

This Australian Standard was prepared by Committee WD-001, Welding Definitions and Symbols. It was approved on behalf of the Council of Standards Australia on 8 November 2005.

This Standard was published on 21 January 2005.

The following are represented on Committee WD-001:

Australian Industry Group
Bureau of Steel Manufacturers of Australia
New Zealand Heavy Engineering Research Association
Welding Technology Institute of Australia

Keeping Standards up-to-date

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No.	Term	Definition
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LEGEND

- | | |
|---|----------------------------|
| 1 | = Plates to be welded |
| 2 | = Cooling shoes |
| 3 | = Molten slag |
| 4 | = Electrode |
| 5 | = Molten metal |
| 6 | = Finished weld |
| 7 | = Pipes for cooling medium |

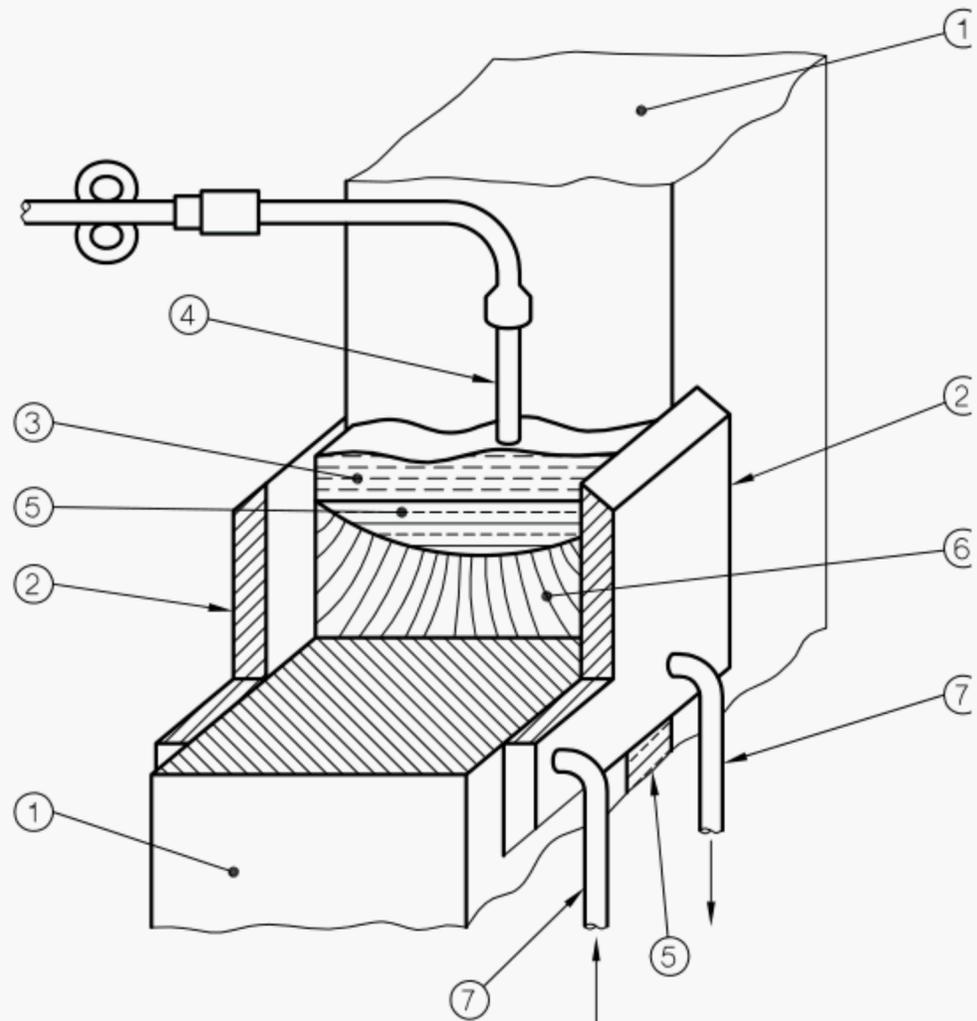


FIGURE 1.2 ELECTROSLAG WELDING (ESW)

- | | | |
|-------|---|--|
| 1.035 | explosion welding | Solid state lap joining or cladding in which the overlapping work pieces are welded when impacted together by the detonation of an explosive charge. |
| 1.036 | firecracker welding | Metal-arc welding in which a covered electrode or electrodes are laid on the parent metal. The arc is started between one end of the electrode and the work and travels along the work as the electrode melts. |
| 1.037 | flame braze welding | Braze welding in which the required heat is furnished by an oxygen-fuel gas flame. |
| 1.038 | flame brazing | Brazing in which heat required is supplied by the flame from an air-fuel gas or oxygen-fuel gas blowpipe. |
| 1.039 | flame cutting | Oxygen cutting in which the appropriate part of the material to be cut is raised to ignition temperature by an oxygen-fuel gas flame. |
| 1.040 | flame gouging | The forming of a groove by flame cutting using a special low velocity nozzle. |
| 1.041 | flame pressure welding
gas pressure welding | Hot pressure welding using heat from an oxygen-fuel gas flame. |
| 1.042 | flame soldering | Soldering in which the heat required is supplied by the flame from an air-fuel gas or oxygen-fuel gas blowpipe. |

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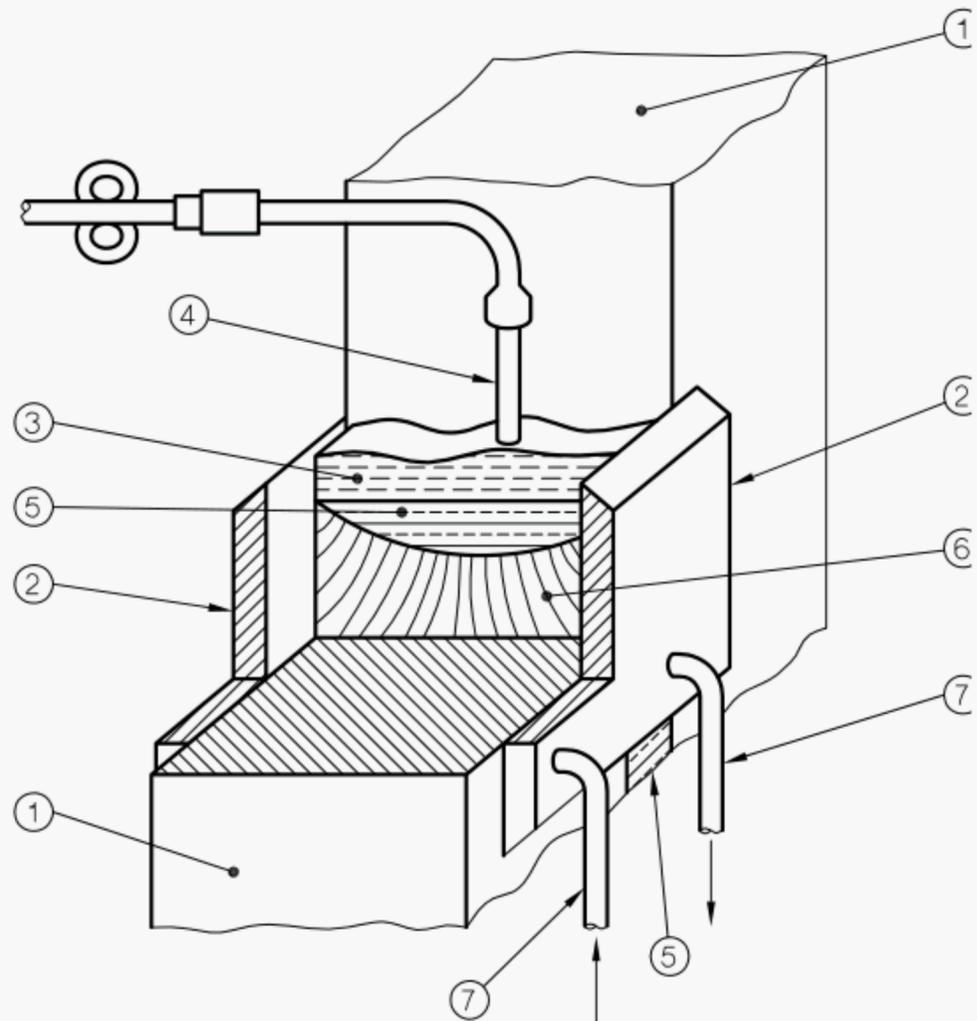


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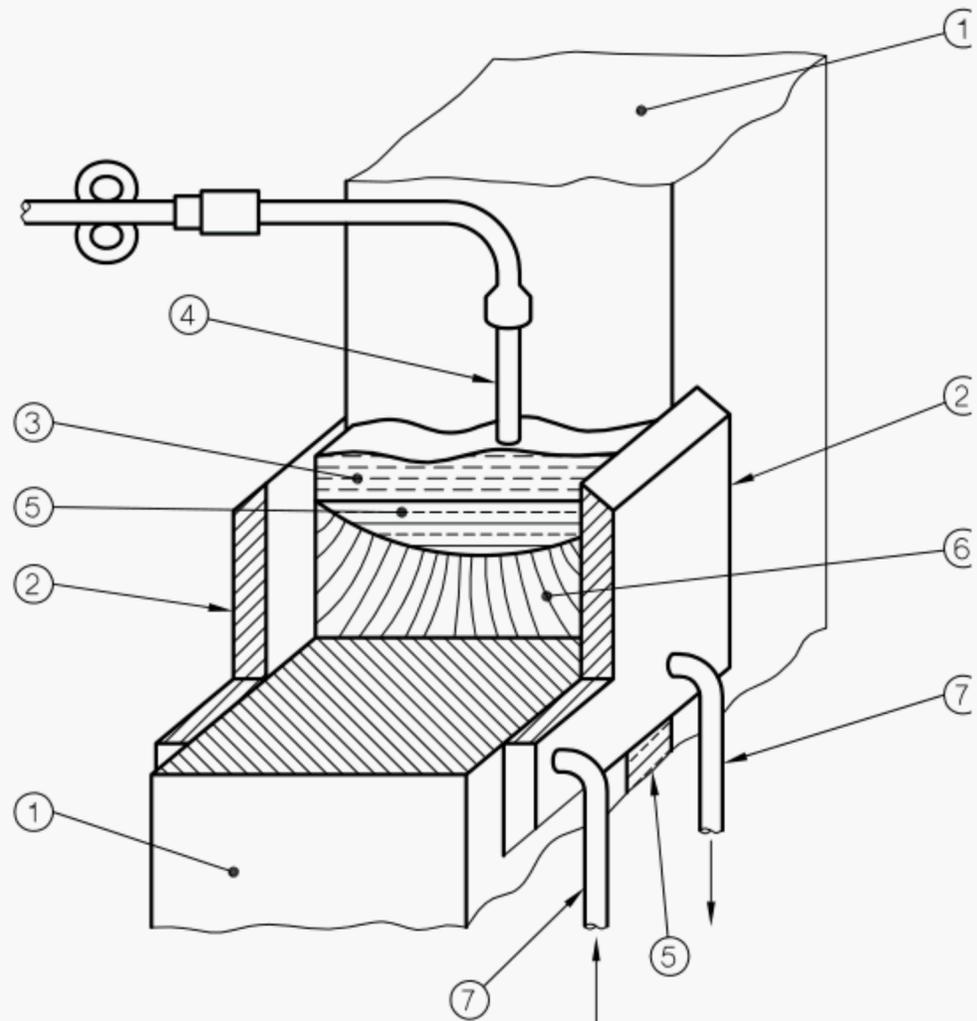


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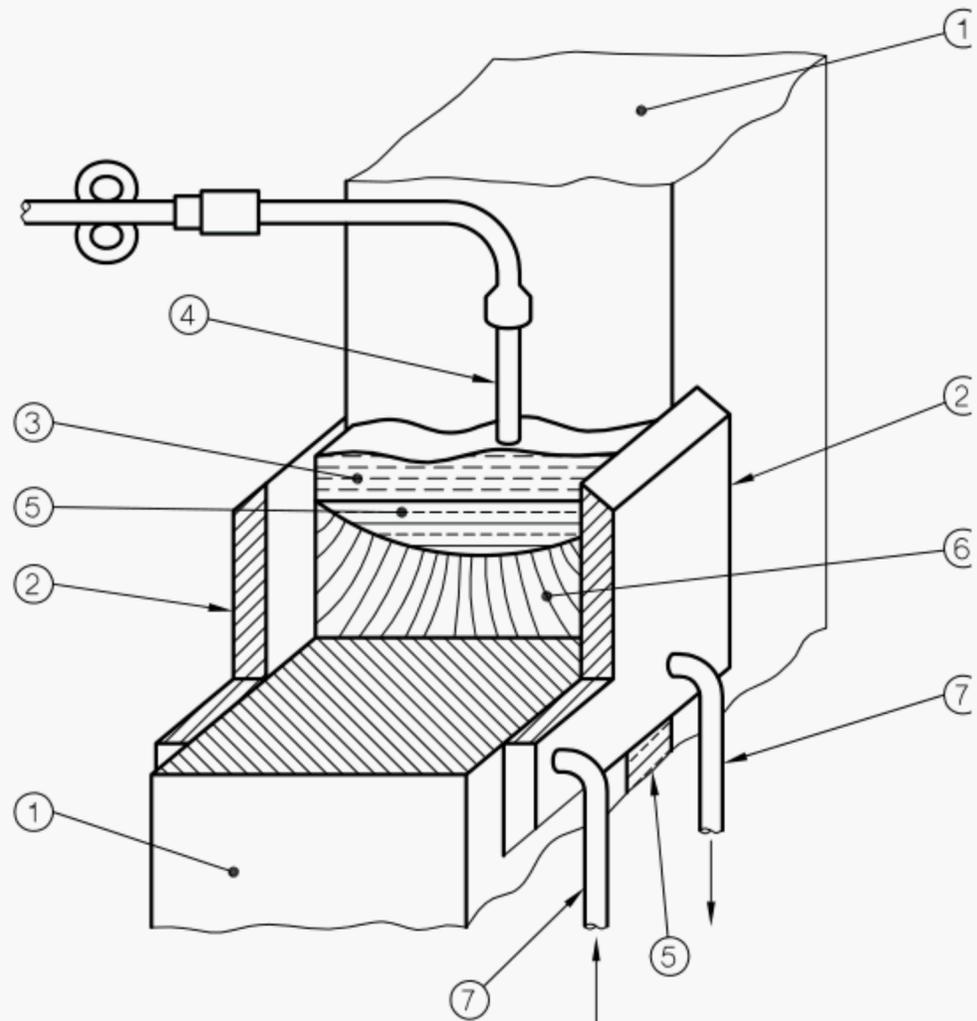


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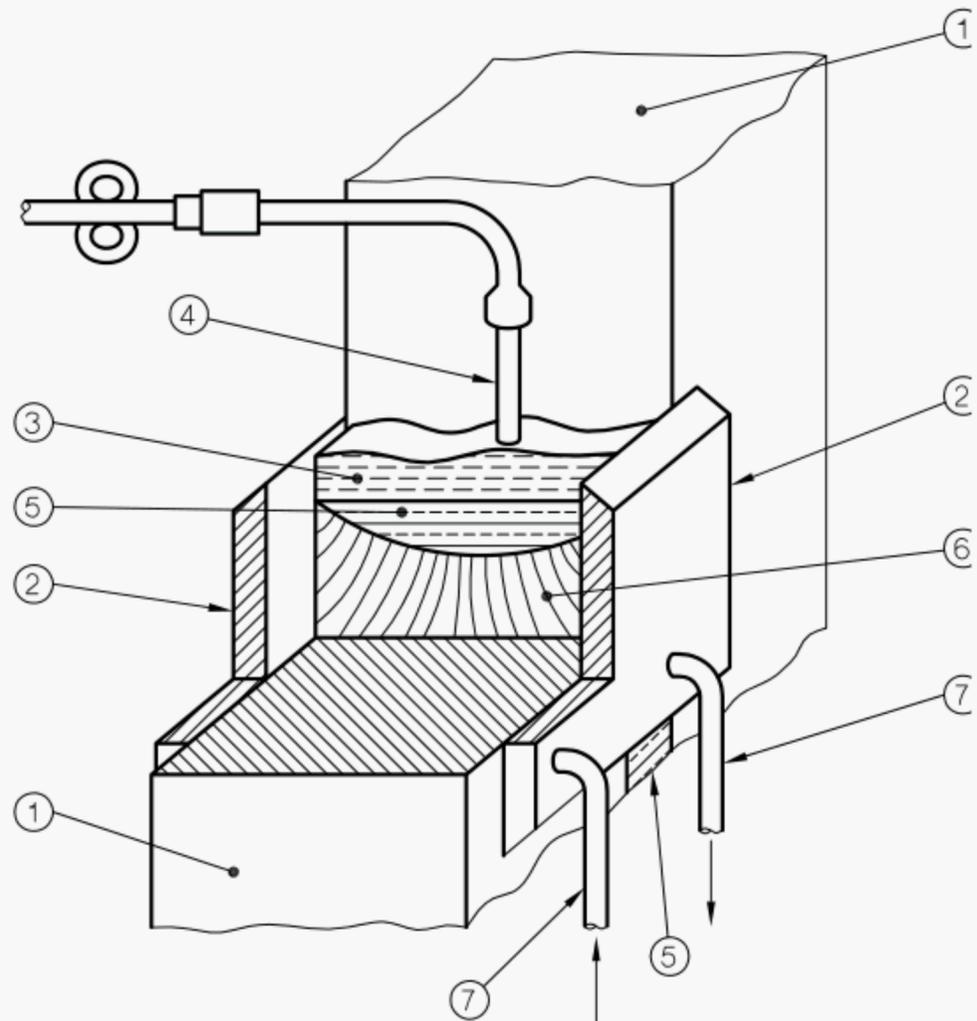


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No.	Term	Definition
1.096	plasma spraying	Thermal spraying in which a non-transferred constricted arc is utilized as the heat source to melt and propel the powder coating material to the substrate.
1.097	powder cutting	Thermal cutting using the heat of chemical reaction between the cutting oxygen stream and a suitable powder injected into it.
1.098	powder flame spraying	Flame spraying in which the material to be sprayed is in powder form.
1.099	powder lancing	The use of an oxygen lance in which powder is mixed with the oxygen stream.
1.100	pressure welding solid phase welding	Solid state welding in which a weld is made by sufficient pressure to cause plastic flow of the surfaces, which may or may not be heated.
1.101	projection welding	Resistance welding in which the localizing of force and electric current to make the weld or welds is obtained by the use of a projection or projections raised on one or more of the faying surfaces. The projections collapse during welding.
1.102	pulsed arc welding	Arc welding in which pulses of current are superimposed on a constant background electric current. In continuous electrode processes, the pulses control metal transfer.
1.103	radiation welding	Fusion welding in which the heat for welding is obtained by concentrating electromagnetic or particle radiation on to the work piece.
1.104	resistance brazing	Brazing in which the filler metal is pre-placed and the required heat is obtained from the resistance to electric current in a circuit of which the work is a part.
1.105	resistance butt welding	Resistance welding in which the components are butted together under pressure, and electric current is allowed to flow until the temperature is reached at which upset metal is produced and the weld is completed.
1.106	resistance seam welding	Resistance welding in which force and electric current are applied to the work piece by two electrode wheels or by an electrode wheel and an electrode bar to produce a linear lap weld.
1.107	resistance soldering	Soldering in which the heat required is obtained from the resistance to electric current in a circuit of which the work is a part.
1.108	resistance spot-welding	Resistance welding in which a weld is produced at a spot in the work piece between electrodes, the weld being of approximately the same area as the electrode tips, or as the smaller of tips of differing size. Force is applied to the spot, usually through the electrodes, continuously throughout the process.

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No.	Term	Definition
1.121	stud welding	Welding in which a metal stud is joined to a work piece by the production of a weld over the whole of the stud base. This weld is achieved by the use of heat and pressure, the heat being produced by arc, resistance, friction, or other suitable heating process.
1.122	submerged arc welding (SAW)	Arc welding in which a consumable electrode is used and the arc is submerged in a granulated flux, some of which fuses to form a removable covering of slag on the weld. The electrode may be single or multiple.
1.123	surfacing	The deposition of filler metal over an area of a metal surface for building up, wear or corrosion resistance.
1.124	thermal cutting	Parting or shaping of materials by the application of heat with or without a gas stream.
1.125	thermal spraying	A deposition of finely divided metallic or non-metallic materials in a molten or semi-molten condition to form a coating. The coating material may be in the form of powder, ceramic rod, wire or molten materials. (<i>See also flame spraying, plasma spraying, and electric arc spraying.</i>)
1.126	thermic lancing	Cutting or boring using a thermic lance.
1.127	thermit welding	<i>See</i> aluminothermic welding.
—	TIG welding	<i>See</i> 1.057.
1.128	ultrasonic brazing	Brazing in which mechanical vibrations of low amplitude and high frequency are used to generate the heat for brazing.
1.129	ultrasonic soldering	Soldering in which high frequency vibratory energy is transmitted through molten solder to remove undesirable surface films and thereby promote wetting of the base metal. This operation is usually accomplished without a flux.
1.130	ultrasonic welding	Solid state welding by the local application of high frequency vibratory energy as the work pieces are held together under pressure.
1.131	vacuum brazing	Brazing in which the parts to be joined, complete with pre-placed filler metal, are raised to brazing temperature in a vacuum chamber.
1.132	vapour deposition	Surface coating, using physical or chemical techniques for the vapour deposition in vacuum of thin films of metals and refractory materials on a work piece.
1.133	wave soldering	Soldering where work parts are automatically passed through a wave of molten solder. (<i>See also dip soldering.</i>)

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1.129	ultrasonic soldering	Soldering in which high frequency vibratory energy is transmitted through molten solder to remove undesirable surface films and thereby promote wetting of the base metal. This operation is usually accomplished without a flux.
1.130	ultrasonic welding	Solid state welding by the local application of high frequency vibratory energy as the work pieces are held together under pressure.
1.131	vacuum brazing	Brazing in which the parts to be joined, complete with pre-placed filler metal, are raised to brazing temperature in a vacuum chamber.
1.132	vapour deposition	Surface coating, using physical or chemical techniques for the vapour deposition in vacuum of thin films of metals and refractory materials on a work piece.
1.133	wave soldering	Soldering where work parts are automatically passed through a wave of molten solder. (<i>See also dip soldering.</i>)

No.	Term	Definition
1.121	stud welding	Welding in which a metal stud is joined to a work piece by the production of a weld over the whole of the stud base. This weld is achieved by the use of heat and pressure, the heat being produced by arc, resistance, friction, or other suitable heating process.
1.122	submerged arc welding (SAW)	Arc welding in which a consumable electrode is used and the arc is submerged in a granulated flux, some of which fuses to form a removable covering of slag on the weld. The electrode may be single or multiple.
1.123	surfacing	The deposition of filler metal over an area of a metal surface for building up, wear or corrosion resistance.
1.124	thermal cutting	Parting or shaping of materials by the application of heat with or without a gas stream.
1.125	thermal spraying	A deposition of finely divided metallic or non-metallic materials in a molten or semi-molten condition to form a coating. The coating material may be in the form of powder, ceramic rod, wire or molten materials. (<i>See also flame spraying, plasma spraying, and electric arc spraying.</i>)
1.126	thermic lancing	Cutting or boring using a thermic lance.
1.127	thermit welding	<i>See</i> aluminothermic welding.
—	TIG welding	<i>See</i> 1.057.
1.128	ultrasonic brazing	Brazing in which mechanical vibrations of low amplitude and high frequency are used to generate the heat for brazing.
1.129	ultrasonic soldering	Soldering in which high frequency vibratory energy is transmitted through molten solder to remove undesirable surface films and thereby promote wetting of the base metal. This operation is usually accomplished without a flux.
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No.	Term	Definition
2.060	stress-relief heat treatment	Heating to and, if necessary, holding at, some temperature generally below the transformation range, usually followed by slow cooling, for the purpose of reducing internal stresses.
—	surfacing	<i>See</i> 1.123.
2.061	tack weld	A weld made to hold parts of a weldment in alignment until final welds are made.
2.062	thermal stress	Stress produced by differences in temperature or in coefficients of expansion, or both.
2.063	underwater welding	Welding performed underwater either in a wet atmosphere, whereby a local gas envelope is formed around the area to be welded, or in a dry habitat.
2.064	weld	A joint in material, produced by means of heat or pressure, or both, in such a way that there is continuity in the nature of the metal between these parts. A filler metal, the melting temperature of which is of the same order as that of the parent metal, or may not be used.
2.065	weld bead	A run of weld metal deposited on a surface but not forming part of a joint.
2.066	weld junction	The boundary between the fusion zone and the heat-affected zone (see Figure A2 of Appendix A).
2.067	weld metal	All metal melted during the making of a weld and retained in the weld (see Figure A2 of Appendix A).
2.068	weld run	The weld metal resulting from one passage of an electrode, torch, or blowpipe.
2.069	weld timer	A device that controls only the weld time.
2.070	weld zone	The zone containing the weld metal and heat-affected zone (see Figure A2 of Appendix A).
2.071	weld-metal area	The area of the weld metal as measured on the cross-section of a weld.
2.072	weldability	The ability of a metal to be welded under given fabrication conditions in a specific weldment, and to perform satisfactorily in the intended service.
2.073	weldability test	A test intended to show that the parent metal can be welded to give an acceptable joint under the conditions prevailing.
2.074	welder	The person who performs the welding operation. NOTE: The term ‘welder’ is often used incorrectly to refer to a welding machine.
2.075	welder certification	Certification that a welder has complied with prescribed prerequisites, training, and examination requirements for a specific welding skill.

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No.	Term	Definition
3.008	block welding	Welding in which short lengths of the weld are each made by superimposing a number of runs up to the full or partial size of the weld to form a block before proceeding with the next block. These blocks may be adjacent or spaced (see Figure 3.2).

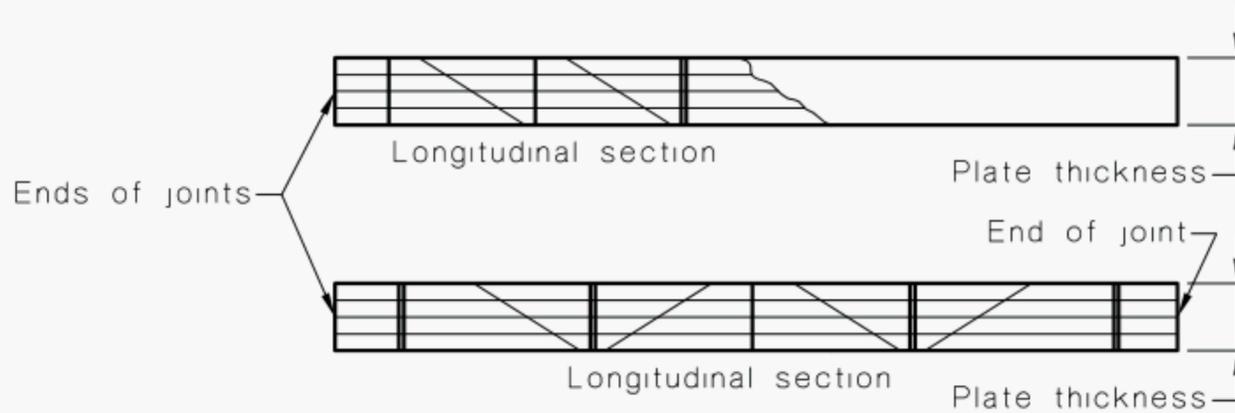


FIGURE 3.2 EXAMPLES OF BLOCK SEQUENCES

3.009	butt joint	A joint between the ends or edges of two parts making an angle to one another of 135° to 180° inclusive in the region of the joint (see Figure A6(a) to A6(d) and (an) of Appendix A).
—	butt weld	<i>See 2.010.</i>
3.010	capping run	The final run or runs deposited to complete a weld profile of a multi-run weld.
3.011	chain intermittent fillet welds	Two lines of intermittent fillet welds on a joint wherein the welds in one line are approximately opposite to those in the other line.
3.012	chipping hammer	A device for the removal of slag from weld deposits.
3.013	close joint	A preparation in which the components to be joined are substantially in contact before welding.
3.014	complete penetration	A butt weld where fusion exists between weld metal and the parent metal throughout the entire depth of the joint.
3.015	concave fillet weld	A fillet weld in which the face of the weld is concave (see Figure 3.3).

No.	Term	Definition
3.008	block welding	Welding in which short lengths of the weld are each made by superimposing a number of runs up to the full or partial size of the weld to form a block before proceeding with the next block. These blocks may be adjacent or spaced (see Figure 3.2).

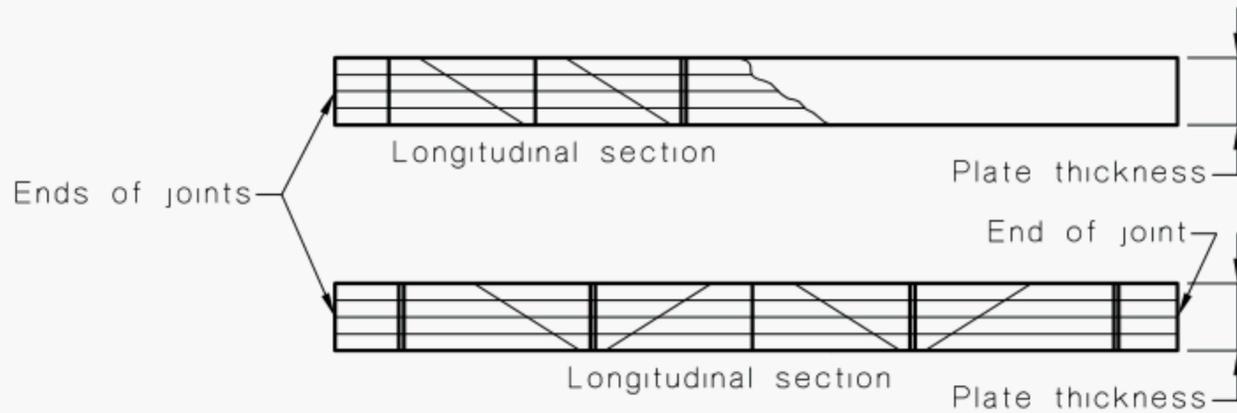


FIGURE 3.2 EXAMPLES OF BLOCK SEQUENCES

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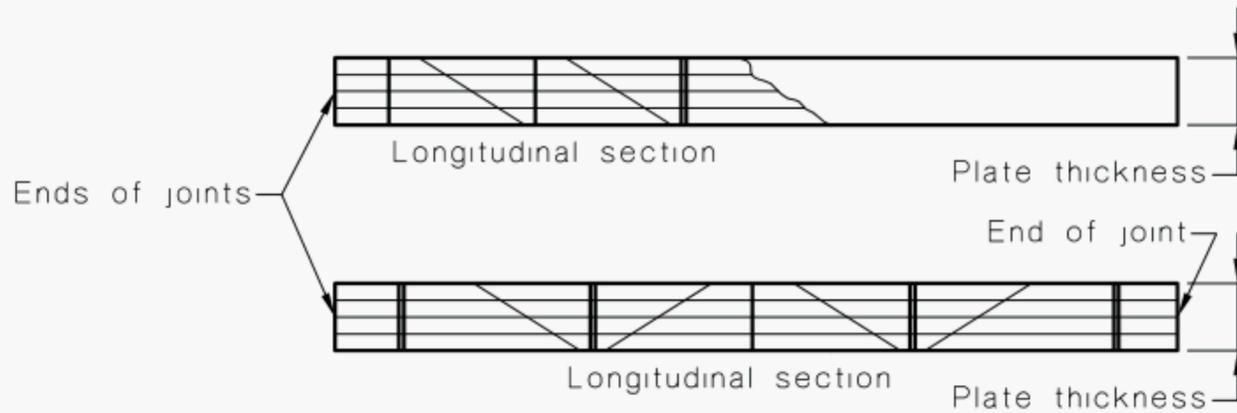


FIGURE 3.2 EXAMPLES OF BLOCK SEQUENCES

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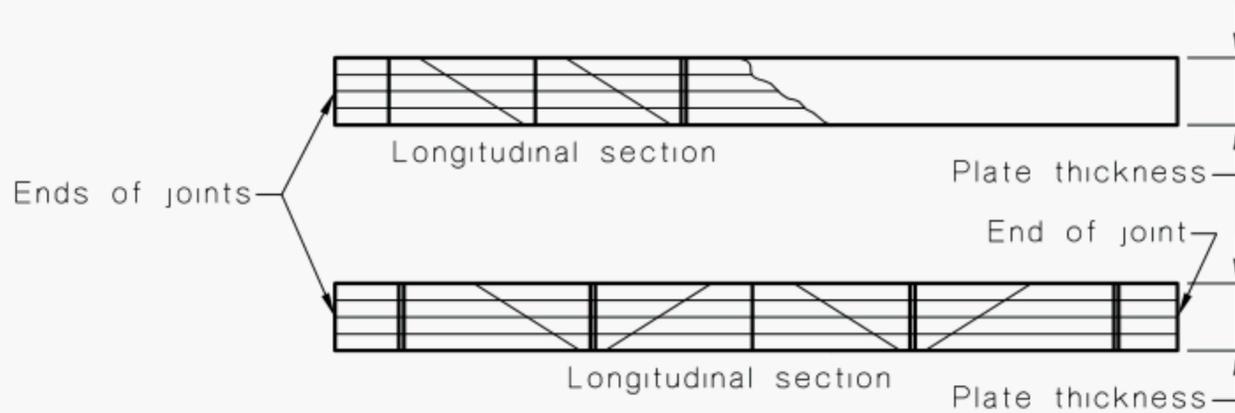


FIGURE 3.2 EXAMPLES OF BLOCK SEQUENCES

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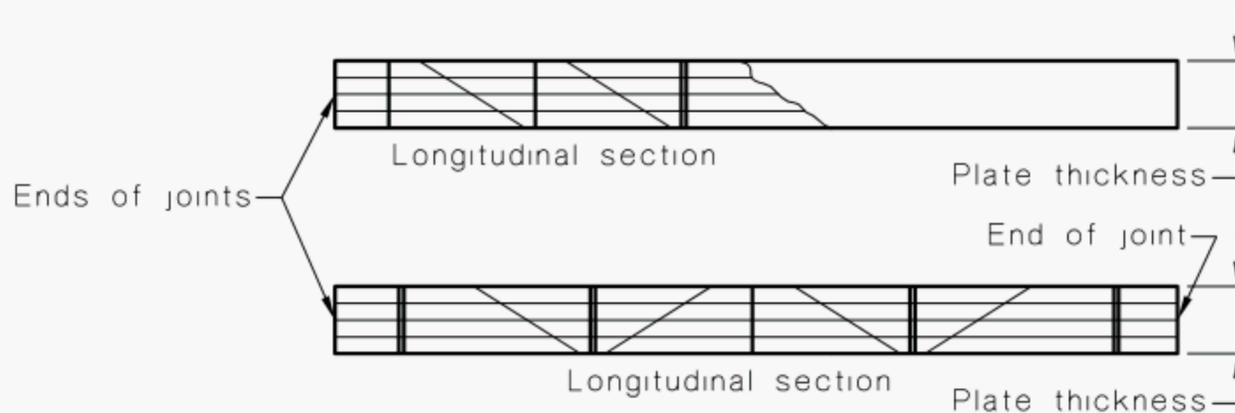


FIGURE 3.2 EXAMPLES OF BLOCK SEQUENCES

3.009	butt joint	A joint between the ends or edges of two parts making an angle to one another of 135° to 180° inclusive in the region of the joint (see Figure A6(a) to A6(d) and (an) of Appendix A).
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No.	Term	Definition
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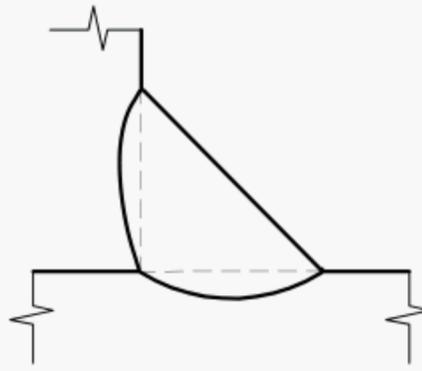


FIGURE 3.10 MITRE-FILLET WELD

3.055	open joint	A preparation in which the components to be joined are separated by a specified gap before welding.
3.056	overhead position	The position of welding wherein welding is performed from the underside of the joint (see Figure 3.11).

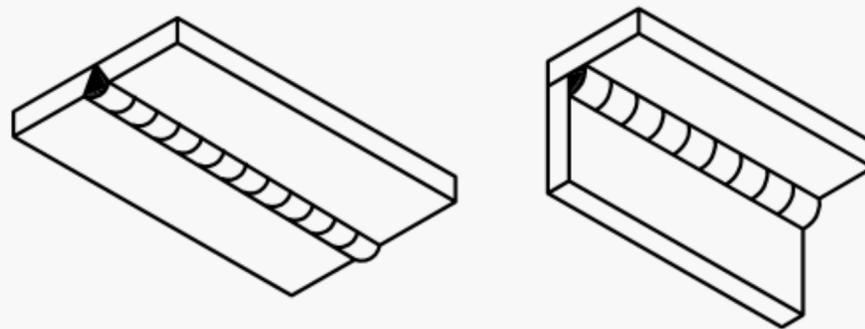


FIGURE 3.11 EXAMPLES OF OVERHEAD POSITION

3.057	partial penetration	A butt weld where, by design, fusion does not extend the full depth of the joint.
3.058	penetration	<i>See joint penetration.</i>
3.059	penetration bead	Weld metal protruding through the root of a fusion weld made from one side only (see Figure 3.12).

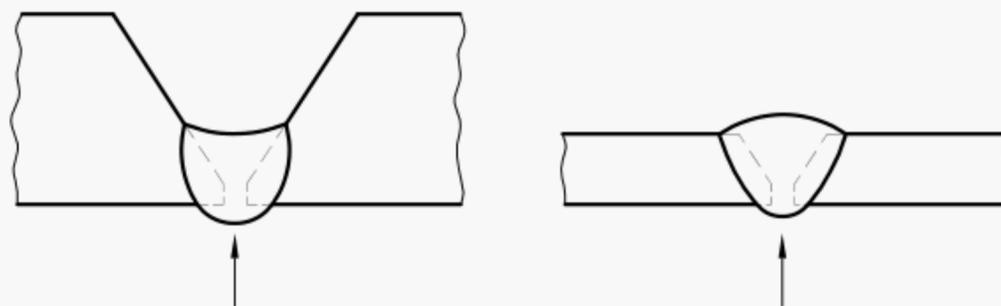


FIGURE 3.12 EXAMPLES OF PENETRATION BEAD

3.060	penetration run	A run that produces a penetration bead.
3.061	pick-up (fusion welding)	Contribution of alloys to the deposited metal from the parent metal and flux.

No.	Term	Definition
3.062	plug weld	A weld made by completely or partially filling a circular hole in one component with filler metal, with the filler metal fusing to the entire surface of the contiguous component exposed through the hole (see Figure A6(ak) Appendix A).
3.063	positioner manipulator	A mechanical device manually or power operated to hold and tilt or rotate the work to the desired position for welding.
3.064	reinforcement	Weld metal lying outside the plane joining the toes (see Figure 3.13).

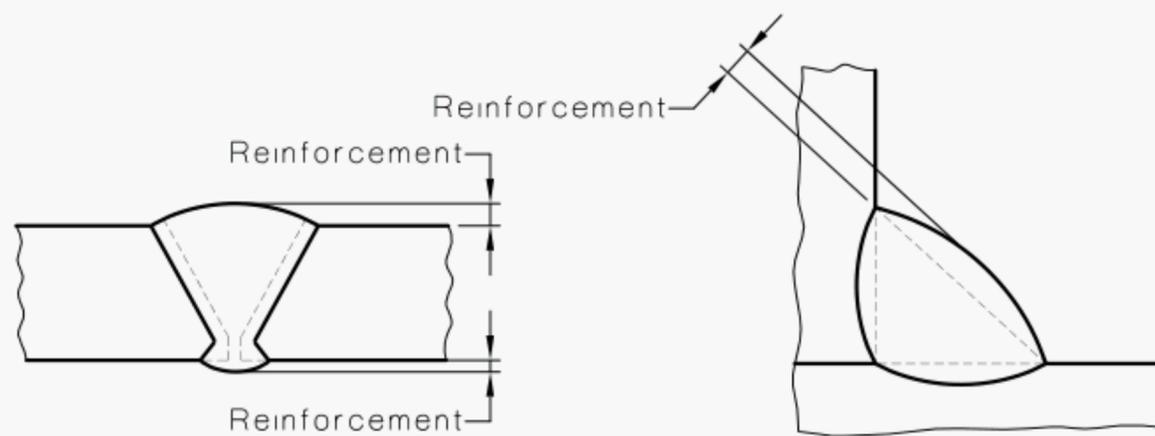


FIGURE 3.13 EXAMPLES OF REINFORCEMENT

3.065	root face	The portion of a fusion face at the root, which is not bevelled or grooved (see Figure A5 of Appendix A).
3.066	root gap	The minimum distance at any cross-section between edges, ends, or surfaces to be joined (see Figure A5 of Appendix A).
3.067	root of preparation	<ol style="list-style-type: none"> 1 In the preparation of V, U, J and bevel butt welds, the zone in the neighbourhood of, and including, the root gap. 2 In a square butt weld with backing bar or strip, the zone between the prepared edges adjacent to a backing bar or strip. 3 In parts assembled for fillet welding, the zone in the neighbourhood of the actual or projected intersection of the fusion faces (see Figure 3.14).

No. **Term** **Definition**

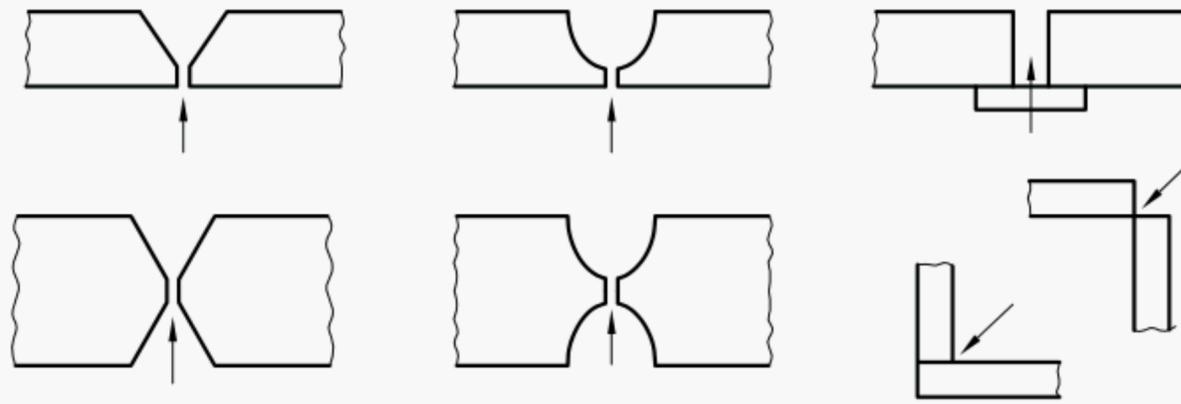


FIGURE 3.14 ROOTS OF TYPICAL JOINT PREPARATION

3.068 **root of weld** The points, as shown in cross-section, at which the back of the weld intersects the base metal surfaces (see Figure A2 of Appendix A).

3.069 **root penetration** The depth a weld extends into the root of a joint (see Figure 3.15).

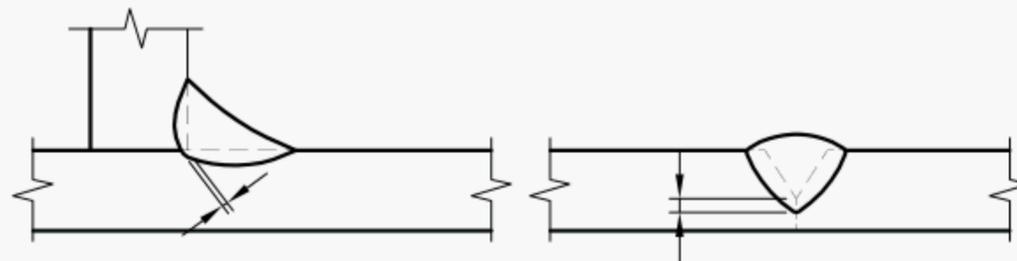


FIGURE 3.15 EXAMPLES OF ROOT PENETRATION

3.070 **root radius** The radius of the curved portion of the fusion face in a component (see Figure A5 of Appendix A).

3.071 **root run** The first run deposited in the root of a multi-run weld.

3.072 **run-on or run-off plates** Pieces of metal placed so as to extend the joint in the same plane to enable a full section of weld metal to be maintained at the extremities of the joint.

3.073 **seal weld** A weld used to make a fluid-tight joint.

3.074 **single-bevel butt weld** A butt weld in which the edge of only one component is bevelled (see Figure A6(p), (q), (u), and (v) of Appendix A).

3.075 **single-J butt weld** A butt weld in which the edge of one component is prepared so that in cross-section the fusion face assumes the form of a J (see Figure A6(aa) and (ab) of Appendix A).

3.076 **single-U butt weld** A butt weld in which the edges of both components are prepared so that in cross-section the fusion faces form a U (see Figure A6(l) of Appendix A).

3.077 **single-V butt weld** A butt weld in which the edges of both components are bevelled so that in cross-section the fusion faces form a V (see Figure A6(e), A6(f), and A6(g) of Appendix A).

No.	Term	Definition
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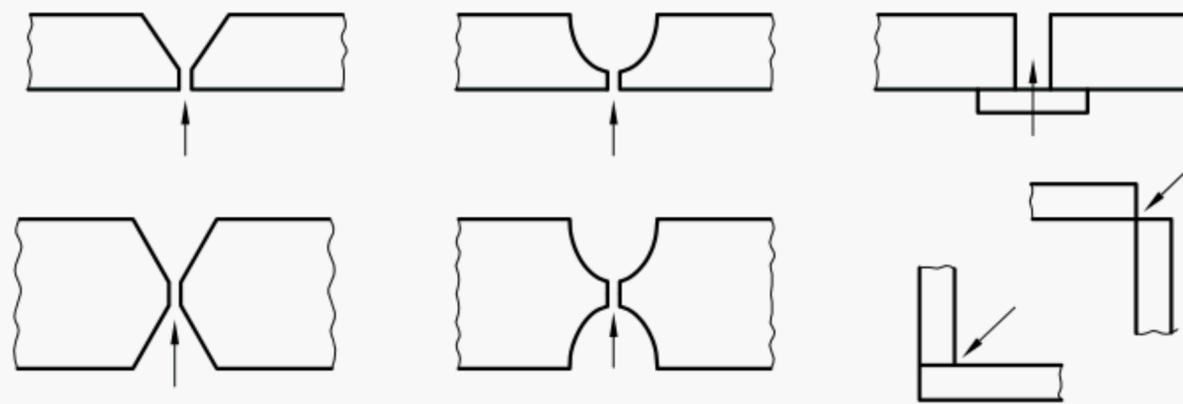


FIGURE 3.14 ROOTS OF TYPICAL JOINT PREPARATION

3.068	root of weld	The points, as shown in cross-section, at which the back of the weld intersects the base metal surfaces (see Figure A2 of Appendix A).
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3.069	root penetration	The depth a weld extends into the root of a joint (see Figure 3.15).
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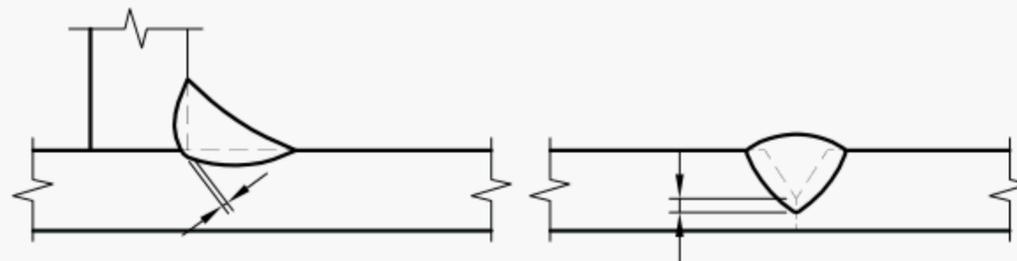


FIGURE 3.15 EXAMPLES OF ROOT PENETRATION

3.070	root radius	The radius of the curved portion of the fusion face in a component (see Figure A5 of Appendix A).
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3.071	root run	The first run deposited in the root of a multi-run weld.
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3.072	run-on or run-off plates	Pieces of metal placed so as to extend the joint in the same plane to enable a full section of weld metal to be maintained at the extremities of the joint.
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3.073	seal weld	A weld used to make a fluid-tight joint.
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3.074	single-bevel butt weld	A butt weld in which the edge of only one component is bevelled (see Figure A6(p), (q), (u), and (v) of Appendix A).
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3.075	single-J butt weld	A butt weld in which the edge of one component is prepared so that in cross-section the fusion face assumes the form of a J (see Figure A6(aa) and (ab) of Appendix A).
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3.076	single-U butt weld	A butt weld in which the edges of both components are prepared so that in cross-section the fusion faces form a U (see Figure A6(l) of Appendix A).
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3.077	single-V butt weld	A butt weld in which the edges of both components are bevelled so that in cross-section the fusion faces form a V (see Figure A6(e), A6(f), and A6(g) of Appendix A).
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No.	Term	Definition
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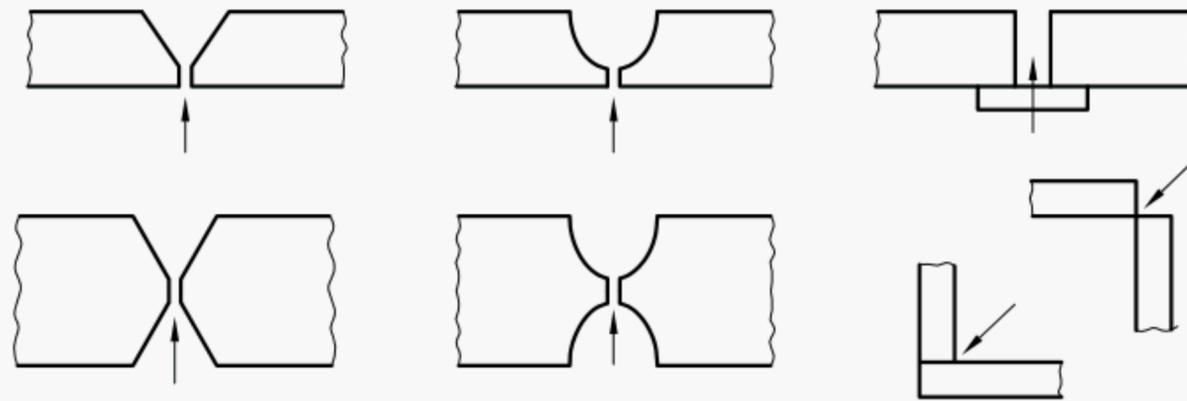


FIGURE 3.14 ROOTS OF TYPICAL JOINT PREPARATION

3.068	root of weld	The points, as shown in cross-section, at which the back of the weld intersects the base metal surfaces (see Figure A2 of Appendix A).
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3.069	root penetration	The depth a weld extends into the root of a joint (see Figure 3.15).
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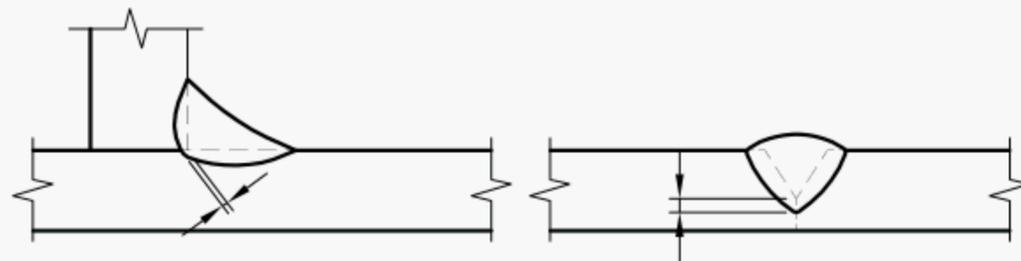


FIGURE 3.15 EXAMPLES OF ROOT PENETRATION

3.070	root radius	The radius of the curved portion of the fusion face in a component (see Figure A5 of Appendix A).
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3.071	root run	The first run deposited in the root of a multi-run weld.
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3.072	run-on or run-off plates	Pieces of metal placed so as to extend the joint in the same plane to enable a full section of weld metal to be maintained at the extremities of the joint.
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3.073	seal weld	A weld used to make a fluid-tight joint.
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3.074	single-bevel butt weld	A butt weld in which the edge of only one component is bevelled (see Figure A6(p), (q), (u), and (v) of Appendix A).
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3.075	single-J butt weld	A butt weld in which the edge of one component is prepared so that in cross-section the fusion face assumes the form of a J (see Figure A6(aa) and (ab) of Appendix A).
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3.076	single-U butt weld	A butt weld in which the edges of both components are prepared so that in cross-section the fusion faces form a U (see Figure A6(l) of Appendix A).
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3.077	single-V butt weld	A butt weld in which the edges of both components are bevelled so that in cross-section the fusion faces form a V (see Figure A6(e), A6(f), and A6(g) of Appendix A).
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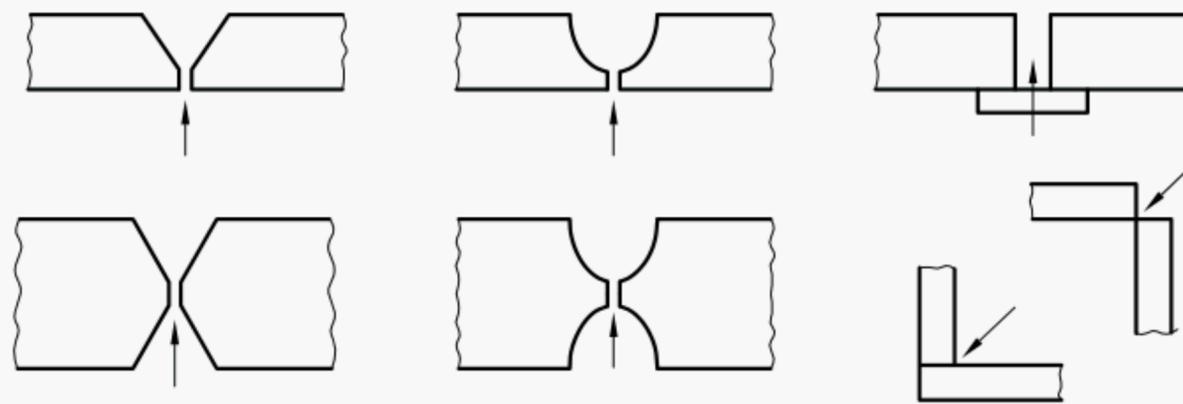


FIGURE 3.14 ROOTS OF TYPICAL JOINT PREPARATION

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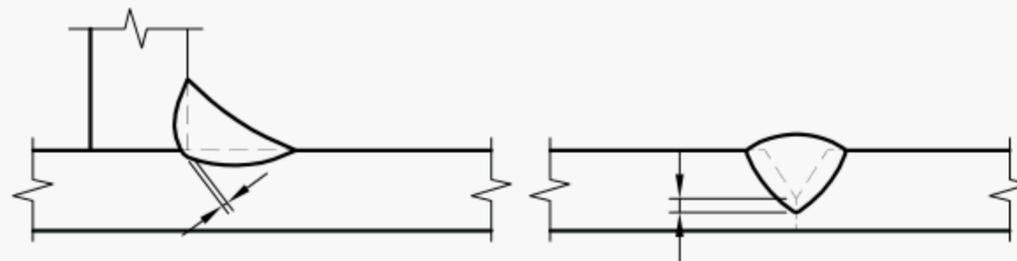


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No.	Term	Definition
3.107	arc welding gun	A device used in semi-automatic, machine, and automatic arc welding to transfer current, guide the consumable electrode, and direct shielding gas when used.
3.108	arc welding plant	Complete equipment for providing and controlling an arc welding process.
3.109	arc welding power source	Apparatus for providing and controlling electrical energy for arc welding processes.
3.110	arc welding torch	A device used in the gas tungsten and plasma arc welding processes to control the position of the electrode, to transfer current to the arc, and to direct the flow of shielding and plasma gas.
3.111	arc welding transformer	A transformer designed to provide a.c. electrical energy for one or more welding arcs.
3.112	atomic-hydrogen torch	A holder carrying the electrodes and incorporating a means of supplying hydrogen to the arc in atomic-hydrogen welding.
—	atomic-hydrogen welding	<i>See</i> 1.011.
—	auto-contact welding	<i>See</i> 1.012.
3.113	balanced wave	An alternating current wave in which the positive and negative half cycles are symmetrical.
3.114	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, other than that which was incidental to its manufacture or preservation, has had no coating or covering applied to it.
—	bare metal arc welding	<i>See</i> 1.013.
3.115	basic electrode	A covered electrode in which the covering contains a high proportion of basic material such as limestone and fluorspar.
3.116	braided electrode	A covered electrode with the covering reinforced by a process of braiding.
3.117	burn back	Fusing of the consumable electrode to the current contact tube by lengthening the arc in any form of automatic or semi-automatic metal-arc welding using a consumable electrode.
3.118	burn-off rate	The linear rate of consumption of a consumable electrode.
—	carbon-arc welding	<i>See</i> 1.020.
3.119	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.
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No.	Term	Definition
3.231	twin arc welding	<i>See</i> multiple arc welding.
3.232	typical electrode current	The current at which an electrode may generally be used satisfactorily in a given weld position.
3.233	urami bead	A root run with electrodes designed to give a good reverse side profile.
3.234	uranami bead	<i>See</i> urami bead.
3.234 (a)	virgin flux	Unused flux that has been produced using new raw materials.
3.235	viscous slag	A slag with flow characteristics that restrict slag flowing into the molten pool. It has a narrow solidification range.
3.236	welding alternator	An alternating current generator designed for providing electric energy to one or more welding arcs
3.237	welding cable	Flexible electrical conductor carrying current for welding.
g3.238	welding head	Part of a welding machine or automatic welding equipment comprising an electrode feed mechanism and a means of conveying current to the electrode.
3.239	welding load voltage	The voltage between the output terminals of an arc welding plant when the load current is flowing.
—	wire feeder	<i>See</i> 2.088.
3.240	work	The material or object on which welding, brazing, soldering and cutting are carried out.
3.241	wrapped electrode	A covered electrode with all or part of the covering of flux wound onto the core wire.
3.242	zero current pause	The period of time in a half-cycle between arc extinction and re-ignition, during which no current flows.

3.3 TERMS RELATING TO GAS WELDING

3.243	backfire	The return of the flame into the blowpipe with a popping sound, the flame being either extinguished or re-ignited at the welding tip or cutting nozzle.
—	backhand welding	<i>See</i> 2.005.
3.244	blowpipe	A device for the correct mixing and burning of gases to produce a flame for welding, brazing, braze welding, surfacing, cutting, heating, and similar operations.
3.245	blowpipe handle	That part of a blowpipe that is normally held or gripped and incorporates the valves and hose connections.
3.246	carburizing flame	A flame in which there is an excess of a carbonaceous fuel gas, resulting in a carbon-rich zone extending around and beyond the cone (see Figure A11 of Appendix A).

No.	Term	Definition
3.247	closed injector	An injector that is closed to the atmosphere, the entrained gas being drawn up through a tube connected to the unit.
3.248	combination blowpipe	A blowpipe that can be used for welding, cutting, heating, or flame cleaning when fitted with the appropriate attachments.
3.249	cone	The more luminous part of a flame, which is located at the end of a welding tip, heating tip, or cutting nozzle (see Figures A10 to A12 of Appendix A).
3.250	covered filler rod coated filler rod	A filler rod having a covering of flux.
3.251	cylinder	A portable container used for the transport and storage of a liquefied or compressed gas.
3.252	cylinder manifold	A device for connecting the gas flow from a number of cylinders to a common supply line.
3.253	feather	The carbon-rich zone, visible in a flame extending around and beyond the cone when there is an excess of carbonaceous gas (see Figure A11 of Appendix A).
—	filler rod	<i>See</i> 2.021.
3.254	flame snapout	Unintentional extinction of the flame outside the tip or nozzle orifice.
3.255	flame surfacing	Oxy-acetylene surfacing in which a carburizing flame is used to heat the surface in the parent metal, which then unites with molten metal from a suitable filler.
3.256	flashback	The return of the flame through the blowpipe into the supply system.
3.257	flashback arrester	A safety device fitted in an oxygen-fuel gas system to prevent any flashback reaching the regulators, pipeline or cylinders.
—	flux	<i>See</i> 2.023.
—	forehand welding	<i>See</i> 2.025.
3.258	gas economizer	An auxiliary device designed for temporarily cutting off the supply of gas to the welding equipment, except the supply to a pilot jet where fitted.
—	gas welding	<i>See</i> 1.058.
3.259	handle mixing	The mixing of preheat gases with a mixer or injector located in or adjacent to the handle.
3.260	head mixing	The mixing of preheat gases in the cutting blowpipe head.
3.261	heating tip	A single-hole or multi-hole tip used with a blowpipe specifically for oxygen-fuel gas heating or air-fuel gas heating.
3.262	hose	A reinforced flexible tube used for conveying gas from a source to welding or cutting equipment.

No.	Term	Definition
3.263	hose check valve	A non-return valve fitted to the blowpipe end of a hose for the purpose of preventing the reverse flow of gases.
3.264	injector	A device in which gas leaving a constricted orifice entrains and mixes with another gas that is at a lower pressure.
3.265	low pressure blowpipe	A blowpipe that incorporates an injector for use with low pressure acetylene or other fuel gases with oxygen.
3.266	mixer	A device, located within a welding or cutting blowpipe, used for the correct mixing of gases. The gases are normally at equal pressure.
3.267	neutral flame	A flame in which the primary combustion is complete, being neither oxidizing nor carburizing. It is characterized by a sharply defined inner cone without feather (see Figure A10 of Appendix A).
3.268	open injector	An injector where the additional gas is air-induced from the atmosphere.
3.269	outer envelope	The envelope of burning gas surrounding the cone of an oxygen-fuel gas flame.
3.270	oxidizing flame	A flame in which there is an excess of oxygen, resulting in an oxygen-rich zone just beyond the cone.
—	oxy-acetylene welding	<i>See</i> 1.086.
3.271	pick-up (gas welding and brazing)	That property of a flux which causes some of it to adhere to the heated end of a filler rod for addition to the molten pool.
3.272	reducing flame	<i>See</i> carburizing flame.
3.273	regulator	A device used for reducing cylinder or pipeline pressure to a substantially constant outlet pressure.
3.274	sustained backfire	The return of the flame into the blowpipe with continued burning at the point of mixing accompanied by a hissing sound.
3.275	tip	<i>See</i> welding tip.
3.276	welding blowpipe	<i>See</i> blowpipe.
3.277	welding tip	The detachable part of a welding blowpipe from which the gases emerge.

3.4 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM WELDING

3.278	accelerating voltage	The voltage, between the cathode and the anode, that accelerates the electrons.
3.279	anode	The electrode used to accelerate the electron beam.
—	arc-image welding	<i>See</i> 1.006.
3.280	beam current	The current flowing between the cathode and the anode of an electron gun, expressed in milliamperes.
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No.	Term	Definition
4.036	backing electrode	A plate or strip of current-carrying material used in place of electrodes on the reverse side of the work when making series of multiple spot welds.
4.037	backward force	The force tending to separate the electrodes
4.038	backward pressure	The pressure (force per unit area) resulting from the backward force.
4.039	bolster	An electrode holder for mounting on a platen.
—	butt resistance-seam welding	<i>See</i> 1.016.
—	capacitor discharge spot-welding	<i>See</i> 1.017.
4.040	cascade firing	In multiweld applications, a system of switching in which each transformer or group of transformers is switched in succession, with or without current-off time during switching. This system may be used to limit the supply load.
4.041	chill time* quench time	The period of time between the end of welding current and the start of post-heating current.
4.042	clamp holding time	The time measured from the end of the post-heating time (or end of upsetting time when no post-heat is used) to the time at which the clamping force is released from the work pieces.
4.043	clamp opening	The distance between the jaws of a clamp in the open position, through which the work piece would be inserted or withdrawn.
4.044	clamping force	The force exerted on the dies by the clamping system.
4.045	constant current control	Electronic control of the value of welding current, to make its preset value constant and independent of variations in either mains voltage or the amount of magnetic material introduced into the throat of the welding machine.
—	continuous resistance-seam welding	<i>See</i> 1.025.
4.046	cool time* off-time	In pulsation and seam welding, the period of time between two successive heat times in the same welding cycle.
4.047	cranked offset electrode	An offset electrode in which the centre-line of the electrode is not straight (see Figure 4.3).
4.048	cross-wire weld	A resistance weld at the point of contact between crossed wires or rods made with pressure applied continuously.

* Attention is directed to Figure A14(a) to (k) of Appendix A, for diagrammatic representations of this term.

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No.	Term	Definition
4.062	dual schedule control	A method of control allowing the full weld cycle, i.e., squeeze, weld, hold, and off timer controls and/or heat controls, to be duplicated and selected independently.
4.063	dual-gun dual-schedule control	A method of control in which the welding cycle to each of the gun welding heads supplied from one transformer can be controlled independently, the initiation circuit being interlocked to allow the operation of only one gun at a time.
4.064	dual-schedule dual program	A method of control allowing the full weld cycle to be duplicated with the addition of duplication of weld and/or heat controls, all controls being selected independently.
4.065	edge distance	The distance between the centre of a weld and the nearest edge of the work piece.

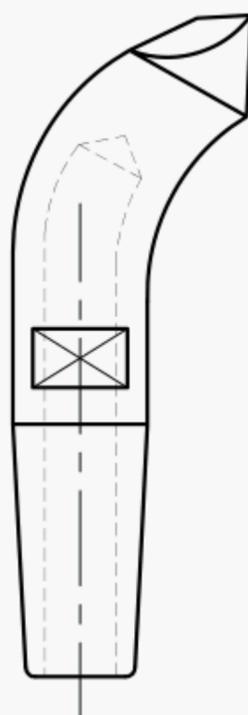


FIGURE 4.3 CRANKED OFFSET ELECTRODE

4.066	electrode (resistance welding)	A replaceable portion of a resistance welding machine, which transmits current, and usually applies force to the work piece. NOTE: This term should not be confused with the term 'electrode (arc welding)'.
4.067	electrode contact area die contact area	The area through which current passes from an electrode or a clamping die to the work piece.
4.068	electrode face	That surface of an electrode that makes contact with the work piece.
4.069	electrode force	The force transmitted by the electrodes to the work piece.
4.070	electrode gap electrode clearance	The distance between two corresponding electrode faces when the machine is ready for operation.

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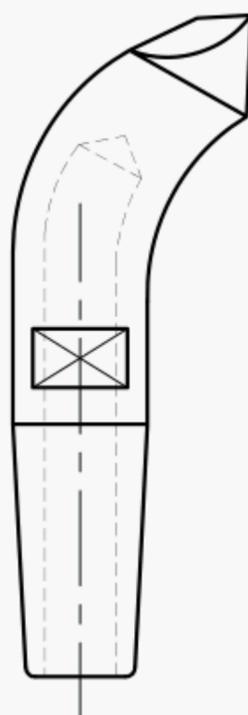


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No.	Term	Definition
4.084	flashing	<ol style="list-style-type: none"> 1 That part of the flash butt welding operation when the two components are slowly moved into contact with one another and the contacts as formed are ruptured by the passage of electric current 2 The display afforded by the expulsion of molten particles during the making of a flash butt weld.
4.085	flashing allowance	The length allowed for the total shortening of both components due to flashing, in preparation for flash butt welding.
4.086	flashing current	The current flowing during flashing time.
4.087	flashing loss	In flash butt welding, the total actual shortening of both components during the flashing time.
4.088	flashing speed	The rate of travel of the platen during the flashing cycle in flash butt welding.
4.089	flashing time*	In flash butt welding, the period of time between the start of continuous flashing and the time when upset force is applied.
4.090	flashing travel	The distance travelled by the platen during flashing in flash butt welding.
—	foil butt seam welding tape butt seam welding	<i>See</i> 1.047.
4.091	follow-up	That movement of an electrode assembly that keeps the electrode force applied while surface indentation or collapse is occurring on the work piece.
4.092	foot-operated welding machine pedal-operated welding machine	A welding machine in which mechanical force is applied by means of a pedal.
4.093	forge delay time	The period of time between the start of weld time and the instant of application of an increased welding force intended to consolidate the weld.
4.094	forging force	The force applied during a welding cycle by the electrodes to the work after welding current has ceased to flow and until pressure is released. NOTE: In some circumstances this may also be the upset force (see definition) in which case the term 'upset force' is preferred.
4.095	forging pressure	The pressure (force per unit area) resulting from the forging force.
4.096	forging time	The period of time between the cessation of welding current and the cessation of the forging force.

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4.091	follow-up	That movement of an electrode assembly that keeps the electrode force applied while surface indentation or collapse is occurring on the work piece.
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FIGURE 4.10 PLAIN BUTT JOINT (BEFORE FORGING)

—	roll welding	<i>See 1.110.</i>
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4.195	scarf joint	A joint, peculiar to blacksmith welding, in which the weld lies at an angle (generally about 45°) to the axis of the parts joined (see Figure 4.11).
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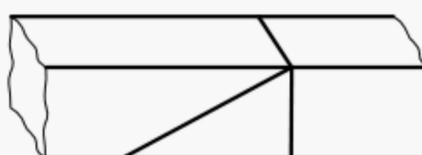


FIGURE 4.11 SCARF JOINT (AFTER FORGING)

4.4 TERMS RELATING TO PRESSURE WELDING

—	cold pressure welding	<i>See 1.023.</i>
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4.196	constant-pressure pressure welding	Pressure welding in which the weld is made during the period of increasing temperature at a substantially constant pressure.
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4.197	Deformation	The local percentage reduction in the total thickness of sheets or plates at a pressure-welded lap joint.
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—	flame pressure welding gas pressure welding	<i>See 1.041.</i>
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4.198	heating time	The time, if any, in pressure welding, during which the parts to be joined are held together under reduced pressure until welding temperature is reached.
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—	HF pressure welding	<i>See 1.060.</i>
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—	hot pressure welding	<i>See 1.064.</i>
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—	pressure welding solid-phase welding	<i>See 1.100.</i>
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4.199	upsetting time	In constant-temperature pressure welding, the time during which the parts to be joined are maintained at the welding temperature and under the upsetting force.
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4.200	welding time	The time in pressure welding during which the parts to be joined are maintained at welding temperature under full welding pressure.
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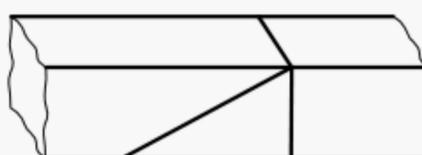


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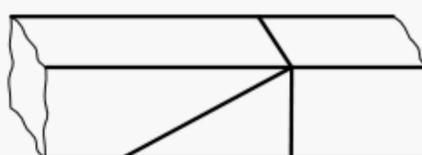


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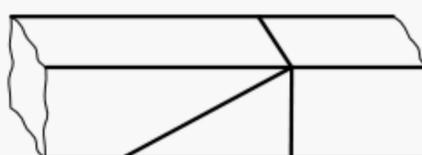


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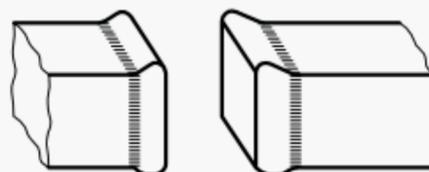


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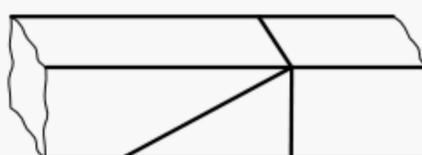


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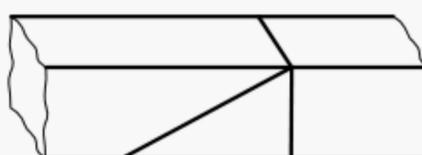


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No.	Term	Definition
—	soldering soft soldering	<i>See</i> 1.115.
5.011	step soldering	The soldering of successive joints on a given part with solders of successively lower soldering temperatures so as to accomplish the joining without disturbing the joints previously soldered.
5.012	sweat soldering	Soldering in which two or more parts which have been pre-coated with solder are reheated and assembled into a joint without the use of additional solder.
—	ultrasonic soldering	<i>See</i> 1.129.
—	wave soldering	<i>See</i> 1.133.

No.	Term	Definition
—	soldering soft soldering	<i>See</i> 1.115.
5.011	step soldering	The soldering of successive joints on a given part with solders of successively lower soldering temperatures so as to accomplish the joining without disturbing the joints previously soldered.
5.012	sweat soldering	Soldering in which two or more parts which have been pre-coated with solder are reheated and assembled into a joint without the use of additional solder.
—	ultrasonic soldering	<i>See</i> 1.129.
—	wave soldering	<i>See</i> 1.133.

No.	Term	Definition
—	soldering soft soldering	<i>See</i> 1.115.
5.011	step soldering	The soldering of successive joints on a given part with solders of successively lower soldering temperatures so as to accomplish the joining without disturbing the joints previously soldered.
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—	wave soldering	<i>See</i> 1.133.

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—	soldering soft soldering	<i>See</i> 1.115.
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—	ultrasonic soldering	<i>See</i> 1.129.
—	wave soldering	<i>See</i> 1.133.

No.	Term	Definition
7.044	partially transferred arc	A plasma arc formed when the work piece is connected to one terminal of the power supply and the other terminal is connected to an electrode within the torch. The torch also forms part of the electrical circuit and has intermediate potential.
—	pilot arc	<i>See</i> 3.197.
—	plasma	<i>See</i> 3.198.
—	plasma arc	<i>See</i> 3.199.
—	plasma arc cutting	<i>See</i> 1.093.
7.045	plasma jet	A jet of plasma formed by a non-transferred arc and expelled through an orifice at high velocity by gas pressure.
7.046	plenum	The space between the inside wall of the constricting nozzle and the electrode.
7.047	secondary gas shield (auxiliary gas shield)	A flow of gas outside the orifice gas.
7.048	torch stand-off distance	The distance between the outer face of the constricting nozzle and the work.
—	transferred arc	<i>See</i> 3.227.
7.049	water injection plasma cutting	Plasma cutting using a symmetrical impinging water jet near the constricting nozzle orifice to further constrict the plasma flame.
7.050	water shield plasma	A technique similar to dual flow plasma cutting with water used in place cutting of the auxiliary shielding gas.
7.051	water shroud attachment	A device to control a flow of water, which constricts the arc and cools the work piece.

7.4 TERMS RELATING TO ARC CUTTING

—	air-arc cutting	<i>See</i> 1.001.
—	air-arc gouging	<i>See</i> 1.002.
—	arc cutting	<i>See</i> 1.005.
—	carbon-arc cutting	<i>See</i> 1.019.
—	carbon electrode	<i>See</i> 3.119.
7.052	cutting electrode	An electrode with a covering that aids the production of such an arc that molten metal is blown away to produce a groove or cut in the work.
—	gas metal-arc cutting	<i>See</i> 1.055.
—	metal-arc cutting	<i>See</i> 1.080.
—	oxygen-arc cutting	<i>See</i> 1.087.

7.5 TERMS RELATING TO SPARK-EROSION CUTTING

—	spark-erosion cutting	<i>See</i> 1.117.
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No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
—	electron-beam cutting	<i>See</i> 1.032.
—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
7.6 TERMS RELATING TO ELECTRON-BEAM AND LASER-BEAM CUTTING		
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—	laser-beam cutting	<i>See</i> 1.074.

No.	Term	Definition
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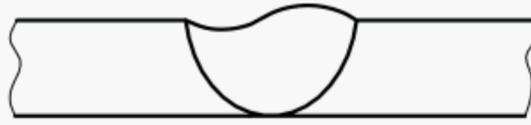


FIGURE 8.31 UNDERFILL

8.076	uniformly distributed porosity	A number of gas pores distributed in a substantially random but uniform manner throughout the weld metal (see Figure 8.32).
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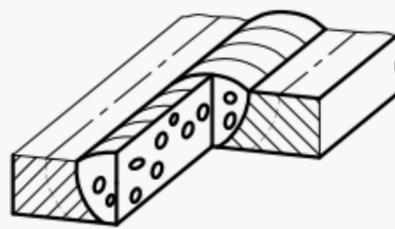


FIGURE 8.32 UNIFORMLY DISTRIBUTED POROSITY

8.077	voids	In flash but welding, cavities formed during welding, usually with oxidized surfaces.
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8.078	worm-hole	An elongated or tubular gas cavity in the weld metal (see Figure 8.33).
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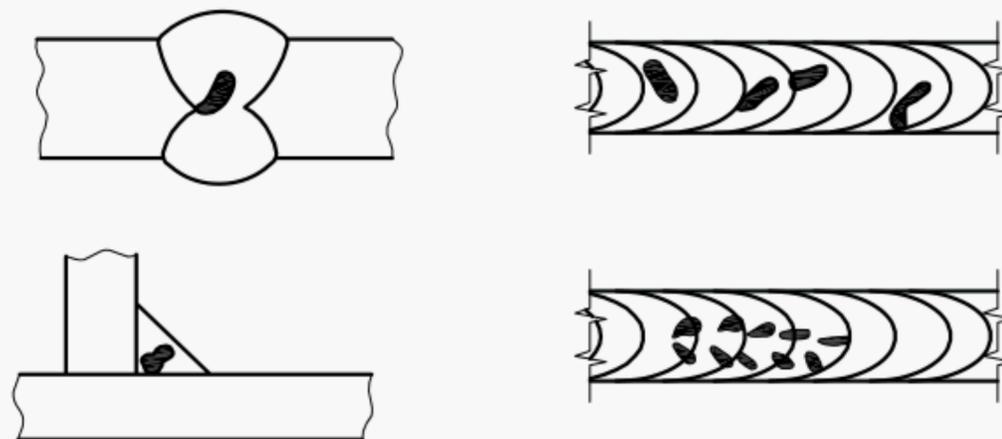


FIGURE 8.33 EXAMPLES OF WORM-HOLES

No.	Term	Definition
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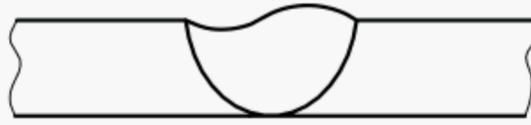


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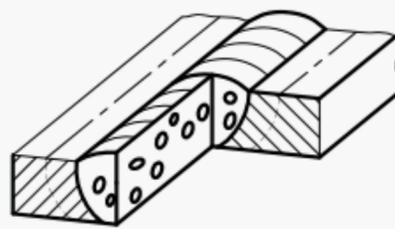


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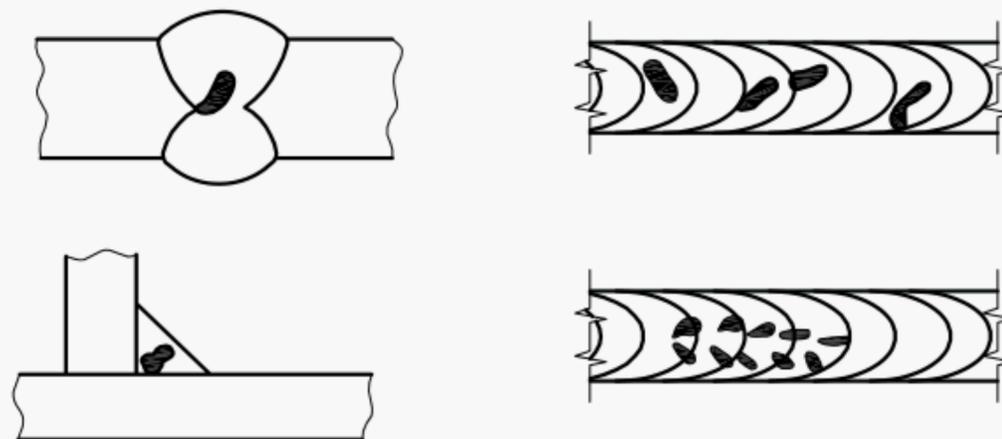


FIGURE 8.33 EXAMPLES OF WORM-HOLES

No. Term Definition

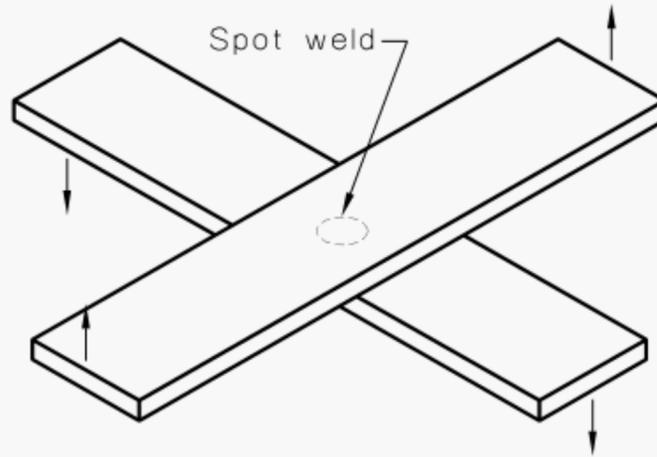


FIGURE 9.1 CROSS TENSION TEST

9.009 cruciform test A test in which a welded cruciform joint is tested in tension or fatigue (see Figure 9.2).



FIGURE 9.2 FORMS OF CRUCIFORM TEST JOINTS

9.010 drop-weight test A fracture toughness test to determine the nil-ductility transition temperature of a selected area of metal in the weld zone.

9.011 face bend test A bend test in which the face surface of the weld is in tension.

9.012 fillet break test A test in which a single fillet joint is broken by placing the root in tension to reveal the extent of root fusion and weld metal soundness (see Figure 9.3).

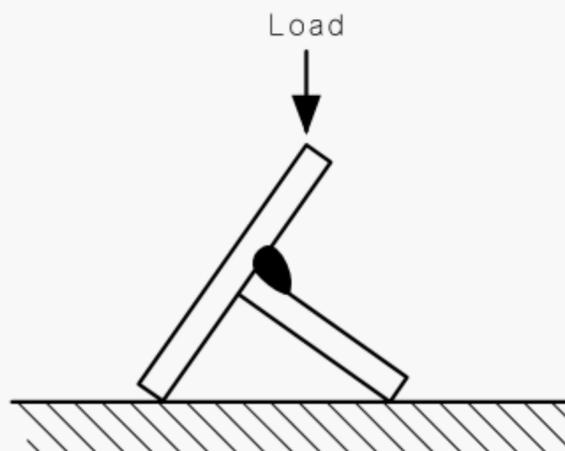


FIGURE 9.3 FILLET BREAK TEST

No. Term Definition

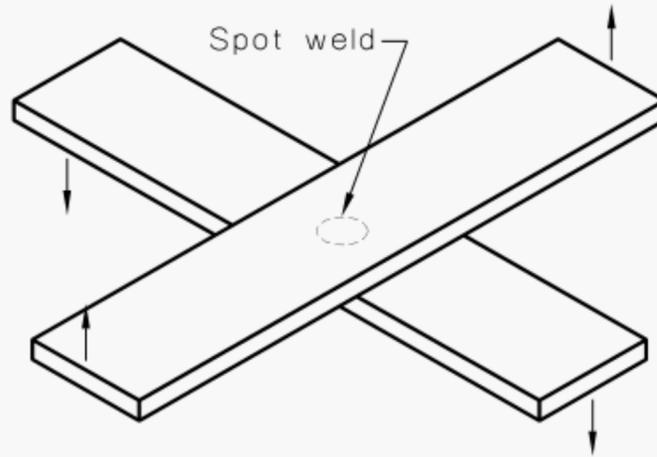


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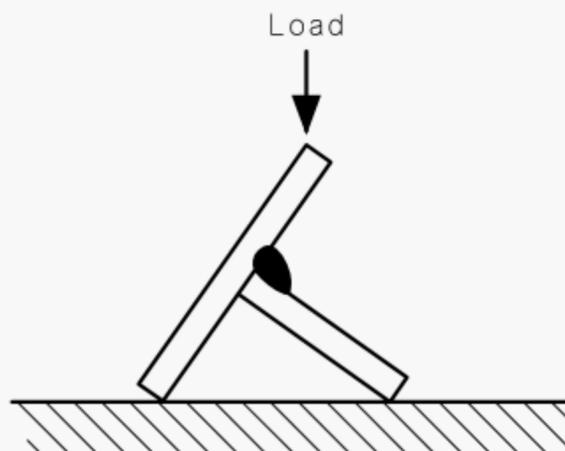


FIGURE 9.3 FILLET BREAK TEST

No. Term Definition

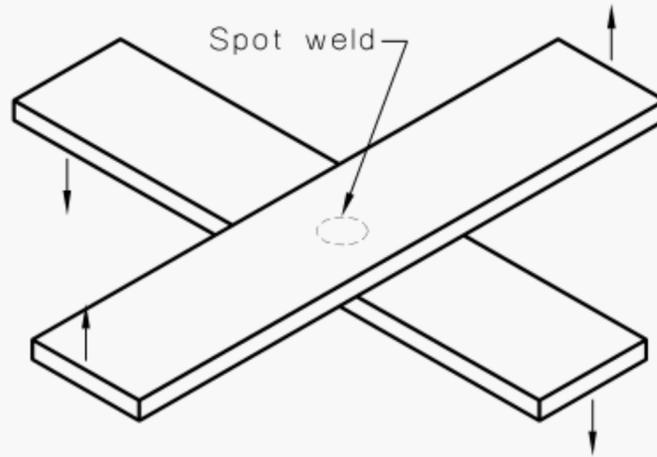


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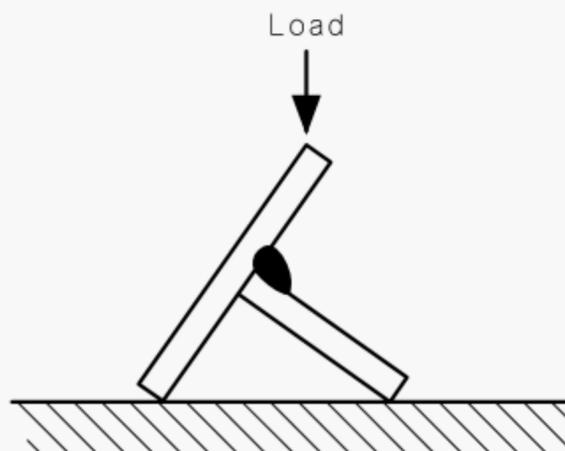


FIGURE 9.3 FILLET BREAK TEST

No. Term Definition

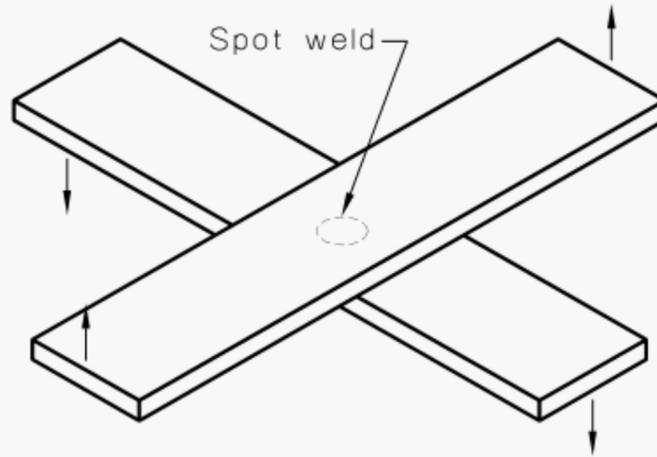


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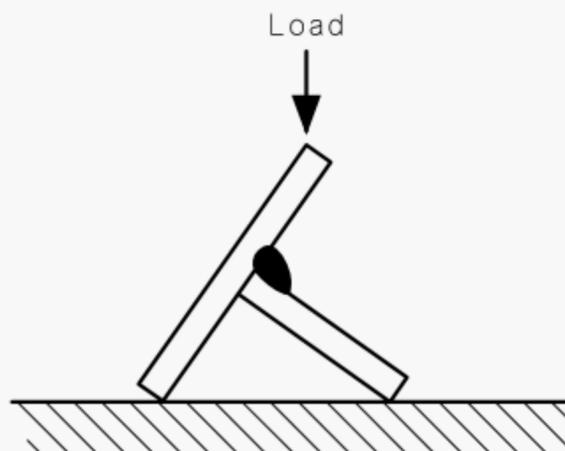


FIGURE 9.3 FILLET BREAK TEST

No.	Term	Definition
9.036	transverse bend test	A bend test in which the test specimen is transversely bisected by the portion of the weld included in it. It may be guided or free.
9.037	transverse tensile test	A tensile test wherein the tensile specimen is taken transversely from a butt-welded joint containing weld metal and parent metal affected by welding.
9.038	U-tensile test	A method of tensile testing spot or projection welds. After welding the test plates are bent as shown in Figure 9.8 and the specimen is then pulled apart.

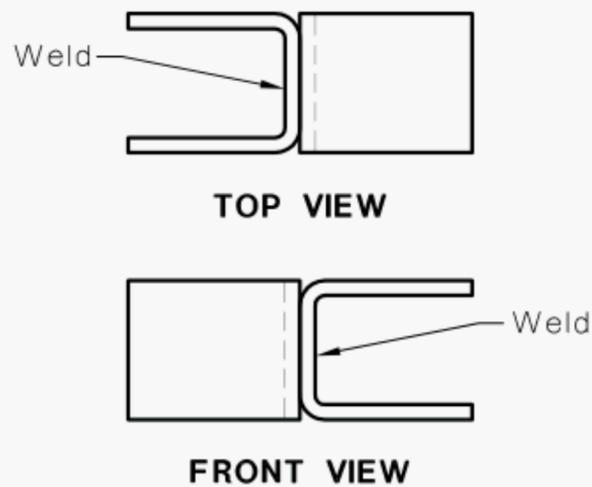


FIGURE 9.8 U-TENSILE TEST

9.039	wide plate test	A toughness test in which a full thickness wide plate containing a notched butt weld is loaded under tension, usually to fracture, at various test temperatures.
9.040	wraparound bend test	A form of guided bend test.
9.041	Y-test	<i>See Tekken test.</i>

No.	Term	Definition
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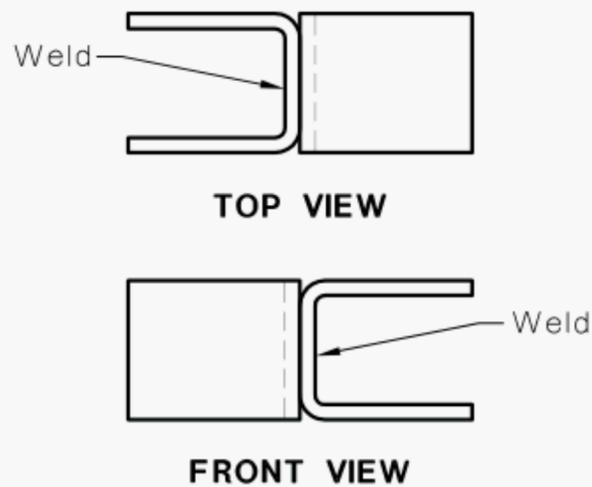


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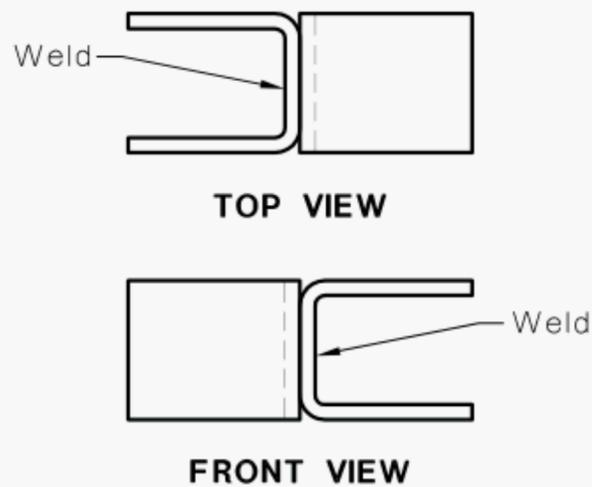


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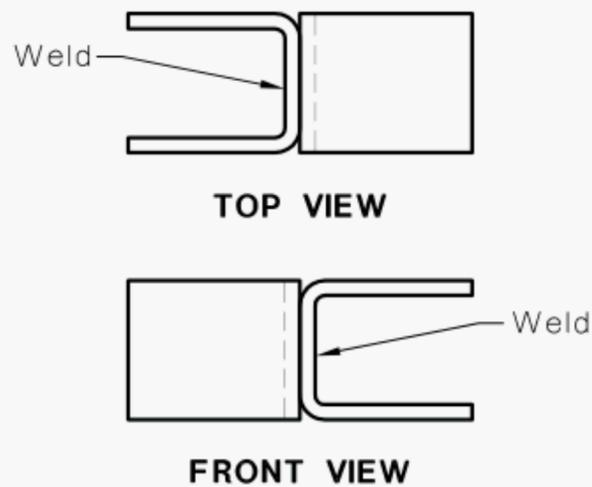


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APPENDIX A
GENERAL ILLUSTRATIONS

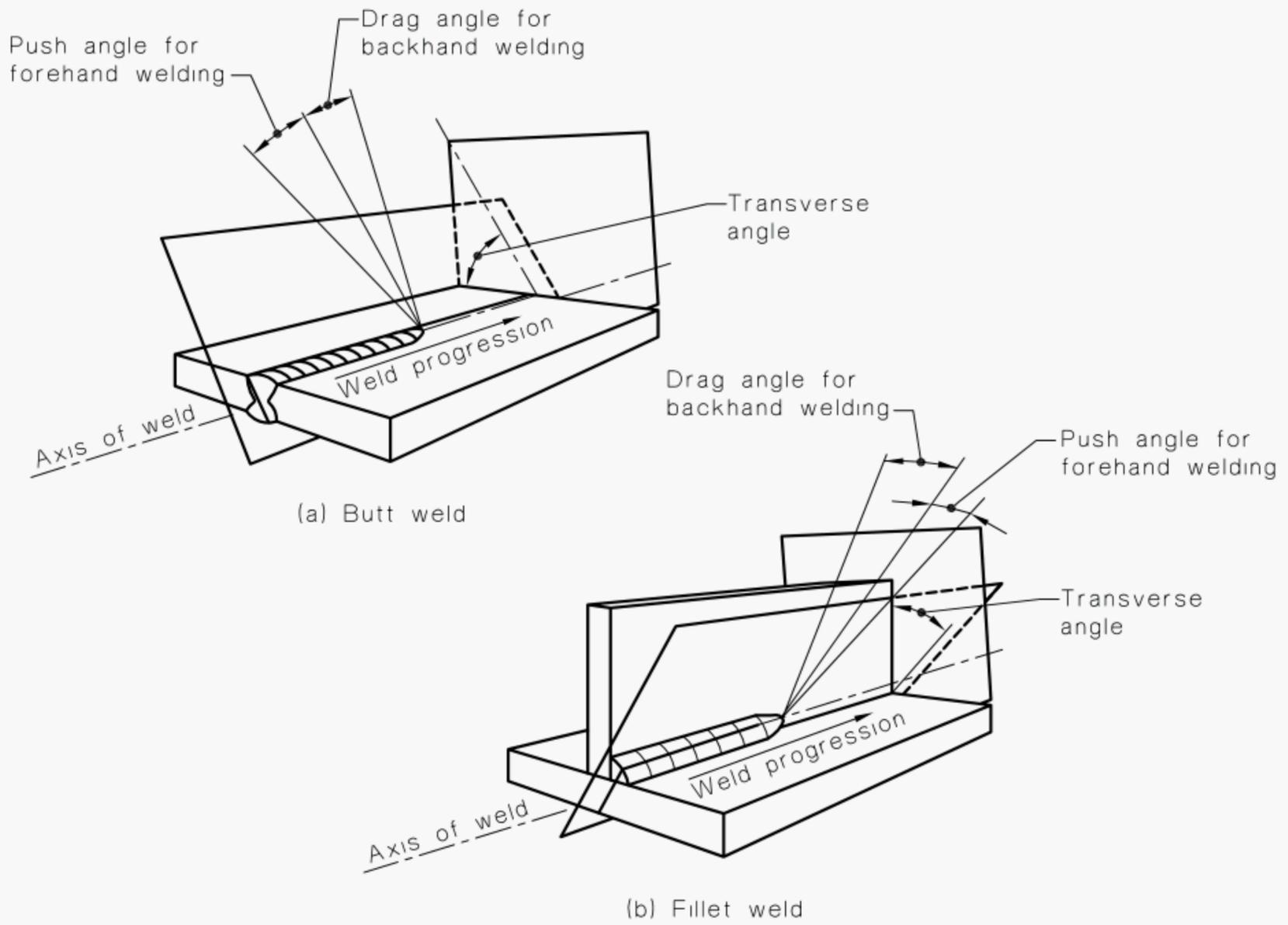


FIGURE A1 POSITION OF ELECTRODE OR TORCH

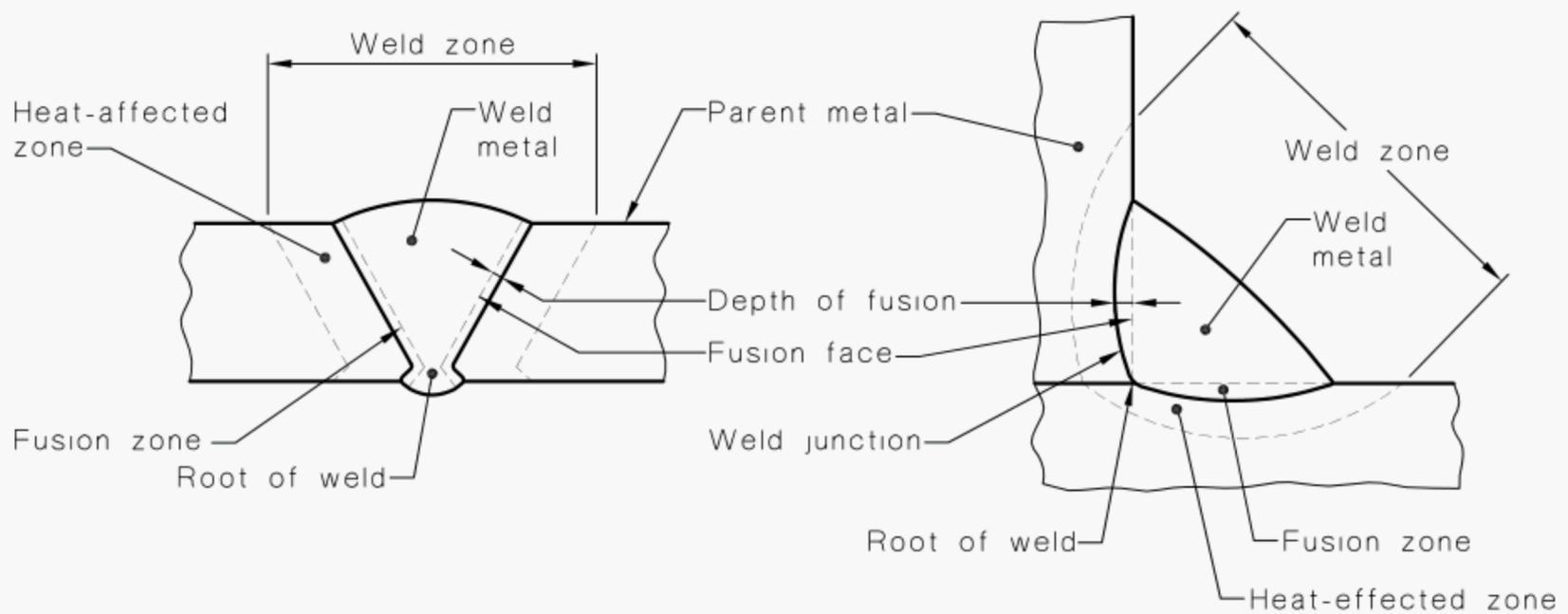


FIGURE A2 ROOT, DEPTH OF FUSION, WELD JUNCTION AND ZONES OF TYPICAL WELDS

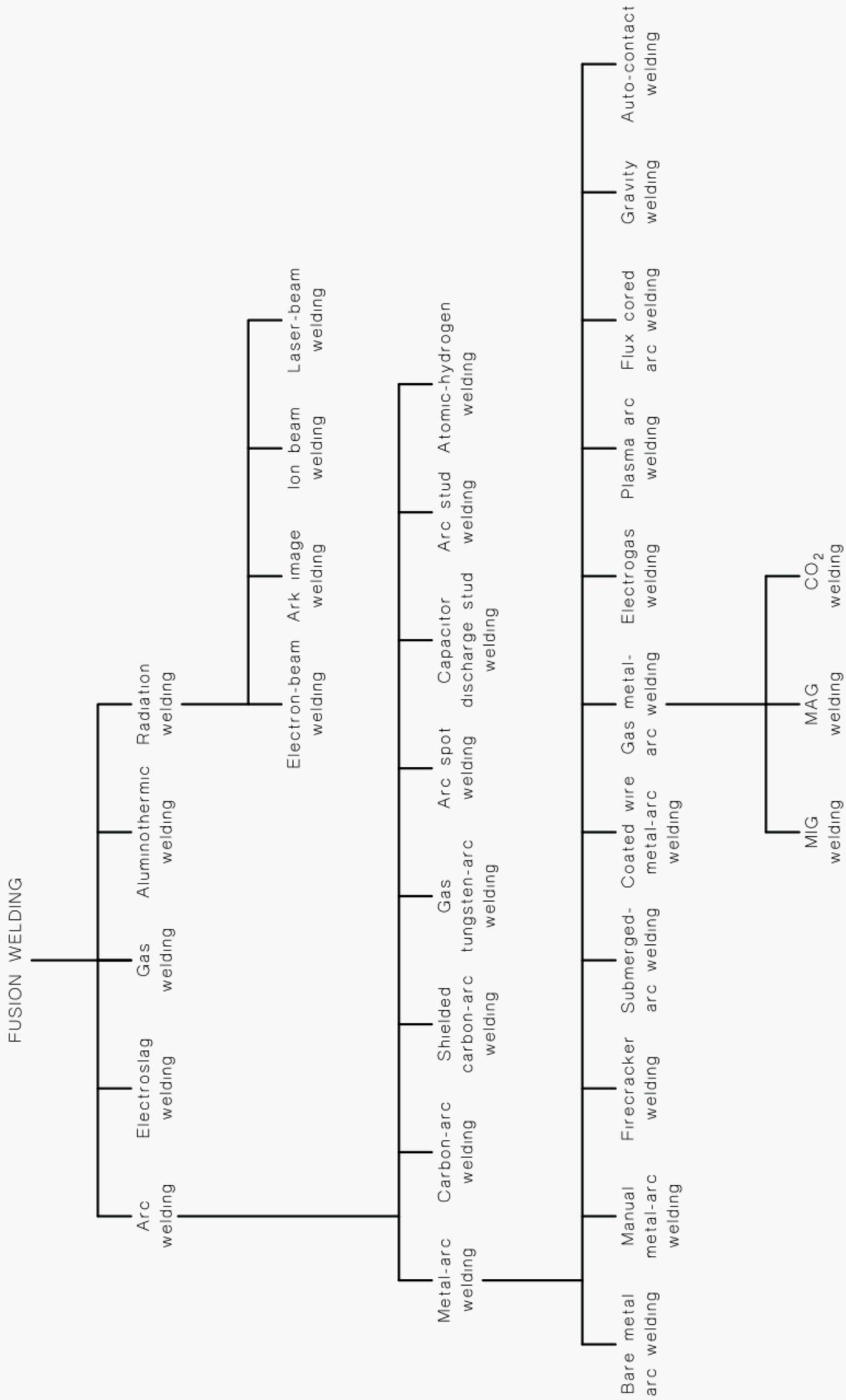


FIGURE A3 CHART OF FUSION WELDING PROCESSES

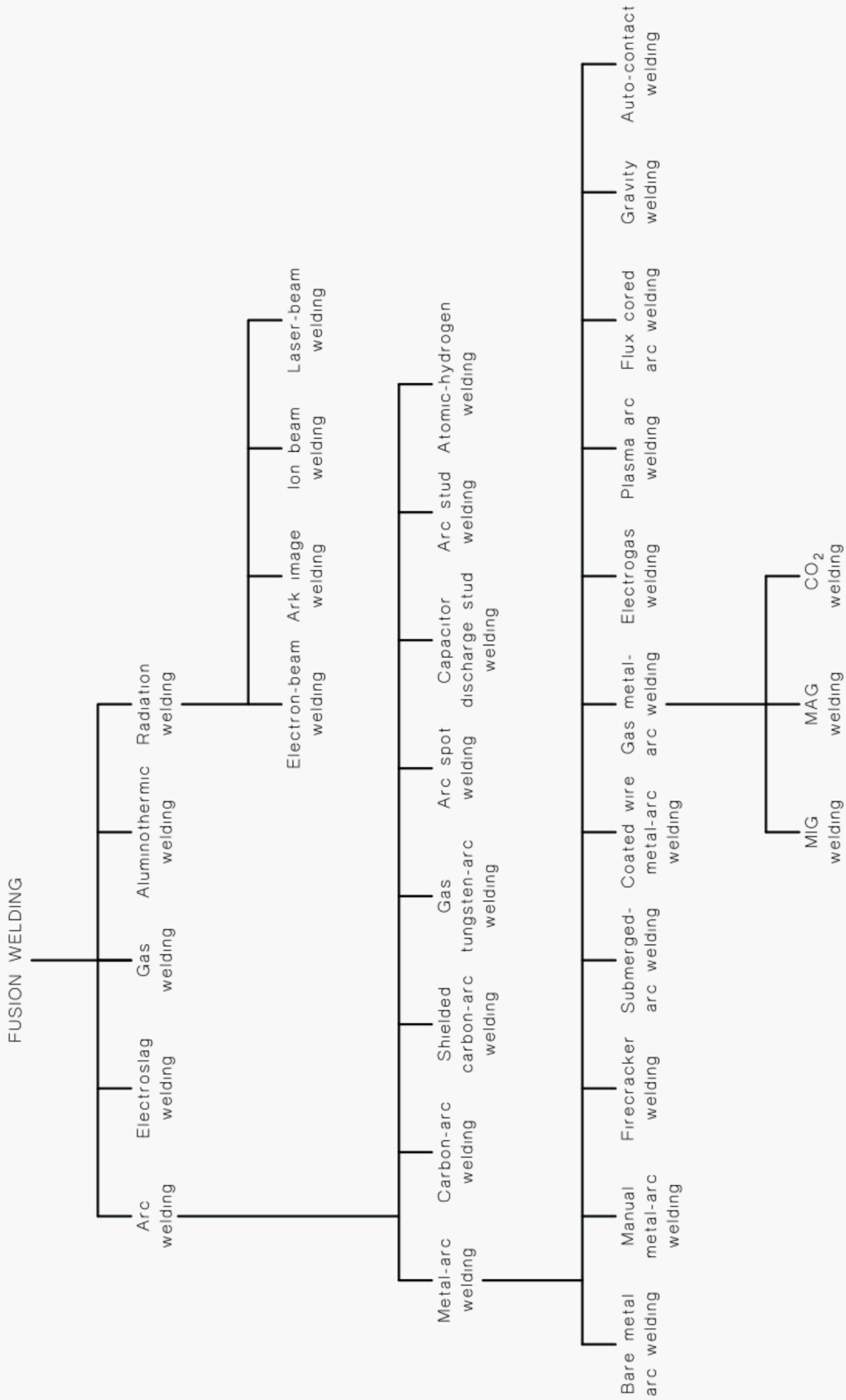


FIGURE A3 CHART OF FUSION WELDING PROCESSES

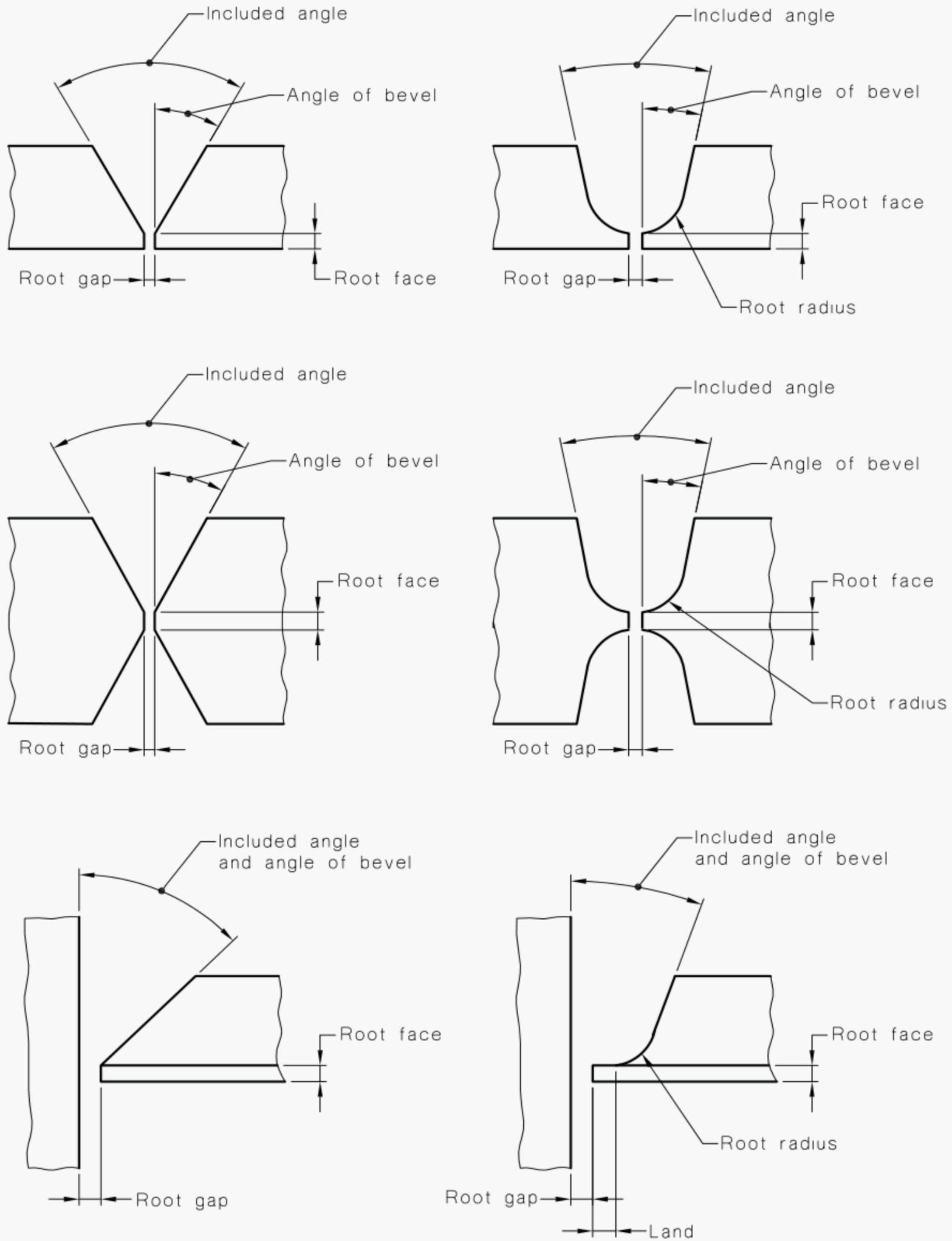


FIGURE A5 TYPICAL JOINT PREPARATIONS

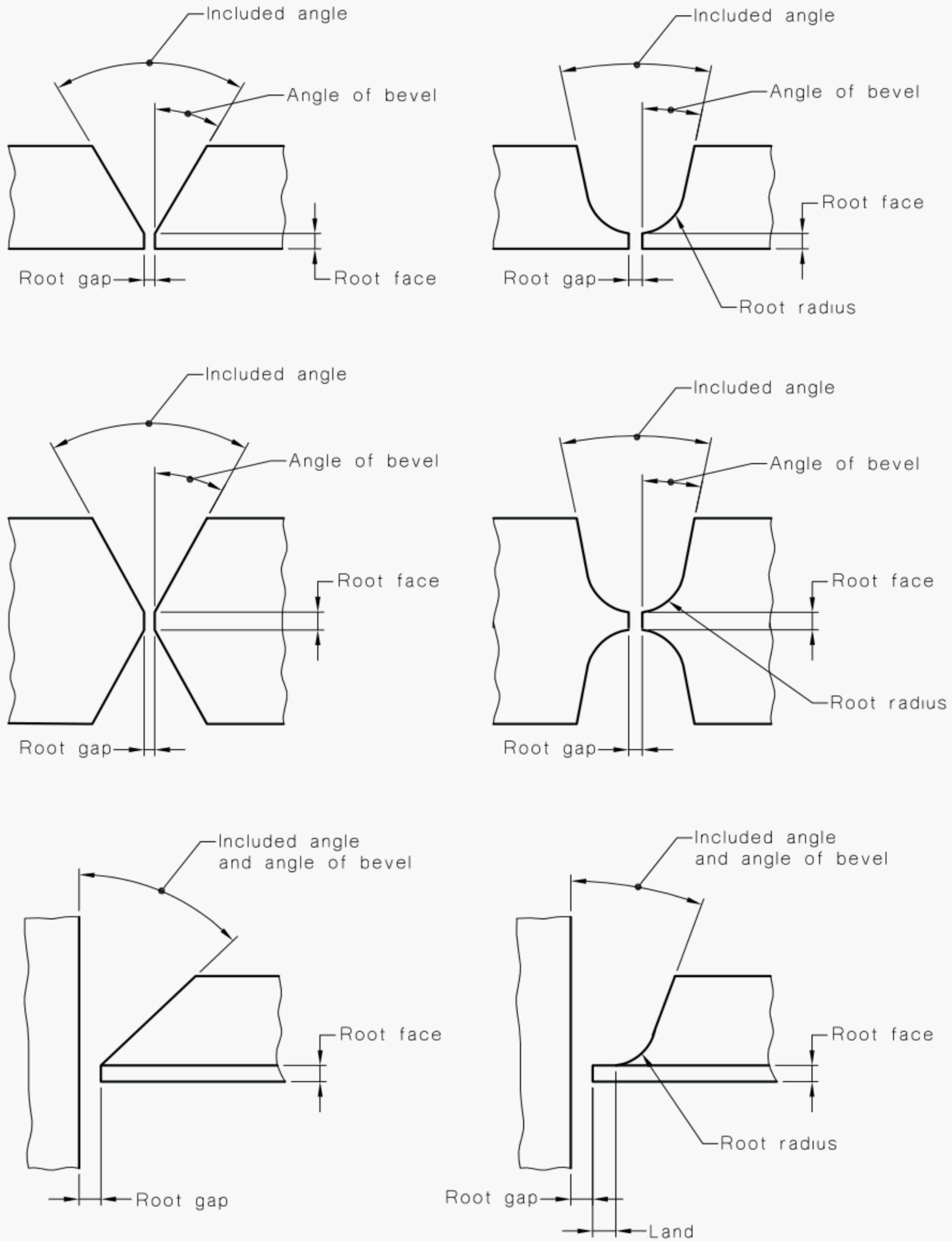


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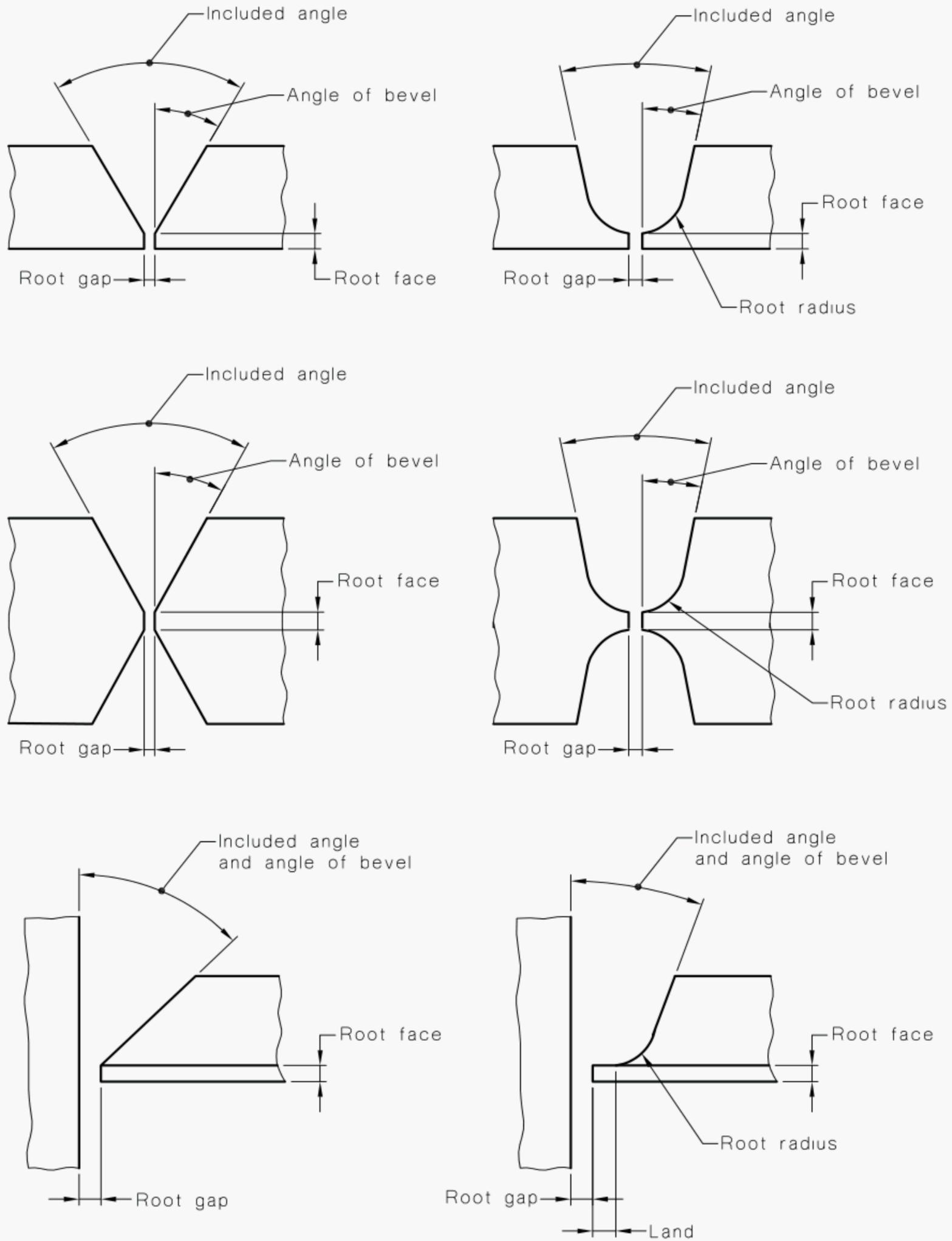


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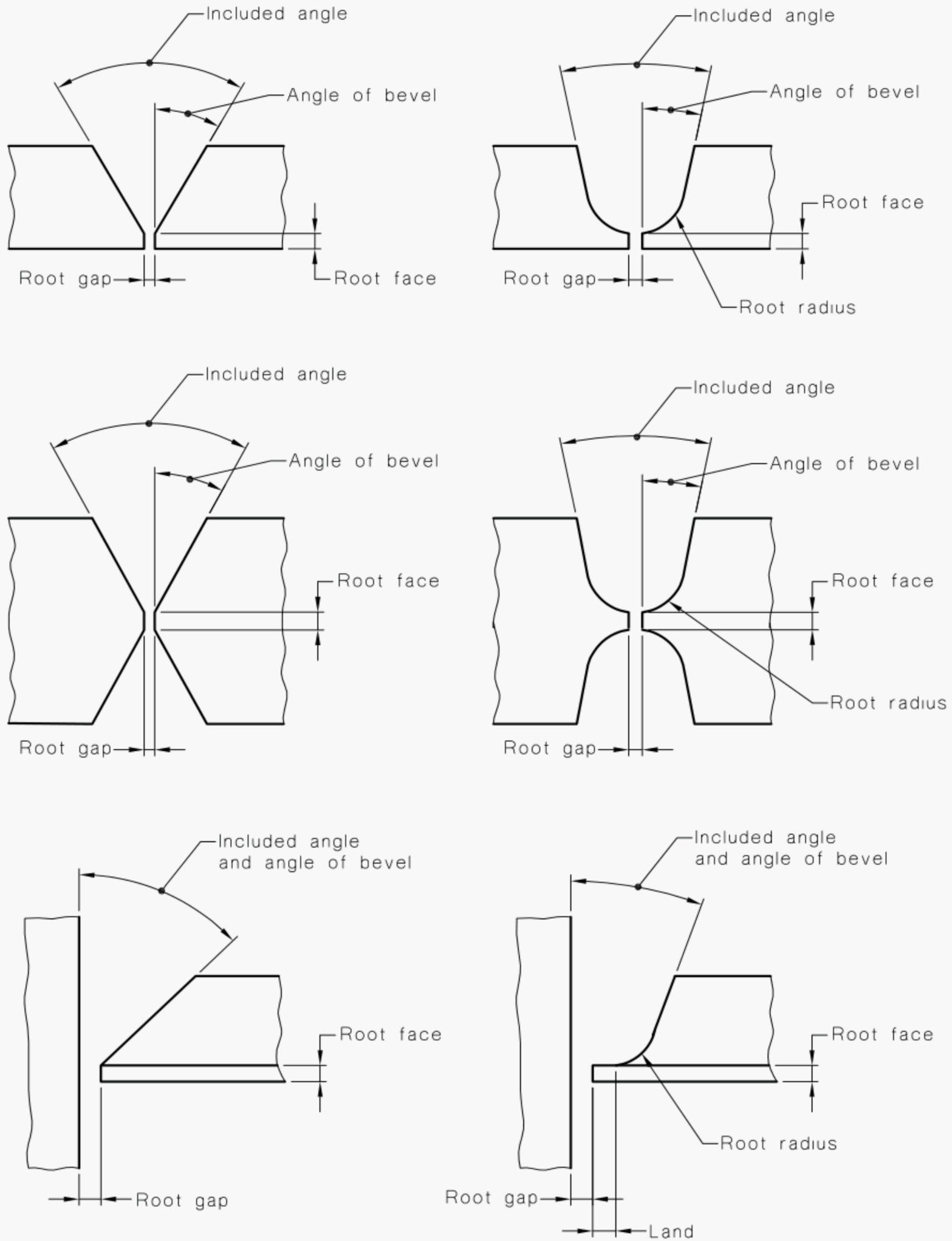


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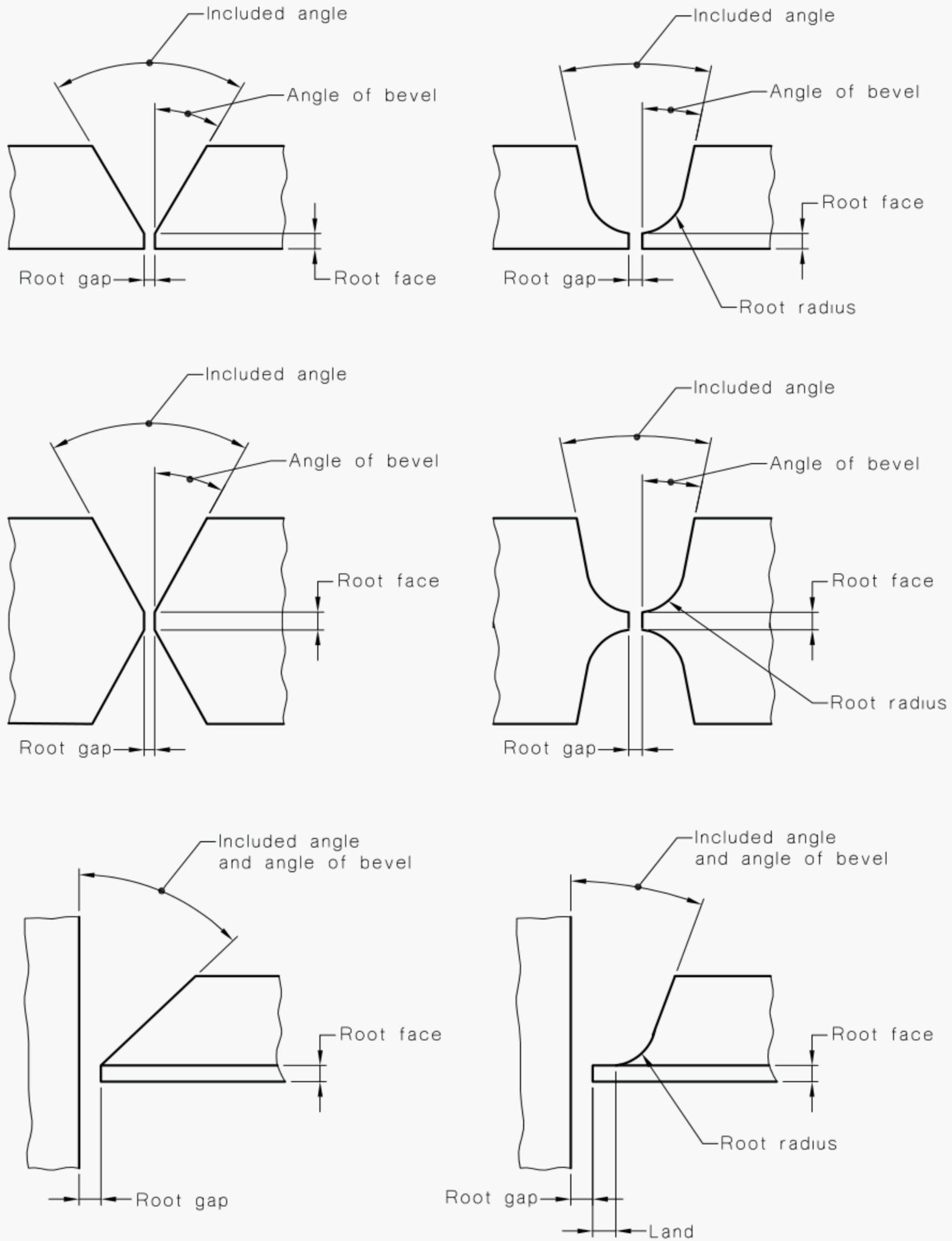


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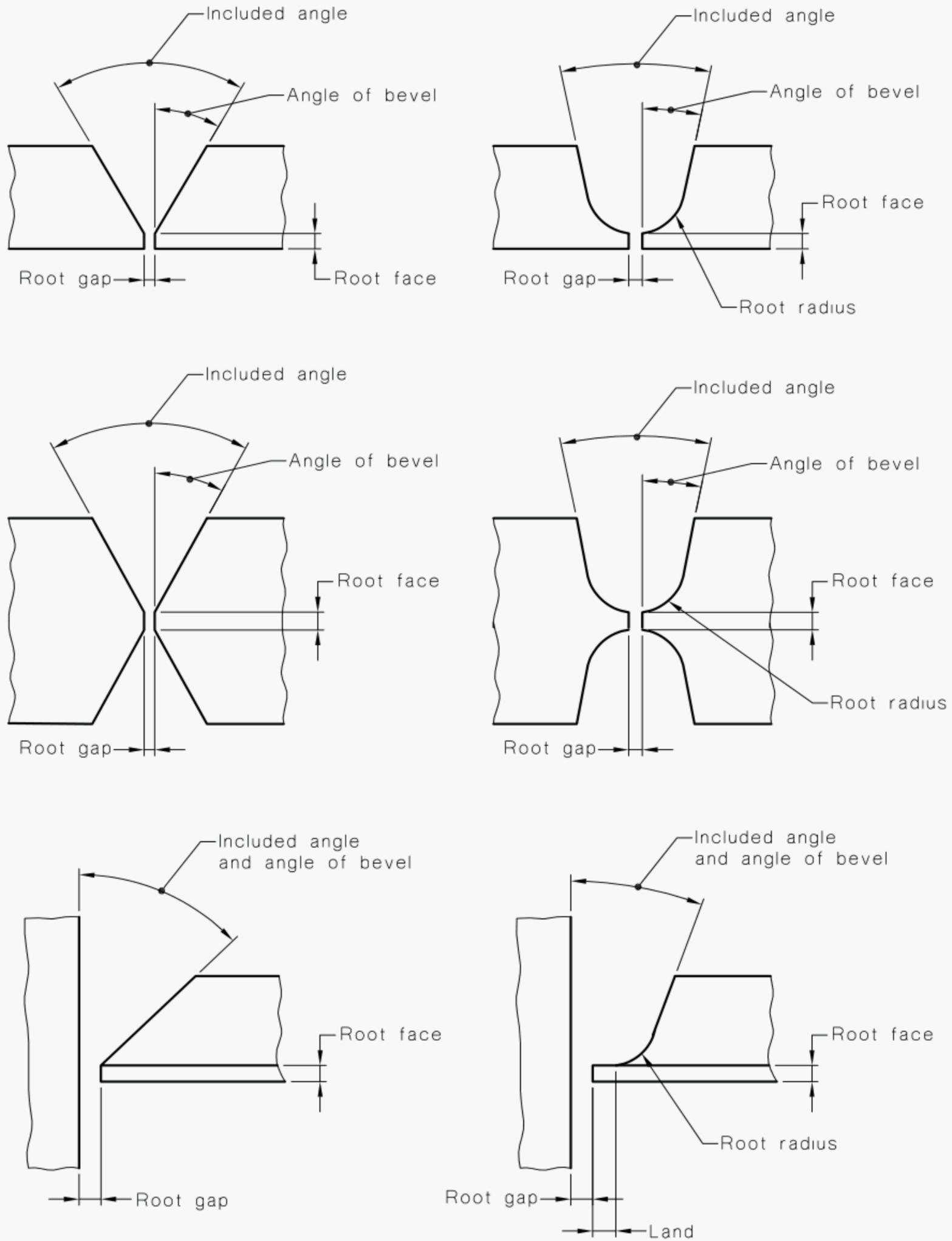


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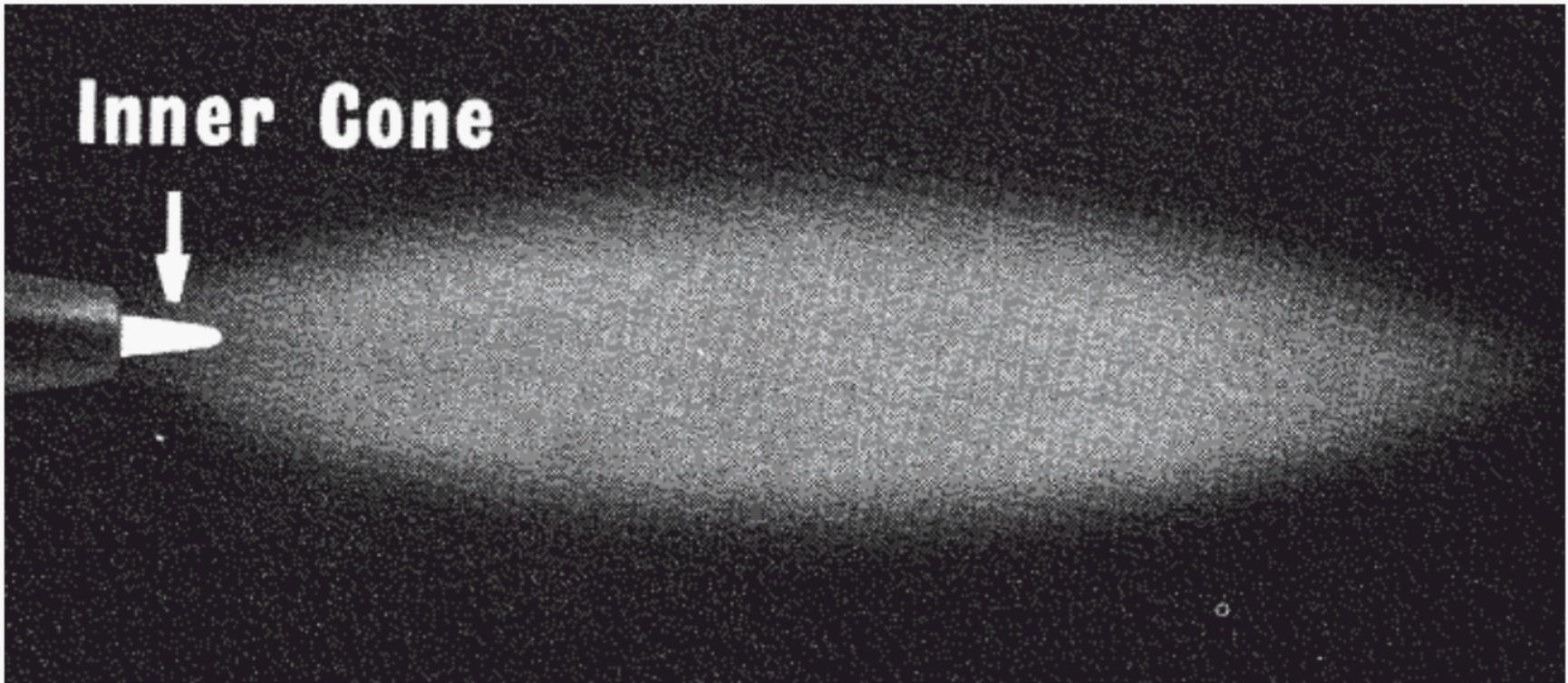


FIGURE A12 OXIDIZING FLAME

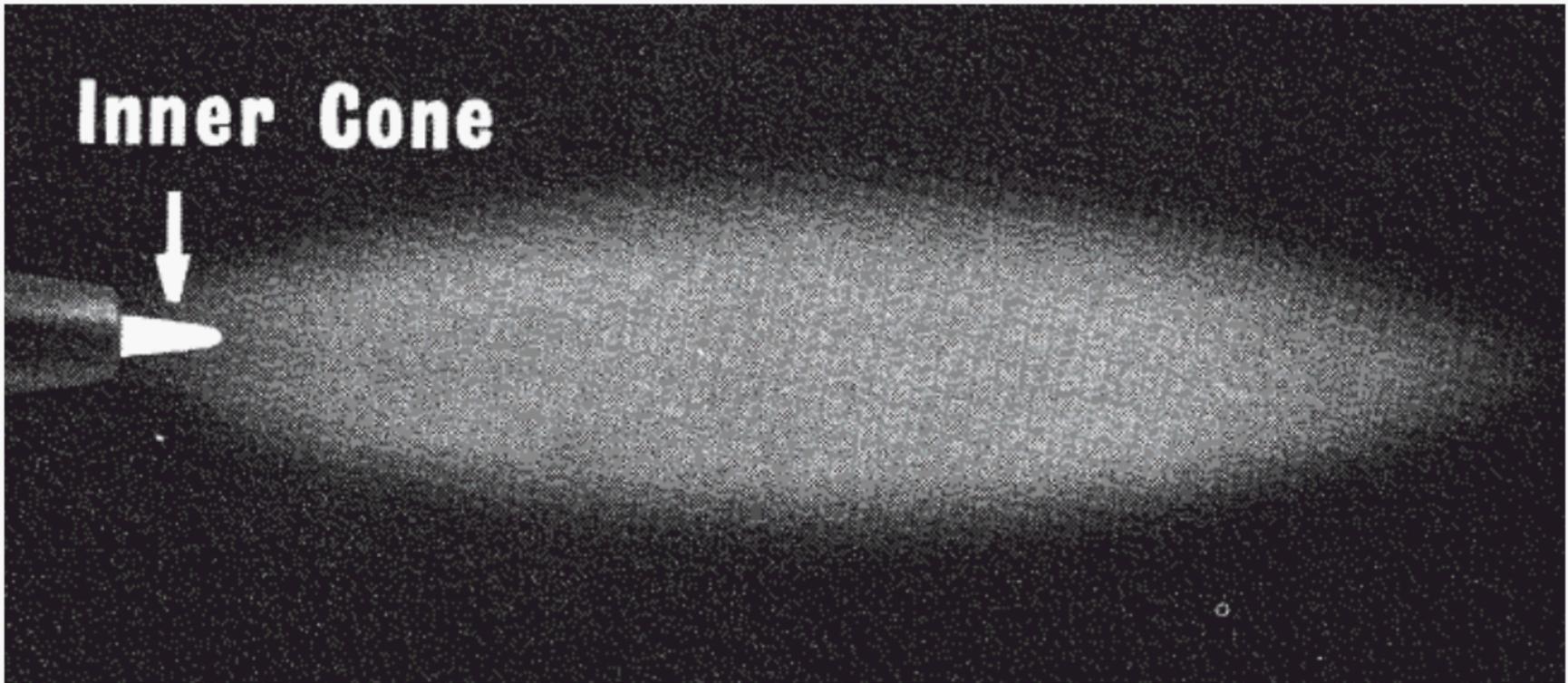


FIGURE A12 OXIDIZING FLAME

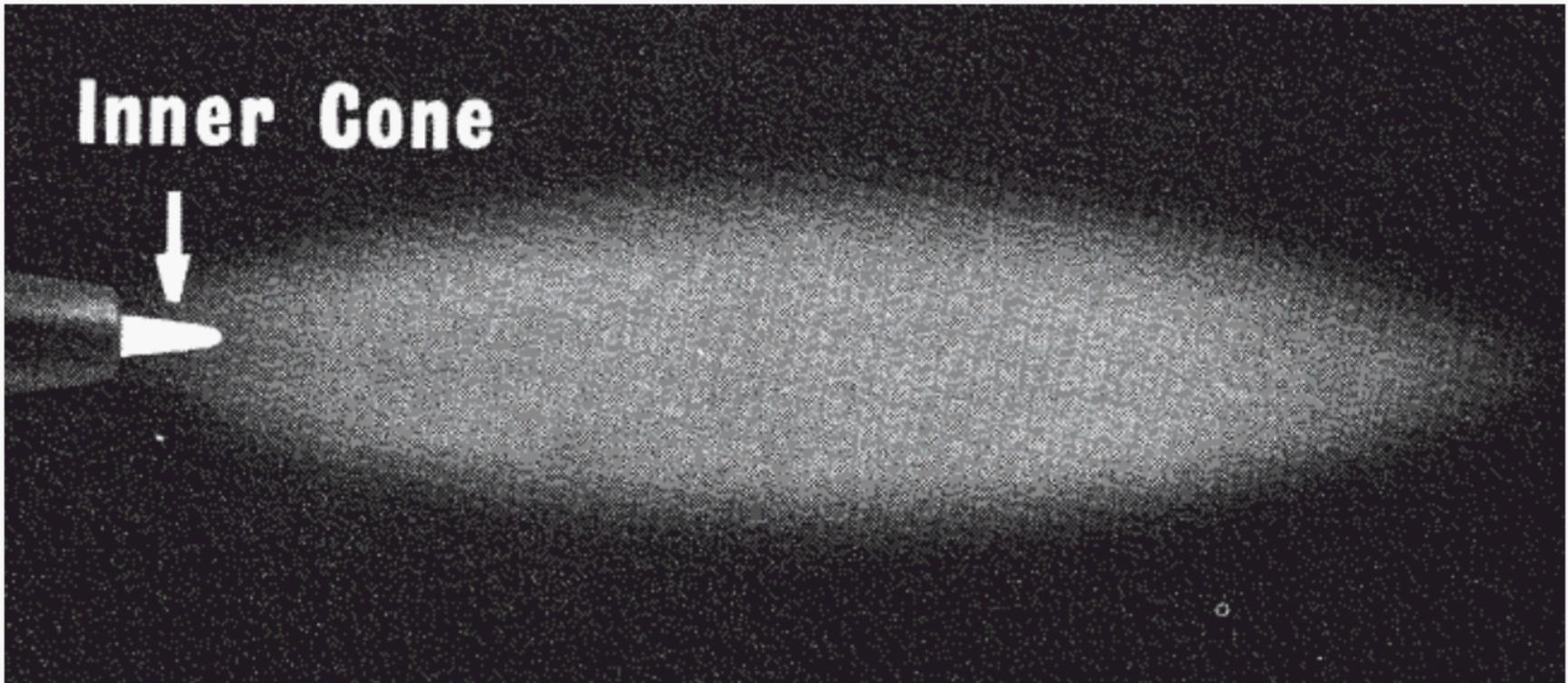


FIGURE A12 OXIDIZING FLAME

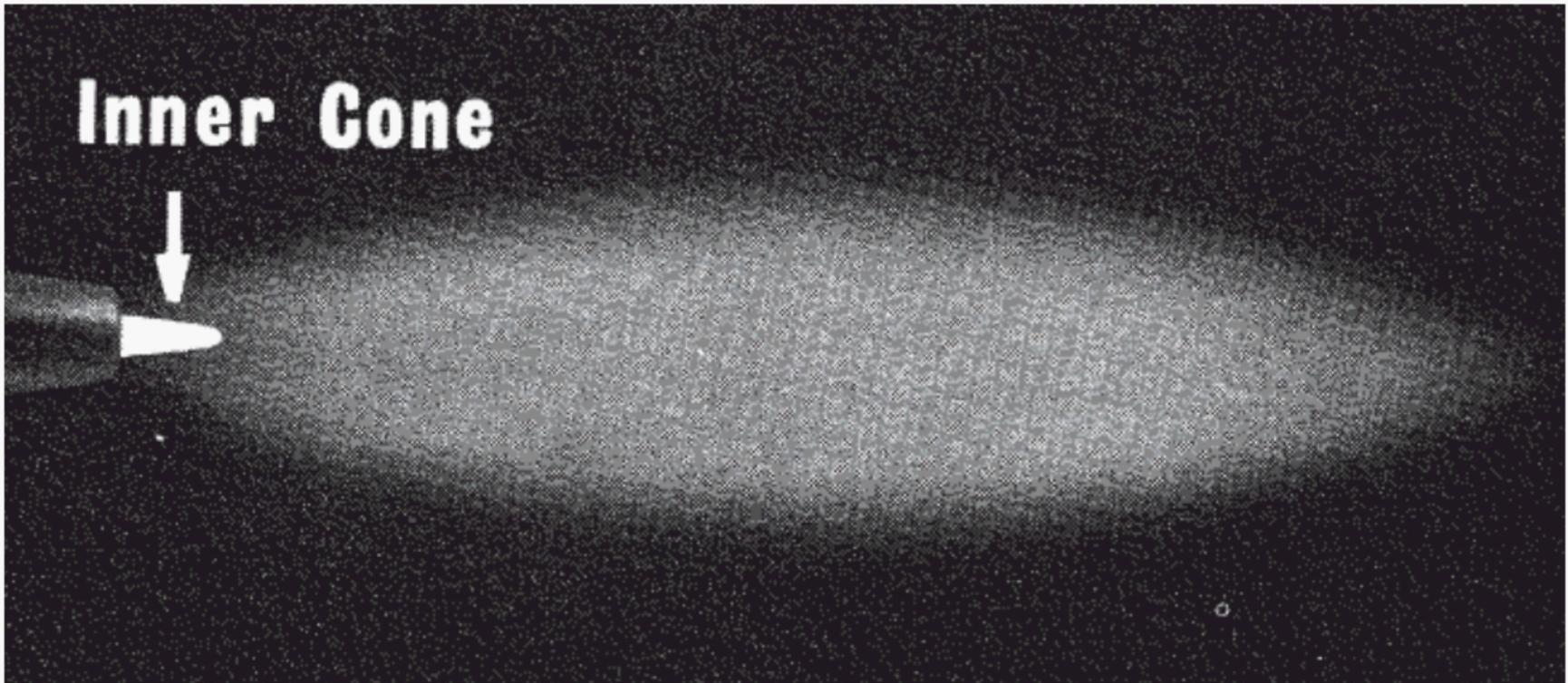


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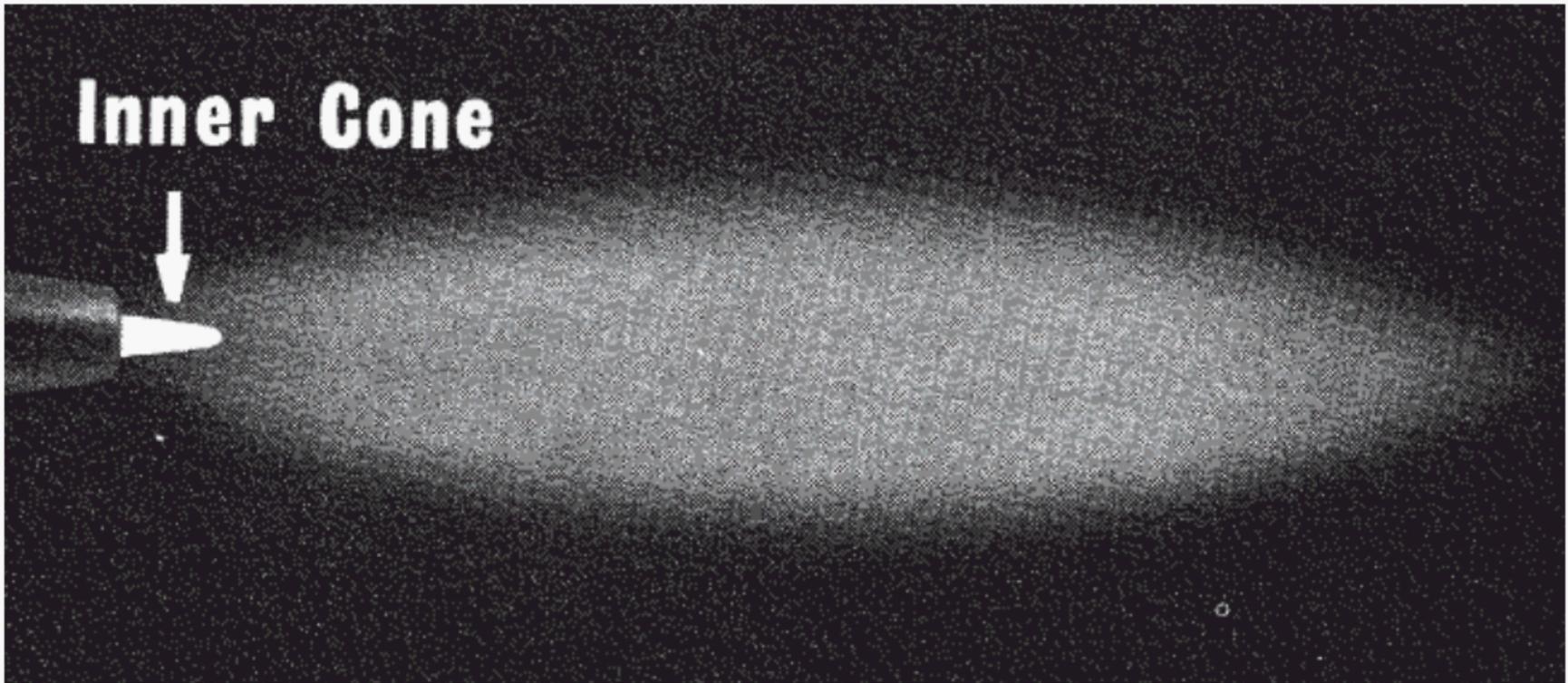


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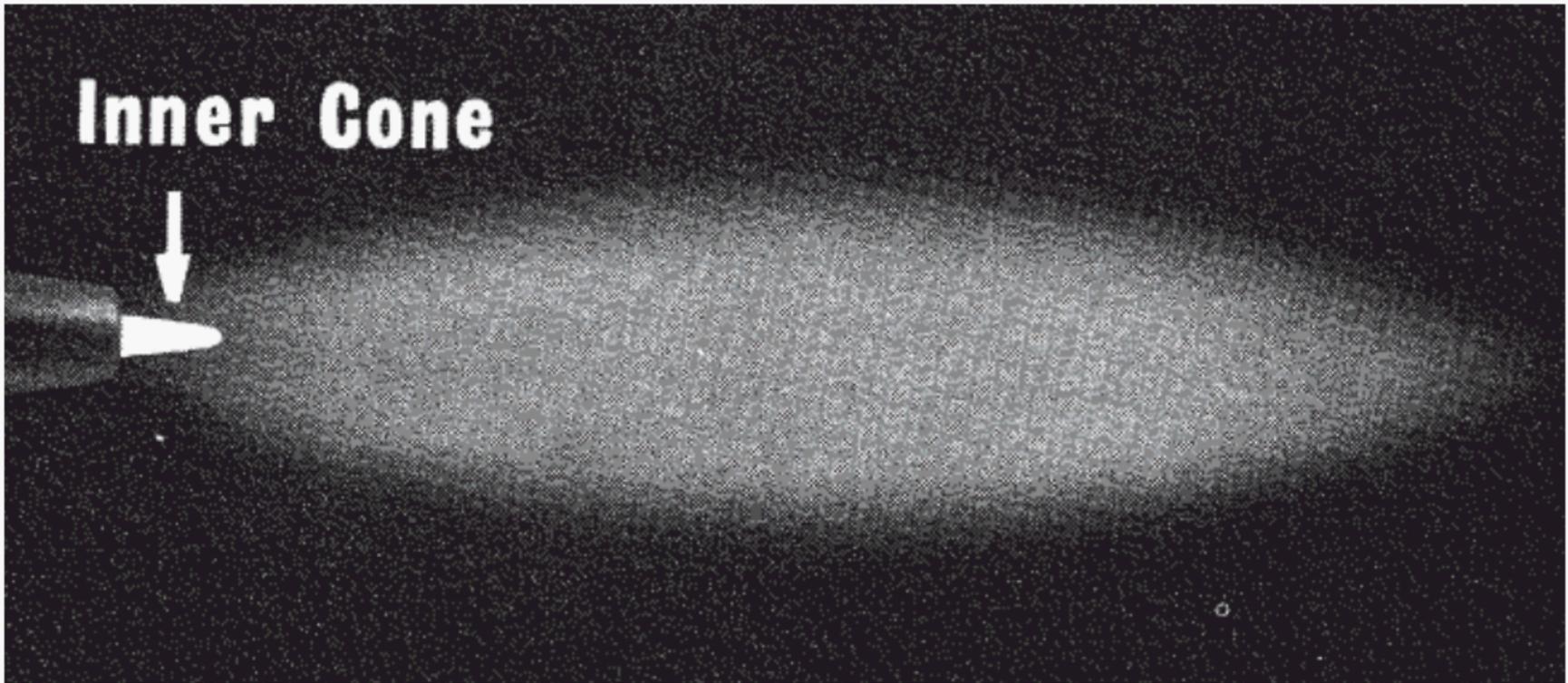


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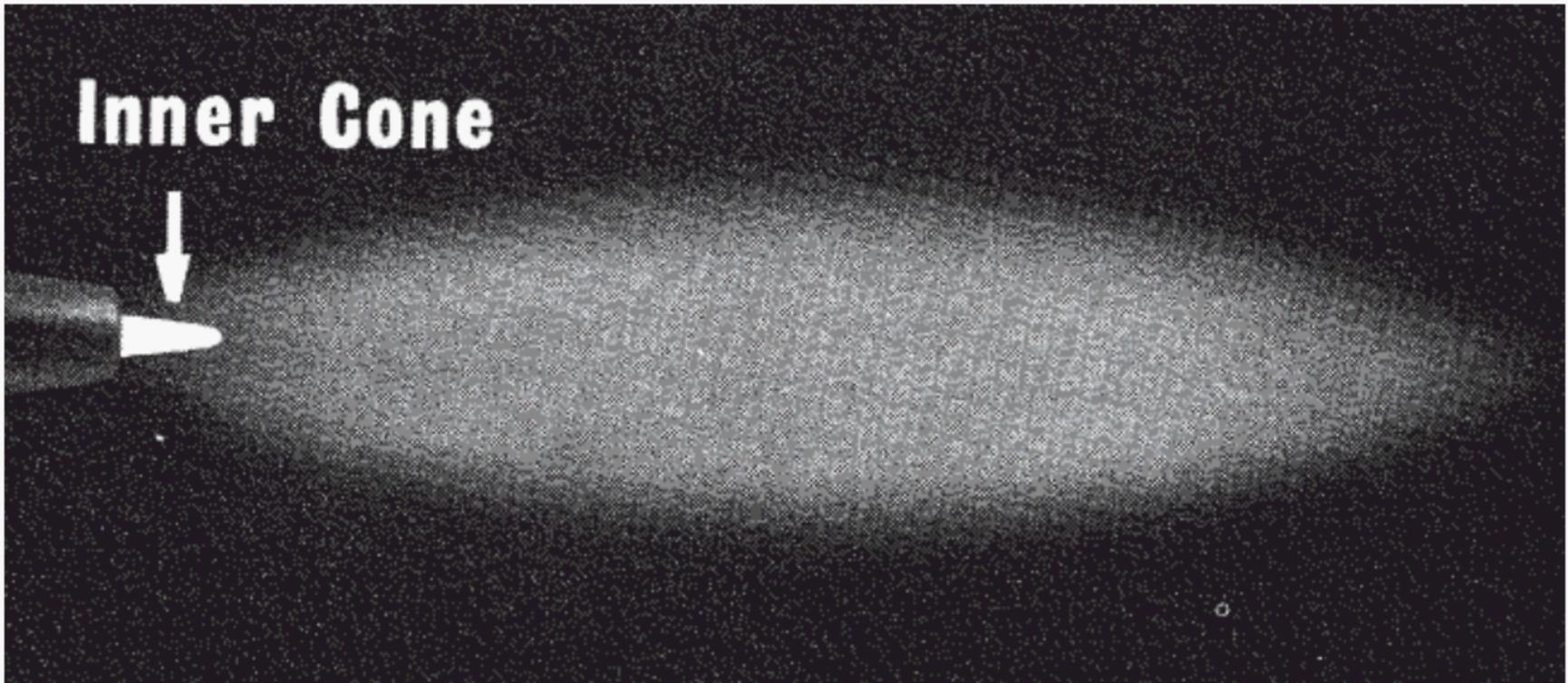


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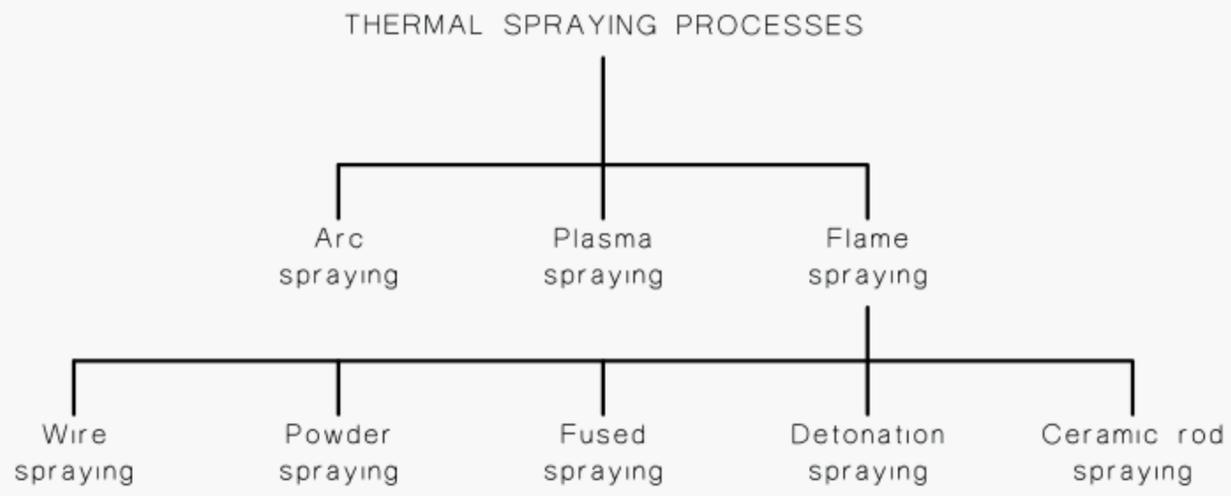


FIGURE A17 CHART OF THERMAL SPRAYING PROCESSES

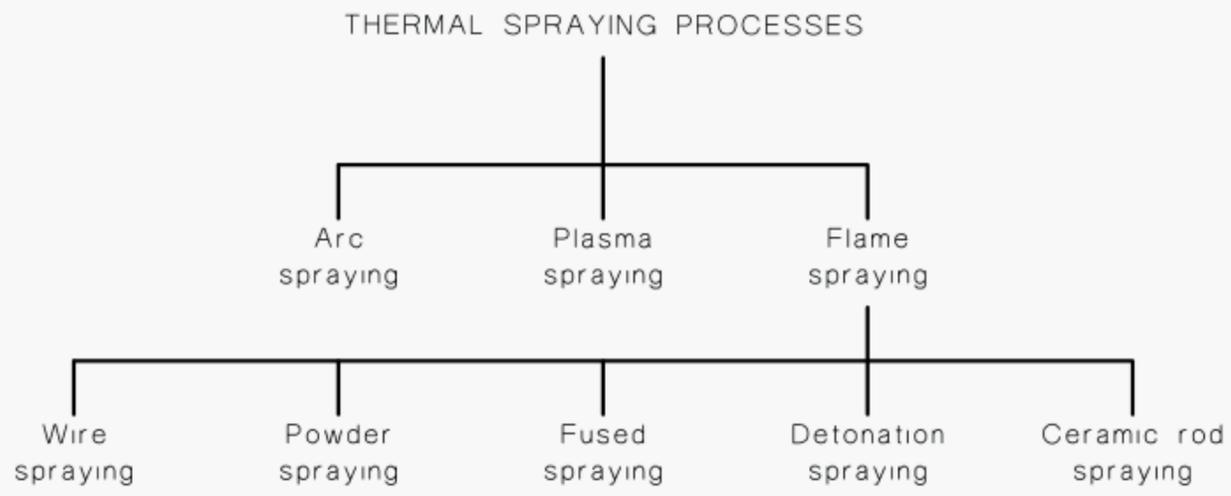


FIGURE A17 CHART OF THERMAL SPRAYING PROCESSES

INDEX

	<i>Clause</i>		<i>Clause</i>
(A)			
accelerating voltage	3.278	back-step welding	3.003
active gas	3.203	back-up, die	4.035
actual throat thickness	3.001	backfire	3.243
air ejector	10.001	backhand welding	2.005
air-arc cutting	1.001	backing bar	3.004
air-arc gouging	1.002	backing electrode	4.036
air/fuel gas blowpipe	5.001	backing run	3.005
airline respirator	10.002	backing strip	3.006
all-weld-metal tensile test	9.001	backing weld	3.007
alternate polarity operation	4.028	backward force	4.037
alternate polarity welding	4.028	backward pressure	4.038
aluminothermic reaction	3.316	balanced wave	3.113
aluminothermic welding	1.003	balanced welding	2.006
analogue timer	4.001	bare electrode	3.114
angle centre electrode	4.029	bare metal arc welding	1.013
angle electrode	4.030	base metal	2.007
angle of bevel	3.002	basic electrode	3.115
angle of preparation	3.043	bead	2.008
angle offset electrode	4.031	beam current	3.280
angular misalignment	8.001	beam current control	3.281
annular preheat cutting nozzle	7.011	beam deflector	3.282
annulus flame cutting nozzle	7.011	beam power	3.283
anode	3.279	beam power density	3.284
anvil	4.223	beam pulsing	3.285
arc blow	3.102	beam spinning	3.286
arc blow compensator	4.201	bell joint	5.002
arc braze welding	1.004	bend test	9.002
arc cutting	1.005	bias voltage	3.287
arc damper	4.201	blacksmith welding	4.192
arc eye	10.003	blending taper	4.224
arc flash	10.004	block welding	3.008
arc length	3.103	blowhole	8.002
arc oscillation welding	2.001	blowpipe	3.244
arc radiation	10.005	blowpipe handle	3.245
arc spot welding	1.007	bolster	4.039
arc spraying	1.008	bond coat	6.001
arc stud welding	1.009	bond line	6.002
arc time	3.104	braided electrode	3.116
arc time factor	3.105	branch T saddle joint	5.003
arc voltage	3.106	branching cracks	8.003
arc welding	1.010	braze welding	1.014
arc welding gun	3.107	braze welding rod	5.004
arc welding plant	3.108	brazing	1.015
arc welding power source	3.109	brazing alloy	5.007
arc welding torch	3.110	break-up	8.004
arc welding transformer	3.111	bronze filler metal	5.004
arc-image welding	1.006	bronze welding	1.014
arm	4.032	buffer	4.225
atomic hydrogen torch	3.112	burn back	3.117
atomic-hydrogen welding	1.011	burn-off	4.002
auto-contact welding	1.012	burn-off rate	3.118
autogenous welding	2.002	burn-through	8.005
automatic stud welding equipment	4.202	burnt weld	2.009
automatic welding	2.003	bursting disc	10.006
auxiliary gas shield	7.047	butt joint	3.006
averaging time	4.033	butt resistance-seam welding	1.016
(B)			
back gouging	2.004	butt weld	2.010
back plate	4.034	buttering	2.011
back weld	3.005	(C)	
		CO ₂ spot welding	3.121
		CO ₂ welding	1.021

INDEX

	<i>Clause</i>		<i>Clause</i>
(A)			
accelerating voltage	3.278	back-step welding	3.003
active gas	3.203	back-up, die	4.035
actual throat thickness	3.001	backfire	3.243
air ejector	10.001	backhand welding	2.005
air-arc cutting	1.001	backing bar	3.004
air-arc gouging	1.002	backing electrode	4.036
air/fuel gas blowpipe	5.001	backing run	3.005
airline respirator	10.002	backing strip	3.006
all-weld-metal tensile test	9.001	backing weld	3.007
alternate polarity operation	4.028	backward force	4.037
alternate polarity welding	4.028	backward pressure	4.038
aluminothermic reaction	3.316	balanced wave	3.113
aluminothermic welding	1.003	balanced welding	2.006
analogue timer	4.001	bare electrode	3.114
angle centre electrode	4.029	bare metal arc welding	1.013
angle electrode	4.030	base metal	2.007
angle of bevel	3.002	basic electrode	3.115
angle of preparation	3.043	bead	2.008
angle offset electrode	4.031	beam current	3.280
angular misalignment	8.001	beam current control	3.281
annular preheat cutting nozzle	7.011	beam deflector	3.282
annulus flame cutting nozzle	7.011	beam power	3.283
anode	3.279	beam power density	3.284
anvil	4.223	beam pulsing	3.285
arc blow	3.102	beam spinning	3.286
arc blow compensator	4.201	bell joint	5.002
arc braze welding	1.004	bend test	9.002
arc cutting	1.005	bias voltage	3.287
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arc eye	10.003	blending taper	4.224
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arc oscillation welding	2.001	blowpipe	3.244
arc radiation	10.005	blowpipe handle	3.245
arc spot welding	1.007	bolster	4.039
arc spraying	1.008	bond coat	6.001
arc stud welding	1.009	bond line	6.002
arc time	3.104	braided electrode	3.116
arc time factor	3.105	branch T saddle joint	5.003
arc voltage	3.106	branching cracks	8.003
arc welding	1.010	braze welding	1.014
arc welding gun	3.107	braze welding rod	5.004
arc welding plant	3.108	brazing	1.015
arc welding power source	3.109	brazing alloy	5.007
arc welding torch	3.110	break-up	8.004
arc welding transformer	3.111	bronze filler metal	5.004
arc-image welding	1.006	bronze welding	1.014
arm	4.032	buffer	4.225
atomic hydrogen torch	3.112	burn back	3.117
atomic-hydrogen welding	1.011	burn-off	4.002
auto-contact welding	1.012	burn-off rate	3.118
autogenous welding	2.002	burn-through	8.005
automatic stud welding equipment	4.202	burnt weld	2.009
automatic welding	2.003	bursting disc	10.006
auxiliary gas shield	7.047	butt joint	3.006
averaging time	4.033	butt resistance-seam welding	1.016
(B)			
back gouging	2.004	butt weld	2.010
back plate	4.034	buttering	2.011
back weld	3.005	(C)	
		CO ₂ spot welding	3.121
		CO ₂ welding	1.021

INDEX

	<i>Clause</i>		<i>Clause</i>
(A)			
accelerating voltage	3.278	back-step welding	3.003
active gas	3.203	back-up, die	4.035
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air-arc gouging	1.002	backing electrode	4.036
air/fuel gas blowpipe	5.001	backing run	3.005
airline respirator	10.002	backing strip	3.006
all-weld-metal tensile test	9.001	backing weld	3.007
alternate polarity operation	4.028	backward force	4.037
alternate polarity welding	4.028	backward pressure	4.038
aluminothermic reaction	3.316	balanced wave	3.113
aluminothermic welding	1.003	balanced welding	2.006
analogue timer	4.001	bare electrode	3.114
angle centre electrode	4.029	bare metal arc welding	1.013
angle electrode	4.030	base metal	2.007
angle of bevel	3.002	basic electrode	3.115
angle of preparation	3.043	bead	2.008
angle offset electrode	4.031	beam current	3.280
angular misalignment	8.001	beam current control	3.281
annular preheat cutting nozzle	7.011	beam deflector	3.282
annulus flame cutting nozzle	7.011	beam power	3.283
anode	3.279	beam power density	3.284
anvil	4.223	beam pulsing	3.285
arc blow	3.102	beam spinning	3.286
arc blow compensator	4.201	bell joint	5.002
arc braze welding	1.004	bend test	9.002
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arc eye	10.003	blending taper	4.224
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arc radiation	10.005	blowpipe handle	3.245
arc spot welding	1.007	bolster	4.039
arc spraying	1.008	bond coat	6.001
arc stud welding	1.009	bond line	6.002
arc time	3.104	braided electrode	3.116
arc time factor	3.105	branch T saddle joint	5.003
arc voltage	3.106	branching cracks	8.003
arc welding	1.010	braze welding	1.014
arc welding gun	3.107	braze welding rod	5.004
arc welding plant	3.108	brazing	1.015
arc welding power source	3.109	brazing alloy	5.007
arc welding torch	3.110	break-up	8.004
arc welding transformer	3.111	bronze filler metal	5.004
arc-image welding	1.006	bronze welding	1.014
arm	4.032	buffer	4.225
atomic hydrogen torch	3.112	burn back	3.117
atomic-hydrogen welding	1.011	burn-off	4.002
auto-contact welding	1.012	burn-off rate	3.118
autogenous welding	2.002	burn-through	8.005
automatic stud welding equipment	4.202	burnt weld	2.009
automatic welding	2.003	bursting disc	10.006
auxiliary gas shield	7.047	butt joint	3.006
averaging time	4.033	butt resistance-seam welding	1.016
(B)			
back gouging	2.004	butt weld	2.010
back plate	4.034	buttering	2.011
back weld	3.005	(C)	
		CO ₂ spot welding	3.121
		CO ₂ welding	1.021

INDEX

	<i>Clause</i>		<i>Clause</i>
(A)			
accelerating voltage	3.278	back-step welding	3.003
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air-arc gouging	1.002	backing electrode	4.036
air/fuel gas blowpipe	5.001	backing run	3.005
airline respirator	10.002	backing strip	3.006
all-weld-metal tensile test	9.001	backing weld	3.007
alternate polarity operation	4.028	backward force	4.037
alternate polarity welding	4.028	backward pressure	4.038
aluminothermic reaction	3.316	balanced wave	3.113
aluminothermic welding	1.003	balanced welding	2.006
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annular preheat cutting nozzle	7.011	beam deflector	3.282
annulus flame cutting nozzle	7.011	beam power	3.283
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anvil	4.223	beam pulsing	3.285
arc blow	3.102	beam spinning	3.286
arc blow compensator	4.201	bell joint	5.002
arc braze welding	1.004	bend test	9.002
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arc damper	4.201	blacksmith welding	4.192
arc eye	10.003	blending taper	4.224
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arc length	3.103	blowhole	8.002
arc oscillation welding	2.001	blowpipe	3.244
arc radiation	10.005	blowpipe handle	3.245
arc spot welding	1.007	bolster	4.039
arc spraying	1.008	bond coat	6.001
arc stud welding	1.009	bond line	6.002
arc time	3.104	braided electrode	3.116
arc time factor	3.105	branch T saddle joint	5.003
arc voltage	3.106	branching cracks	8.003
arc welding	1.010	braze welding	1.014
arc welding gun	3.107	braze welding rod	5.004
arc welding plant	3.108	brazing	1.015
arc welding power source	3.109	brazing alloy	5.007
arc welding torch	3.110	break-up	8.004
arc welding transformer	3.111	bronze filler metal	5.004
arc-image welding	1.006	bronze welding	1.014
arm	4.032	buffer	4.225
atomic hydrogen torch	3.112	burn back	3.117
atomic-hydrogen welding	1.011	burn-off	4.002
auto-contact welding	1.012	burn-off rate	3.118
autogenous welding	2.002	burn-through	8.005
automatic stud welding equipment	4.202	burnt weld	2.009
automatic welding	2.003	bursting disc	10.006
auxiliary gas shield	7.047	butt joint	3.006
averaging time	4.033	butt resistance-seam welding	1.016
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back gouging	2.004	butt weld	2.010
back plate	4.034	buttering	2.011
back weld	3.005	(C)	
		CO ₂ spot welding	3.121
		CO ₂ welding	1.021

	<i>Clause</i>		<i>Clause</i>
hot crack.....	8.028	lack of sidewall fusion.....	8.042
hot cropping	1.063	lamellar tearing.....	8.043
hot pass	3.041	land.....	3.051
hot pressure welding	1.064	lap joint.....	2.029
hot-cracking test	9.018	laser-beam cutting.....	1.074
hydrogen controlled	3.042	laser-beam welding	1.075
hydrogen-controlled electrode.....	3.171	leg.....	3.052
(I)		leg length	3.053
ignition temperature	7.007	lift.....	4.207
imperfect shape.....	8.029	lightly coated electrode	3.177
imperfection	8.030	linear misalignment.....	8.044
implant test.....	9.019	linear porosity.....	8.045
inclined electrode.....	4.030	liquid phase diffusion welding	4.221
included angle.....	3.043	load test current	3.178
inclusion.....	8.031	load-carrying weld	2.030
incomplete penetration	3.044	local exhaust ventilation	10.029
incorrect size weld	8.033	localized porosity.....	8.046
incorrect toe angle.....	8.032	longitudinal bend test	9.020
indirect spot welding	4.105	longitudinal crack	8.047
induction brazing	1.065	loss of cross-sectional area	8.048
induction soldering.....	1.066	low of hydrogen electrode	3.179
induction welding	1.067	low pressure blowpipe.....	3.265
inert gas	3.172	low-voltage electron gun	3.300
inert gas arc welding	3.173	low-frequency resistance welding	4.108
inertia friction welding.....	1.068	(M)	
inflated slag.....	3.202	machine stroke.....	4.109
infrared brazing	1.069	macro test.....	9.021
infrared soldering.....	1.070	MAG welding.....	1.076
inherent rectification	3.174	magnetic rotating arc welding	1.077
initial current.....	4.106	magnetically impelled arc butt welding	1.078
initial force.....	4.007	main arc	3.180
initial plate angle	4.229	manipulator	3.063
initial pressure	4.008	manual metal-arc welding.....	1.079
injector.....	3.264	manual welding.....	2.031
insert.....	4.107	mash weld	4.110
insulated electrode holder.....	10.028	mask	6.006
inter-pulse time.....	2.028	maximum continuous hand-welding current.....	3.181
interdendritic shrinkage.....	8.034	mechanical bond	6.007
interface	4.179	mechanized welding.....	2.032
intermittent weld.....	3.045	medium voltage electron gun	3.301
interpass temperature	3.046	melt back.....	3.182
interrun temperature.....	3.047	melt through	8.005
interrupted seam welding.....	1.071	metal cored electrode	3.184
intrusion.....	8.035	metal electrode	3.185
ion beam welding.....	1.072	metal runout	8.049
iron oxide electrode.....	3.175	metal transfer.....	3.186
iron powder electrode.....	3.176	metal-arc cutting	1.080
iron soldering	1.073	metal-arc spot welding	3.183
irregular surface.....	8.036	metal-arc welding	1.081
irregular width	8.037	metallic inclusions	8.050
(J)		metallized flux stud.....	4.208
jet	4.230	metallurgical bond	6.008
joint	3.048	micro-plasma welding	1.082
joint penetration.....	3.049	micro-welding.....	2.033
joint preparation.....	3.050	microcrack.....	8.051
jumped joint	4.194	microshrinkage	8.052
(K)		MIG braze welding	1.083
kerf.....	7.008	MIG gun.....	3.187
(L)		MIG welding	1.084
lack of fusion.....	8.038	misalignment	8.053
lack of interrun fusion	8.039	mitre-fillet weld	3.054
lack of penetration	8.040	mixer.....	3.266
lack of root fusion.....	8.041	motor generator welding power source	3.188

	<i>Clause</i>		<i>Clause</i>
hot crack.....	8.028	lack of sidewall fusion.....	8.042
hot cropping	1.063	lamellar tearing.....	8.043
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hot pressure welding	1.064	lap joint.....	2.029
hot-cracking test	9.018	laser-beam cutting.....	1.074
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inert gas arc welding	3.173	low-frequency resistance welding	4.108
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infrared soldering.....	1.070	MAG welding.....	1.076
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hot crack.....	8.028	lack of sidewall fusion.....	8.042
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ignition temperature	7.007	lift.....	4.207
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imperfection	8.030	linear misalignment.....	8.044
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inclined electrode.....	4.030	liquid phase diffusion welding	4.221
included angle.....	3.043	load test current	3.178
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incorrect toe angle.....	8.032	longitudinal bend test	9.020
indirect spot welding	4.105	longitudinal crack	8.047
induction brazing	1.065	loss of cross-sectional area	8.048
induction soldering.....	1.066	low of hydrogen electrode	3.179
induction welding	1.067	low pressure blowpipe.....	3.265
inert gas	3.172	low-voltage electron gun	3.300
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inflated slag.....	3.202	machine stroke.....	4.109
infrared brazing	1.069	macro test.....	9.021
infrared soldering.....	1.070	MAG welding.....	1.076
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initial current.....	4.106	magnetically impelled arc butt welding	1.078
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initial plate angle	4.229	manipulator	3.063
initial pressure	4.008	manual metal-arc welding.....	1.079
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inter-pulse time.....	2.028	maximum continuous hand-welding current.....	3.181
interdendritic shrinkage.....	8.034	mechanical bond	6.007
interface	4.179	mechanized welding.....	2.032
intermittent weld.....	3.045	medium voltage electron gun	3.301
interpass temperature	3.046	melt back.....	3.182
interrun temperature.....	3.047	melt through	8.005
interrupted seam welding.....	1.071	metal cored electrode	3.184
intrusion.....	8.035	metal electrode	3.185
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iron oxide electrode.....	3.175	metal transfer.....	3.186
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iron soldering	1.073	metal-arc spot welding	3.183
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hot crack.....	8.028	lack of sidewall fusion.....	8.042
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hot-cracking test	9.018	laser-beam cutting.....	1.074
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imperfection	8.030	linear misalignment.....	8.044
implant test.....	9.019	linear porosity.....	8.045
inclined electrode.....	4.030	liquid phase diffusion welding	4.221
included angle.....	3.043	load test current	3.178
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incomplete penetration	3.044	local exhaust ventilation	10.029
incorrect size weld	8.033	localized porosity.....	8.046
incorrect toe angle.....	8.032	longitudinal bend test	9.020
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induction brazing	1.065	loss of cross-sectional area	8.048
induction soldering.....	1.066	low of hydrogen electrode	3.179
induction welding	1.067	low pressure blowpipe.....	3.265
inert gas	3.172	low-voltage electron gun	3.300
inert gas arc welding	3.173	low-frequency resistance welding	4.108
inertia friction welding.....	1.068	(M)	
inflated slag.....	3.202	machine stroke.....	4.109
infrared brazing	1.069	macro test.....	9.021
infrared soldering.....	1.070	MAG welding.....	1.076
inherent rectification	3.174	magnetic rotating arc welding	1.077
initial current.....	4.106	magnetically impelled arc butt welding	1.078
initial force.....	4.007	main arc	3.180
initial plate angle	4.229	manipulator	3.063
initial pressure	4.008	manual metal-arc welding.....	1.079
injector.....	3.264	manual welding.....	2.031
insert.....	4.107	mash weld	4.110
insulated electrode holder.....	10.028	mask	6.006
inter-pulse time.....	2.028	maximum continuous hand-welding current.....	3.181
interdendritic shrinkage.....	8.034	mechanical bond	6.007
interface	4.179	mechanized welding.....	2.032
intermittent weld.....	3.045	medium voltage electron gun	3.301
interpass temperature	3.046	melt back.....	3.182
interrun temperature.....	3.047	melt through	8.005
interrupted seam welding.....	1.071	metal cored electrode	3.184
intrusion.....	8.035	metal electrode	3.185
ion beam welding.....	1.072	metal runout	8.049
iron oxide electrode.....	3.175	metal transfer.....	3.186
iron powder electrode.....	3.176	metal-arc cutting	1.080
iron soldering	1.073	metal-arc spot welding	3.183
irregular surface.....	8.036	metal-arc welding	1.081
irregular width	8.037	metallic inclusions	8.050
(J)		metallized flux stud.....	4.208
jet	4.230	metallurgical bond	6.008
joint	3.048	micro-plasma welding	1.082
joint penetration.....	3.049	micro-welding.....	2.033
joint preparation.....	3.050	microcrack.....	8.051
jumped joint	4.194	microshrinkage	8.052
(K)		MIG braze welding	1.083
kerf.....	7.008	MIG gun.....	3.187
(L)		MIG welding	1.084
lack of fusion.....	8.038	misalignment	8.053
lack of interrun fusion	8.039	mitre-fillet weld	3.054
lack of penetration	8.040	mixer.....	3.266
lack of root fusion.....	8.041	motor generator welding power source	3.188

	<i>Clause</i>		<i>Clause</i>
hot crack.....	8.028	lack of sidewall fusion.....	8.042
hot cropping	1.063	lamellar tearing.....	8.043
hot pass	3.041	land.....	3.051
hot pressure welding	1.064	lap joint.....	2.029
hot-cracking test	9.018	laser-beam cutting.....	1.074
hydrogen controlled	3.042	laser-beam welding	1.075
hydrogen-controlled electrode.....	3.171	leg.....	3.052
(I)		leg length	3.053
ignition temperature	7.007	lift.....	4.207
imperfect shape.....	8.029	lightly coated electrode	3.177
imperfection	8.030	linear misalignment.....	8.044
implant test.....	9.019	linear porosity.....	8.045
inclined electrode.....	4.030	liquid phase diffusion welding	4.221
included angle.....	3.043	load test current	3.178
inclusion.....	8.031	load-carrying weld	2.030
incomplete penetration	3.044	local exhaust ventilation	10.029
incorrect size weld	8.033	localized porosity.....	8.046
incorrect toe angle.....	8.032	longitudinal bend test	9.020
indirect spot welding	4.105	longitudinal crack	8.047
induction brazing	1.065	loss of cross-sectional area	8.048
induction soldering.....	1.066	low of hydrogen electrode	3.179
induction welding	1.067	low pressure blowpipe.....	3.265
inert gas	3.172	low-voltage electron gun	3.300
inert gas arc welding	3.173	low-frequency resistance welding	4.108
inertia friction welding.....	1.068	(M)	
inflated slag.....	3.202	machine stroke.....	4.109
infrared brazing	1.069	macro test.....	9.021
infrared soldering.....	1.070	MAG welding.....	1.076
inherent rectification	3.174	magnetic rotating arc welding	1.077
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