



WELDING BASICS SERIES

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WELDING TERMINOLOGY BASICS



Welding Terminology Basics

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Please note:

The equipment shown in the following pages are not current models.

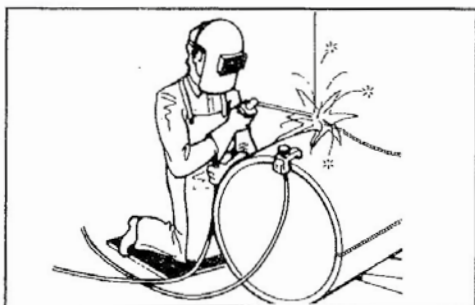
Welding Terminology Basics

Terminology

Welding is a method of joining edges or surfaces of metals by fusion which is achieved by the local application of heat.



High temperatures may be obtained by the controlled burning of gases (oxy-acetylene welding),



or by striking an electric arc (manual metal-arc welding).

For precise definitions of the following terms used in welding and fitting consult BS 499 Part 1. The explanations given here have been simplified.

Arc length

The distance between the end of an electrode and the surface of the weld pool (manual metal-arc welding).

Deposited metal

The metal produced by the melting of the filler metal or electrode and which becomes part of the weld.

Drag lines

Serrations left on the face of a cut made by thermal cutting.

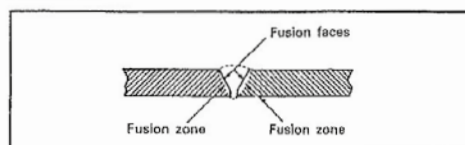
Filler rod

Filler metal in the form of a rod.

Filler wire

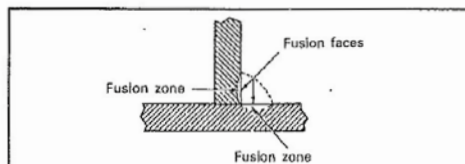
Filler metal in the form of a continuous wire.

Fusion face



The portion of a surface, or of an edge, which is to be fused on making the weld.

Fusion zone



The depth to which the parent metal has been fused.

Gap

The distance between the parts to be joined.

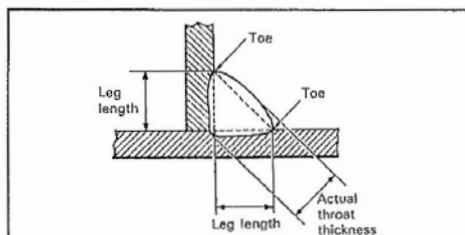
Heat-affected zone

The part of the parent metal where the metallurgical properties have been changed by the heat of welding or cutting but not melted.

Kerf

The gap or void left after metal has been removed by thermal cutting.

Leg length

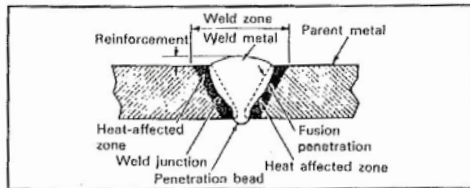


The size of a fillet weld can be specified by leg length, being the distance from the apex of the angle formed by the two fusion faces, to the line where the weld face joins the parent metal.

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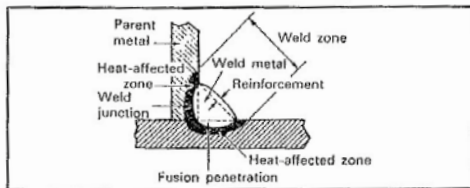
Parent metal

The material or the part to be welded.



Penetration

The depth of the fusion zone in the parent metal or the distance that fusion goes beyond the root of the joint.



Excess weld metal (reinforcement)

Metal deposited on the surface of parent metal,
or
the metal deposited, when making a butt weld, which is surplus to that required to make a flush joint,
or
the metal deposited when making a fillet weld, which is surplus to that required to give a mitre weld profile.

Run

The metal melted or deposited during one passage of the electrode or blowpipe.

Spatter

Globules of metal thrown out during welding.

Throat thickness

The shortest distance from the root of the weld to the weld face of a fillet weld,
or
the thickness of weld metal in a butt weld measured at its centre line.

Toe of weld

The line where the weld face joins the parent metal.

Weld face

The surface of a weld seen from the side from which the weld was made.

Weld junction

The boundary between the fusion zone and the heat affected zone. (See diagram above).

Terminology

Weld metal

All the metal melted during the making of a weld and retained in the weld.

Weld pool

The pool of liquid metal formed during fusion welding.

Weld area

The area that includes the weld metal, the fusion zone, and the heat-affected zone.

Weld symbols

Welds are denoted on drawings by the use of symbols as specified in BS 499 Part 2.

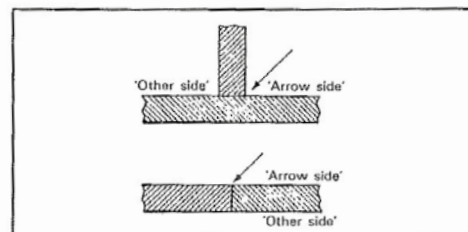
Details relating to edge preparation, gaps, and welding procedure are not covered by BS 499. These details usually appear on welding procedure sheets.

In this booklet reference to BS 499 is limited to simple butt and fillet welds.

The basic requirements of BS 499 schedule of symbols for welding comprise:

- A symbol for the type of welded joint.
- An arrow and reference line to indicate the position of the weld.
- The addition of weld details where necessary.
- Symbols for supplementary instructions.

Arrow



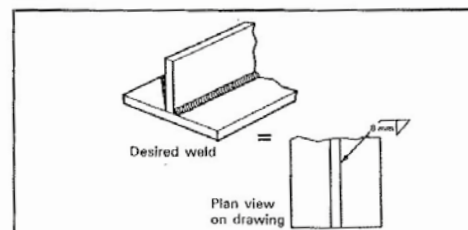
An arrow shows the position of a welded joint. The arrow head is shown on the side from which the joint is to be welded.

The side of the joint nearer to the arrow head is called the 'arrow side'.

The side of the joint furthest from the arrow head is called the 'other' side.

Do not use the terms 'near side' and 'far side'.

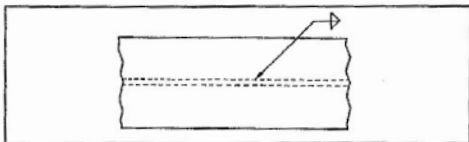
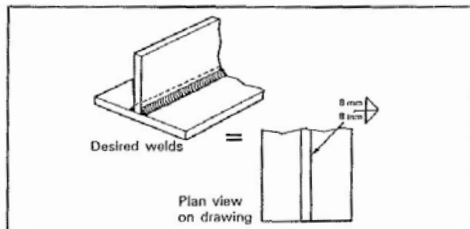
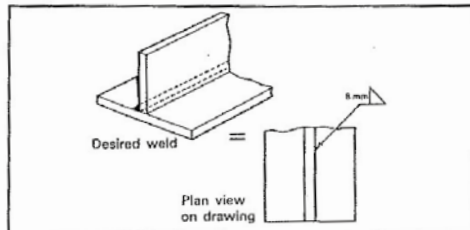
Reference line



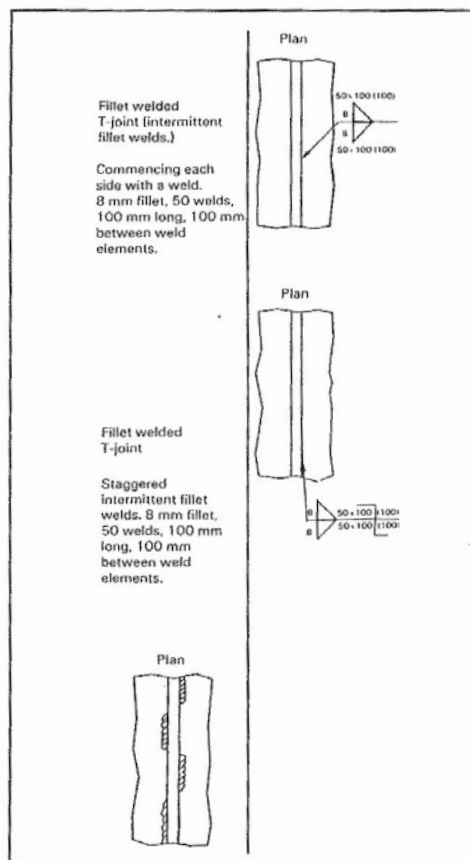
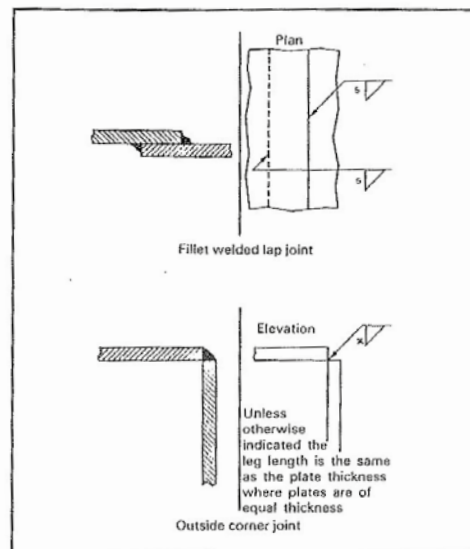
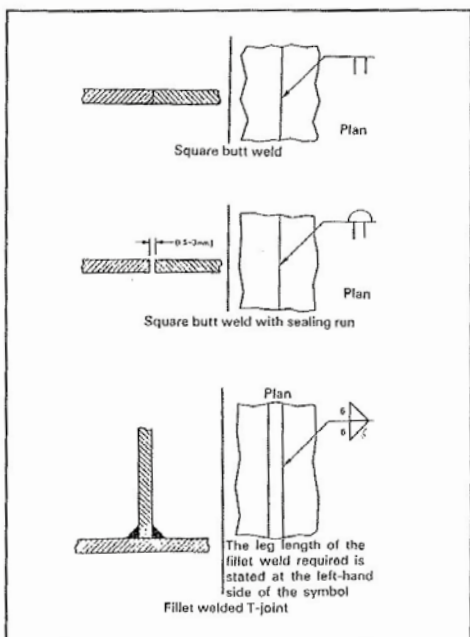
The required position of a weld is shown by an arrowed reference line and appropriate welding symbols as in the diagrams.

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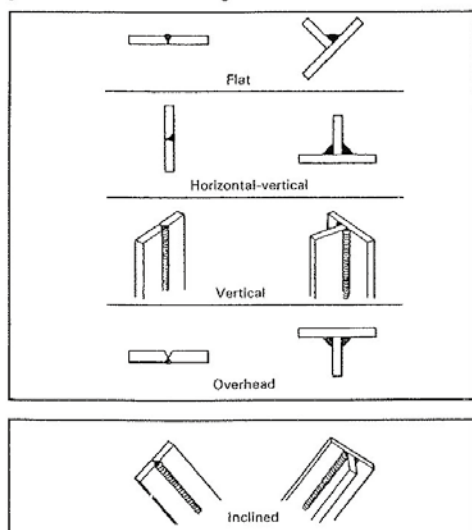


In a hidden view the arrow points to the hidden weld and the size and position of the weld is indicated on the reference line.



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Simplified diagrams of the four basic welding positions of BS 499 are given below.



Note: The term inclined position describes any welding position which is not one of the four basic positions shown.

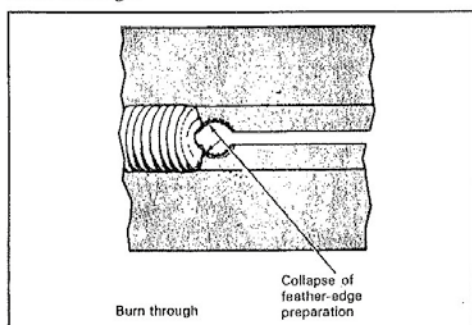
Simplified descriptions of the definitions of weld imperfections in BS 499 Part 1 are given below:

Blow hole

A large cavity in the weld formed due to gas being trapped.

Typical causes - moisture or contamination on parent metal or filler.

Burn through



Collapse of weld pool due to excessive preparation. Typical causes - unsuitable edge preparation; too high a welding current or concentration of heat.

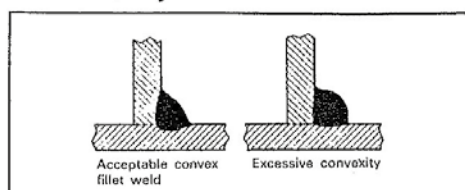
Cracking

Cracks may appear anywhere in the weld or parent metals.

Typical causes - unsuitable parent metal or inappropriate welding techniques.

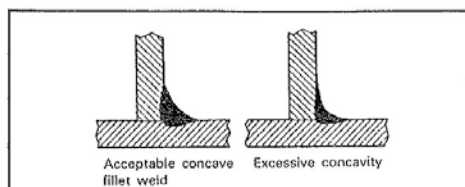
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Excess convexity



Excessive thickness at the throat of the weld. Typical causes - unsuitable filler or electrode; too low a welding current or inadequate heat.

Excessive concavity



Usually refers to fillet welds, with a too shallow throat.

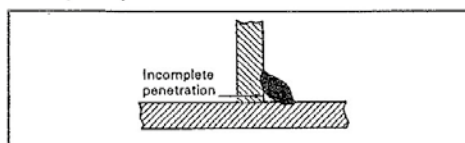
Typical causes - too rapid travel with electrode or blowpipe; vertical welding using downwards method with inadequate addition of filler.

Inclusion

Slag or other foreign matter trapped in a weld.

Typical causes - unclean parent metal or filler; slag not cleaned from preceding runs; undercutting cavities or grooves; tungsten from electrode in tungsten-arc gas shielded welding; accidental contact of nozzle with weld pool.

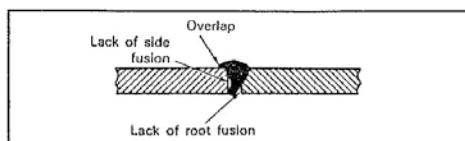
Incomplete penetration



Failure of weld metal to extend into or fill the root of the joint.

Typical causes - unsuitable edge preparation; incorrect welding technique; inadequate back chipping or gouging of initial run before depositing sealing run.

Lack of fusion



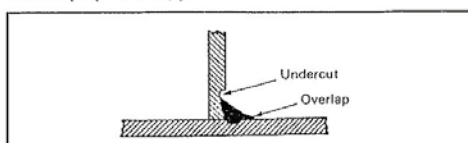
Discontinuity of weld or failure to secure weld.

Typical causes - too low welding current or inadequate heat; too rapid travel with electrode or blowpipe; failure of molten deposited metal to 'wet' the parent metal; bad disposition of runs in a multi-run weld.

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Overlap (cold lap)



Metal which has flowed on to the surface of the parent metal without fusing to it.

Typical causes – contamination of parent metal; inadequate heat at toes of weld; incorrect welding technique.

Porosity

A group of pores in a weld caused by trapped gas.
Typical causes – contamination of parent metal or filler; high sulphur content of parent metal or filler; moisture trapped between joining surfaces; too rapid cooling of weld metal.

Unsatisfactory surface

For example: poor surface finish, irregular profile, or lack of smoothness in weld joint.

Typical causes – poor quality parent metal or filler; incorrect welding technique.

Undercut

A groove or hollow cut in the surface or fusion face of the parent metal at the toe of a run. (See diagram above.)

Typical causes – millscale on or near fusion face; too rapid travel of electrode or blowpipe; too high a concentration of heat; incorrect welding technique.



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