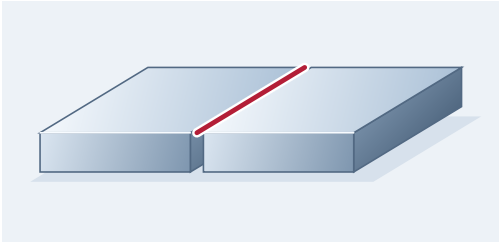
JOINT GEOMETRY

Welding Joint Types

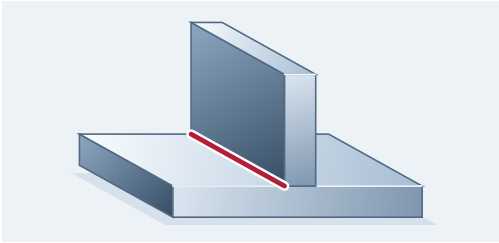
Identify the joint by how the parts fit together. The coloured line marks the joint location.



Butt Joint

Two members meet edge to edge in the same plane.

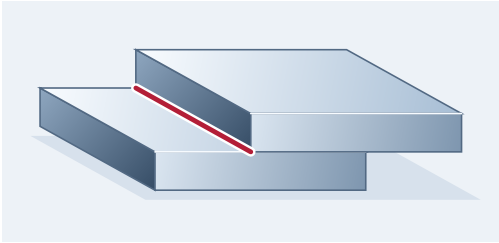
Use for in-line plate or pipe seams where a flush profile or direct load path is required.



Tee Joint

The edge of one member meets the face of another, forming a T.

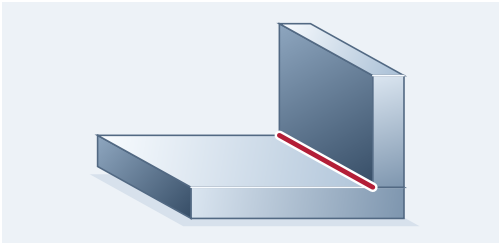
Use to attach ribs or stiffeners to a plate. The inside angle gives access for a fillet weld.



Lap Joint

The faces of two members overlap.

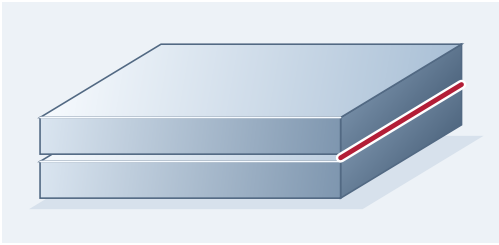
Use for sheet panels or straps. Overlap gives a weldable edge without precise edge-to-edge fit-up.



Corner Joint

Two members meet at their edges to form an angle, usually an L.

Use to close the perimeter of boxes, trays and frames where two walls meet.



Edge Joint

Parallel or nearly parallel members are joined along adjacent edges.

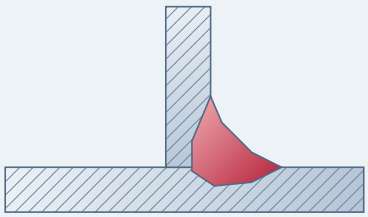
Use to close adjacent sheet or flange edges when the joint detail and loading permit.

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WELD GEOMETRY

Weld Forms

The joint describes how the parts fit. The weld form describes the weld at that joint. Shaded deposits show examples.



Fillet Weld

Tee joint with a fillet

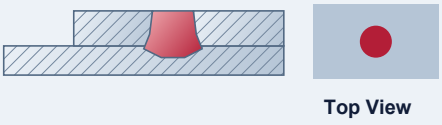
An approximately triangular weld in the angle between members. Common on tee, lap and corner joints.



Groove Weld

Butt joint with a single-V groove

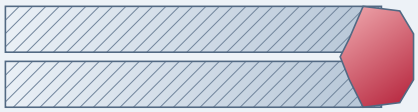
The weld fills the groove between the members. A groove weld can also be made in a prepared tee joint.



Plug Weld

Lap joint with a round hole

Fills a round hole in the upper member to fuse it to the member beneath.



Edge Weld

Edge joint with an edge weld

Fuses adjacent edges along the seam. Common on sheet-metal edge and flange details.

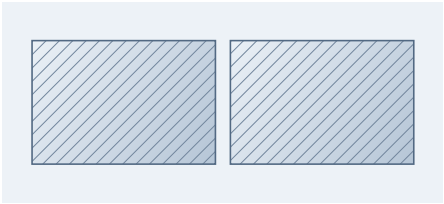
Shading shows the weld metal, including where it extends into the parent metal. The depth is schematic. A slot weld uses an elongated opening in place of a round hole.

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EDGE PREPARATION

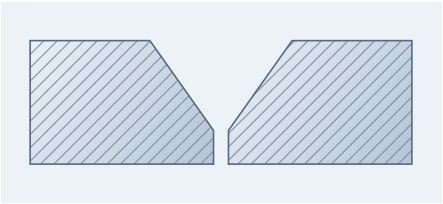
Groove Preparations

Read the section across the seam. The profiles show how the edges are shaped before welding.



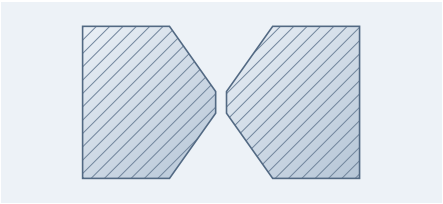
Square

Saves edge machining where the process can achieve the required penetration.



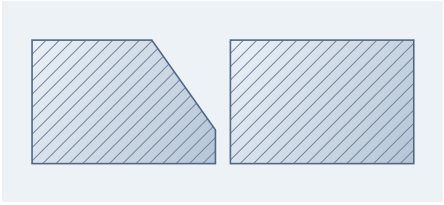
Single-V

Opens both edges for root access when welding from one side.



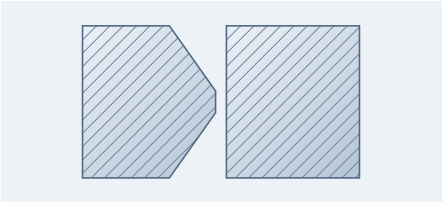
Double-V

With access to both sides, can reduce weld volume and help balance distortion.



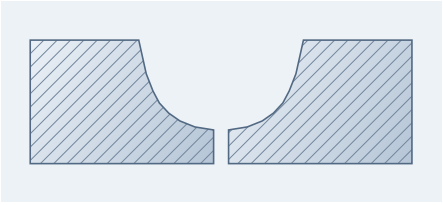
Single Bevel

Opens the root from one side while leaving one member square, as on many tee details.



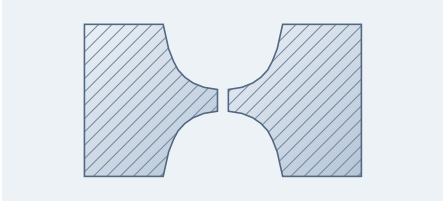
Double Bevel

Keeps one member square and opens the prepared edge from both sides.



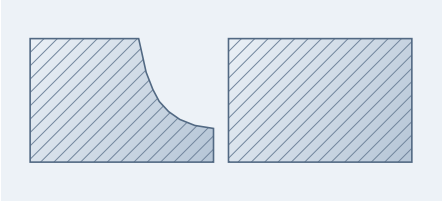
Single-U

Can save weld metal on thick sections welded from one side. Both edges need machining.



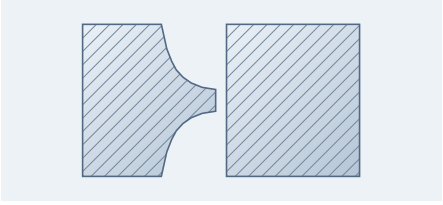
Double-U

Can cut weld volume on thick sections where both sides are accessible.



Single-J

Keeps one edge square and can use less weld metal than a single bevel on thick sections.



Double-J

Keeps one edge square and limits weld volume when welding from both sides.

Single Bevel or Single-J?

A straight bevel is simpler to prepare. A J needs a machined profile, but the narrower groove can save enough weld metal to justify the machining on thick sections. Check that the process still has enough access to fuse the root and sidewall.

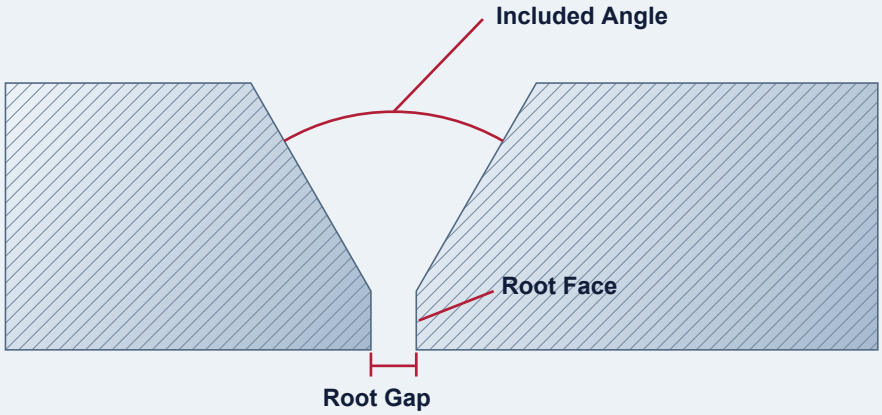
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WORKSHOP REFERENCE

Fit-Up & Drawing Terms

Use the same terms when reading a drawing, checking fit-up or discussing the weld with the workshop.

Single-V Butt Joint



Root Gap	Separation between the members at the root before welding.
Root Face	Unbevelled land at the root of a prepared edge.
Included Angle	Total angle between the groove faces. On a symmetrical V it is twice the bevel angle on one edge.
Full or Partial Penetration	Describes whether the weld penetrates through the full joint thickness or part of it.
Fillet Leg and Throat	The leg runs from the root to the toe along the member. The theoretical throat is the shortest distance from the root to the straight line joining the toes.

Use the drawing and welding procedure specification (WPS) for actual dimensions and requirements. Illustrations are schematic.

TWI · Joint Configurations and Fillet Welds

TWI · Weld Preparations and Penetration

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