Welding symbols

Basic Welding Symbols and Their Location Significance
Objectives

After completing this chapter, the student should be able to:

• Understand the basics of welding symbols
• List the major parts of a welding symbol
• Interpret weld locations
• Interprets welding symbol information
Welding Symbols

• Enable a designer to indicate detailed information
  – Shorthand language
  – Standardized by AWS
  – Tail is added to the basic symbol for placement of specific information
Reference Line (Required element)

Always Horizontal
Arrow Line

Reference Line (Required element)
Tail
Reference Line must always be horizontal,
Arrow points to the line or lines on drawing which clearly identify the proposed joint or weld area.

Reference Line (Required element)

Arrow

Tail

The tail of the welding symbol is used to indicate the welding or cutting processes, as well as the welding specification, procedures, or the supplementary information to be used in making the weld.
FIGURE 20-19 Locations of specifications, processes, and other references on weld symbols.

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Location Significance of Arrow

• Fillet and groove welding symbols
  – Arrow connects welding symbol reference line to one side of the joint
• Joint illustrated as a single line
  – Arrow of a symbol is directed to the line
  – Arrow side of joint is the near side of the joint
• Plug, slot, spot, seam, resistance, flash, upset, or projection symbols
  – Arrow connects reference line to outer surface
Indicating Types of Welds

• Weld type classifications
  – Fillets
  – Grooves
  – Flange
  – Plug
  – Slot
  – Spot or projection
  – Seam
  – Back or backing
  – Surfacing
Weld Location

• Arrow side, other side, and both sides
  – Used to indicate the weld location
• Weld deposited on arrow side
  – Symbol placed below the reference line
• Weld deposited on the other side of the joint
  – Symbol is placed above
• Tail is added to designate welding specifications
Weld Symbol Terminology

OTHER SIDE

ARROW SIDE
Fillet Weld (Arrow Side of Joint Only)
Fillet Weld (Other Side of Joint Only)
Fillet Weld (Both Sides of Joint)
Basic Welding Symbols and Their Location » Significance
Fillet Weld Symbol

- Notice the Vertical line Is always located on the Left!

- And the angled line it leans towards the reference line.

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Fillet Welds

• Dimensions of fillet welds
  – Shown on same side of reference line as weld symbol

• Size of a fillet weld with unequal legs
  – Shown in parentheses to left of symbol

• Intermittent fillet welds
  – Length and pitch increments are placed to the right
  – Used to reduce amount of welding, possible weld distortion, and to prevent a crack from spreading
Plug or Slot

- Rectangle shape

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used

Not Used

Not Used
Plug Welds

• Holes in arrow side member of a joint for plug welding
  – Indicated by placing weld symbol below the reference line
• Holes in the other side member
  – Indicated by placing weld symbol above the line
• Diameter or size
  – Located to the left of the symbol
Spot or Projection

- Resistance welder

Arrow Side

Other Side

Both Sides

Not Used

No Arrow side or Other side Significance
Spot Welds

• Dimensions of resistance spot welds
  – Indicated on same side of reference line as the weld symbol
  – Dimensioned by size or strength
    • Size: designated as weld diameter
    • Strength: shown as minimum shear strength in pounds per spot and is shown to the left of the symbol
**Stud**

- Stud – nail/bolt

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**Arrow Side**

- Not Used

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**Other Side**

- Not Used

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**Both Sides**

- Not Used

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**No Arrow side or Other side Significance**

- Not Used
Seam

- Arrow Side
- Other Side
- Both Sides
- Not Used
- No Arrow side or Other side Significance
Seam Welds

• Dimensions of seam welds
  – Shown on same side of reference line as the weld symbol
  – Size is shown with or without the inch marks to the left of the weld symbol
  – Strength is designated as minimum acceptable shear strength in pounds per linear inch
Back or Backing

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used

Not Used

Not Used
Backing

• Piece of metal placed on back side of a weld joint
  – Must be thick enough to withstand the heat of the root pass
  – May be used on butt joints, tee joints, and outside corner joints
  – May be left on the finished weld or removed
Surfacing

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used

Not Used

Not Used
Edge

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Flanged Welds

- Weld symbols used where edges joined are bent to form a flange
  - Edge flange: shown by edge flange weld symbol
  - Corner flange welds: indicated by corner flange weld symbol
  - Dimensions: shown on same side of reference line as weld symbol
  - Size of flange weld: shown by a dimension placed outward from flanged dimensions
Groove Welding Symbols and Their Location Significance
Groove Welds

• Joint strength
  – Can be improved by making some type of groove preparation
  – Seven types of grooves
    • Can be made in one or both plates or on one or both sides
    • Cutting the groove: weld can penetrate deeper
    • Can be cut in base metals in a number of ways
Square

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance
V

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Bevel

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
J

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Flare–V

- Arrow Side
- Other Side
- Both Sides
- No Arrow side or Other side Significance
- Not Used
Flare–Bevel

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
Scarf for Brazed Joint

Arrow Side

Other Side

Both Sides

No Arrow side or Other side Significance

Not Used
<table>
<thead>
<tr>
<th>Weld all Around</th>
<th>Field weld</th>
<th>Melt thru</th>
<th>Consumable Insert</th>
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<tbody>
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<td><img src="image" alt="Diagram" /></td>
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<td><img src="image" alt="Diagram" /></td>
<td><img src="image" alt="Diagram" /></td>
</tr>
<tr>
<td>Backing/Spacer (Rectangular)</td>
<td><strong>Contour</strong></td>
<td>Backing</td>
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</tbody>
</table>

Flux or Flat | Convex | Concave
---|---|---
![Diagram](image) | ![Diagram](image) | ![Diagram](image)
All the way Around

A circle at the tangent of the arrow and the reference line means welding to be all around.
A flag at the tangent of the reference line and arrow means Field Weld.
Location of Elements of a Welding Symbol

- **FINISH SYMBOL**
- **CONTOUR SYMBOL**
- **GROOVE WELD SIZE**
- **DEPTH OF BEVEL; SIZE OR STRENGTH FOR CERTAIN WELDS**
- **SPECIFICATION, PROCESS, OR OTHER REFERENCE**
- **TAIL (OMITTED WHEN REFERENCE IS NOT USED)**
- **WELD SYMBOL**
- **NUMBER OF SPOT, SEAM, STUD, PLUG, SLOT, OR PROJECTION WELDS**
- **REFERENCE LINE**
- **FIELD WELD SYMBOL**
- **WELD-ALL-AROUND SYMBOL**
- **ARROW CONNECTING REFERENCE LINE TO ARROW SIDE MEMBER OF JOINT OR ARROW SIDE OF JOINT**

**GROOVE ANGLE; INCLUDED ANGLE OF COUNTERSINK FOR PLUG WELDS**

**ROOT OPENING; DEPTH OF FILLING FOR PLUG AND SLOT WELDS**

**LENGTH OF WELD PITCH (CENTER-TO-CENTER SPACING) OF WELDS**

**S(E) {SIDES} OTHER SIDE L-P**

**T**

**ARROW SIDE**

**BOTH**

**REFERENCE LINE**

**ELEMENTS IN THIS AREA REMAIN AS SHOWN WHEN TAIL AND ARROW ARE REVERSED**
Break in arrow means arrow side must be side that beveling or other preparation required.
Size of Fillet Weld Noted
Example of Double Bevel Groove weld

Depth of preparation or groove

1/4 (5/16)

Depth of penetration

1/4 (5/16)
Single-Bevel-Groove and Double Fillet Weld Symbol
Single-Bevel-Groove and Double Fillet weld Symbols
Chain Intermittent Fillet Weld

Weld both sides each end and 10 inches center to center in between.
Staggered Intermittent Fillet Weld

Weld ends than 10 inch centers staggered each side
Code or Standards Requirements

• Type, depth angle, and location of the groove
  – determined by a code or standard

• Welder skill
  – Can be a limiting factor in joint design

• Acceptable cost
  – Joint design: one major way to control welding cost
Summary

• Welding symbols
  – Meanings must be interpreted
  – Understanding prevents over-welding
  – Weldments must be flexible within limits