes from a supplementary welding rod.

substrate. Any base material to which a thermal sprayed coating or surfacing weld is applied.

surface preparation. The operations necessary to produce a desired or specified surface condition.

surfacing. The deposition of filler metal (material) on a base metal (substrate) to obtain desired properties or dimensions. See also buttering, cladding, coating and hard facing.

surfacing weld. A type of weld composed of one or more stringer or weave beads deposited on an unbroken surface to obtain desired properties or dimensions.

T

tack weld. A weld made to hold parts of a weldment in proper alignment until the final welds are made.

taps. Connections to a transformer winding which are used to vary the transformer turns ratio, thereby controlling welding voltage and current.

temporary weld. A weld made to attach a piece or pieces to a weldment for temporary use in handling, shipping, or working on the weldment.

thermal stresses. Stresses in metal resulting from non-uniform temperature distribution.

throat of a fillet weld.

theoretical throat. The distance from the beginning of the root of the joint perpendicular to the hypotenuse of the largest right triangle that can be inscribed within the fillet weld cross section.

actual throat. The shortest distance from the root of a fillet weld to its face.

effective throat. The minimum distance minus any reinforcement from the root of a weld to its face.

T-joint. A joint between two members located approximately at right angles to each other in the form of a T.

toe crack. A crack in the base metal occurring at the toe of a weld.

toe of weld. The junction between the face of a weld and the base metal.

torch standoff distance. The distance between a nozzle and a workpiece.

travel angle. The angle that the electrode makes with a reference line perpendicular to the axis of the weld in the plane of the weld axis. See also drag angle and push angle. Note: This angle can be used to define the position of welding guns, welding torches, high energy beams, welding rods, thermal cutting and thermal spraying torches, and thermal spraying guns.

travel angle (pipe). The angle that the electrode makes with a reference line extending from the center of the pipe through the puddle in the plane of the weld axis. Note: This angle can be used to define the position of welding guns, welding torches, high energy beams, welding rods, thermal cutting and thermal spraying torches, and thermal spraying guns.

U

underbead crack. A crack in the heat-affected zone generally not extending to the surface of the base metal.

undercut. A groove melted into the base metal adjacent to the toe or root of a weld and left unfilled by weld metal.

underfill. A depression on the face of the weld or root surface extending below the surface of the adjacent base metal.

upslope time. The time during which the welding current continuously increases from the beginning of welding current.

V

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

vertical position (pipe welding). The position of a pipe joint in which welding is performed in the horizontal position and the pipe may or may not be rotated.

voltage regulator. An automatic electrical control device for maintaining a constant voltage supply to the primary of a welding transformer.

W

wandering sequence. A longitudinal sequence in which the weld bead increments are deposited at random.

weave bead. A type of weld bead made with transverse oscillation.

weld. A localized coalescence of metals or non-metals produced either by heating the materials to suitable temperatures, with or without the application of pressure, or by the application of pressure alone, and with or without the use of filler material.

weldability. The capacity of a material to be welded under the fabrication conditions imposed into a specific, suitably designed structure and to perform satisfactorily in the intended service.

weld bead. A weld deposit resulting from a pass. See stringer bead and weave bead.

weld crack. A crack in weld metal.

welder. One who performs a manual or semi-automatic welding operation. (Sometimes erroneously used to denote as welding machine.)

welder certification. Certification in writing that a welder has produced welds meeting prescribed standards.

welder performance qualification. The demonstration of a welder's ability to produce welds meeting prescribed standards.

welder registration. The act of registering a welder certification or a photostatic copy thereof.

weld gage. A device designed for checking the shape and size of welds.

welding. A materials joining process used in making welds. (See the Master Chart of Welding and Allied Processes).

welding current. The current in the welding circuit during the making of a weld.

welding cycle. The complete series of events involved in the making of weld.

welding generator. A generator used for supplying current for welding.

welding head. The part of a welding machine or automatic welding equipment in which a welding gun or torch is incorporated.

welding leads. The work lead and electrode lead of an arc welding circuit.

welding machine. Equipment used to perform the welding operation. For example, spot welding machine, arc welding machine, seam welding machine, etc.

welding operator. One who operates machine or automatic welding equipment.

welding procedure. The detailed methods and practices including all joint welding procedures involved in the production of a weldment. See joint welding procedure.

welding process. A materials joining process which produces coalescence of materials by heating them to suitable temperatures, with or without the application of pressure or by the application of pressure alone, and with or without the use of filler metal. (See the Master Chart of Welding and Allied Processes).

welding rectifier. A device in a welding machine for converting alternating current to direct current.

welding rod. A form of filler metal used for welding or brazing which does not conduct the electrical current.

welding sequence. The order of making the welds in a weldment.

welding technique. The details of a welding procedure which are controlled by the welder or welding operator.

weldment. An assembly whose component parts are joined by welding.

weld metal. That portion of a weld which has been melted during welding.

weld metal area. The area of the weld metal as measured on the cross section of a weld.

wetting. The bonding or spreading of a liquid filler metal or flux on a solid base metal.

wire feed speed. The rate of speed in mm/s* or in./min at which a filler metal is consumed in arc welding.

*Note: In Canada this is expressed in mm/min.

wire straightener. A device used for controlling the cast of coiled wire to enable it to be easily fed in to the gun.

work angle. The angle that the electrode makes with the referenced plane or surface of the base metal in a plane perpendicular to the axis of the weld. See also drag angle and push angle.

Note: This angle can be used to define the position of welding guns, welding torches, high energy beams, welding rods, thermal cutting and thermal spraying torches, and thermal spraying guns.

work connection. The connection of the work lead to the work.

work lead. The electric conductor between the source of arc welding current and the work.