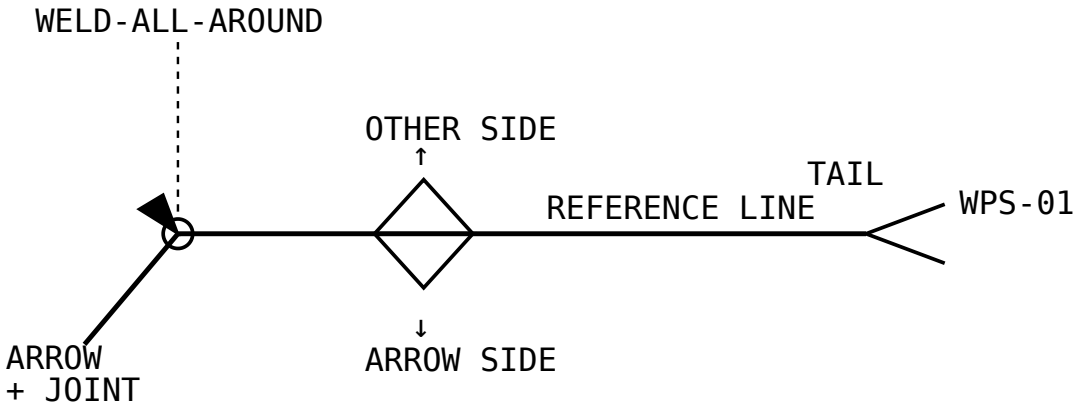
Comprehensive A2.4 Symbol Reference

The complete AWS A2.4:2020 welding symbol reference for fabricators and inspectors. Covers every weld type including groove, fillet, plug, slot, spot, seam, stud, surfacing, backing, and edge welds, plus 10 NDE examination methods, 9 supplementary symbols, 136 process designations, 7 finishing designators, and D1.1:2025 cross-references for structural steel.

> This reference covers every symbol type defined in AWS A2.4:2020 (8th Edition), with D1.1:2025 clause cross-references for structural steel applications. Print this page for a complete multi-page desk reference.

SECTION 1

Symbol Anatomy — A2.4 §4.1



1 Reference Line

Horizontal baseline — all symbol elements attach to it. Arrow side = below, other side = above.

2 Arrow

Points to the joint location. For bevel/J-groove, a break in the arrow indicates the prepared member.

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3 Weld Symbol

Graphic indicating weld type (triangle = fillet, V = groove, etc.). Placed below or above the line.

4 Dimensions

Size to the left of the weld symbol. Length and pitch to the right. Depth/throat in parentheses.

5 Tail

Forked end — contains process (SMAW, FCAW), WPS number, or specification reference. Omit if unused.

6 Weld-All-Around

Circle at reference/arrow junction — weld must continue completely around the joint.

7 Field Weld Flag

Filled triangle at reference/arrow junction — weld to be made in the field, not in the shop.

8 Contour Symbol

Same side as the weld symbol, on its outer face — flush, flat, convex (outward arc), or concave (inward arc). Paired with finishing designator letter (G, M, C, H, P, R, U).

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SECTION 2

Weld Symbol Types — A2.4 Figure 4.1

TYPE	SYMBOL	A2.4 CLAUSE	D1.1 CROSS-REFERENCE
Fillet		§8	Table 7.7 min size, §4.5.2.9 max on edges
Square Groove		§7	Fig 5.1 prequalified CJP/PJP joints
V-Groove		§7	Fig 5.1 B-U2, B-U2a (CJP single-V)
Bevel Groove		§7, §6.3 perp leg	Fig 5.1 TC-U4a (T-joint bevel CJP)
U-Groove		§7	Fig 5.1 B-U6 (single-U CJP, backgouge)
J-Groove		§7, §6.3 perp leg	Fig 5.1 B-U8 (single-J CJP, backgouge)
Flare-V Groove		§7.2.10	Table 4.1: 3/4R (GMAW), 5/8R (SMAW/FCAW-S). Process-dependent.
Flare-Bevel Groove		§7.2.10, §6.3 perp leg	Table 4.1: 5/8R (GMAW/FCAW-G), 5/16R (SMAW/FCAW-S). Process-dependent.
Plug		§9	§4.11 min hole dia, §5.4.4
Slot		§10	§4.11 (same rules as plug)
Spot / Projection		§11	N/A (D1.3 for arc spot on sheet steel)
Seam		§12	N/A (D1.1 does not cover seam welding)
Stud		§14 (arrow-side only)	Clause 9 (drawn-arc stud welding)
Surfacing		§15	§7.25 (repair welding provisions)

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TYPE	SYMBOL	A2.4 CLAUSE	D1.1 CROSS-REFERENCE
Back / Backing		§7.7	§5.4.1.3 backgouge to sound metal (Fig 5.1 note d)
Edge		§13	N/A (D1.3 for sheet steel edges)
Scarf (brazing)		§16	N/A (brazing only, not D1.1)

SECTION 3

Size Notation Quick Reference — A2.4 §7.2, §8.2

Fillet Weld Notation

`6` Leg size — 6mm equal-leg fillet both sides when on both sides of reference line

`6×8` Unequal fillet — both sizes appear to the left as S1×S2. Orientation not specified by the symbol; a drawing detail shows which leg goes on which member.

`6` left + `50-150` right Intermittent — leg size (6mm) to left of symbol; length–pitch (50mm weld, 150mm c/c) to right.

Groove Weld Notation

`D(S)` D = groove depth (preparation depth). (S) = weld size/effective throat (design dimension)

`12(10)` 12mm groove depth, 10mm effective throat — D without parentheses, (S) in parentheses

`R` Root opening value — often shown in tail or drawing note, not symbol

`α` Groove angle — shown on the symbol to the left of the weld symbol (e.g. 45°). Per §7.3.

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Intermittent Weld Notation

`length-pitch` Written right of symbol. Length = each weld run. Pitch = center-to-center spacing

`50-150` 50mm long welds, 150mm apart (center). Net gap = 100mm

`staggered` Intermittent symbols offset on arrow side vs other side = chain or staggered

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SECTION 4

Supplementary Symbols — A2.4 Figure 4.2

Weld-All-Around

Circle at arrow/reference junction. Weld extends around entire joint perimeter. Per §6.11.

Field Weld

Flag at junction. Weld made at erection site, not shop. Per §6.9.

Melt-Through

Filled semicircle opposite weld symbol. CJP with visible root reinforcement. Per §6.14.

Consumable Insert

Square symbol. Placed before root pass for CJP groove welds. Per §7.10.

Backing

Rectangle. Permanent or removable backing bar. R inside = removable. Per §7.8.

Spacer

Rectangle (same as backing but placed inside groove). Metal spacer between root faces. Per §7.9.

Flush/Flat Contour

Straight line above weld symbol. Weld face flush with base metal. Per §6.13.

Convex Contour

Outward arc. Weld face crowns above base metal surface. Per §6.13.

Concave Contour

Inward arc. Weld face dips below base metal surface. Per §6.13.

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SECTION 5

NDE Examination Method Symbols — A2.4 Table A6, Clause 17

CODE	METHOD	CATEGORY	SIDE SIGNIFICANCE	D1.1 REFERENCE
RT	Radiographic Testing	Volumetric	Centered — no side preference (§17.5.5)	Clause 8, Part E
UT	Ultrasonic Testing	Volumetric	Centered — no side preference	Clause 8, Part F
MT	Magnetic Particle Testing	Surface	Arrow/other side — surface access matters (§17.5.2)	§8.14.4 (procedure), Part C (acceptance)
PT	Penetrant Testing	Surface	Arrow/other side — surface access matters	§8.14.5 (procedure), Part C (acceptance)
VT	Visual Testing	Surface	Arrow/other side — surface access matters	§8.6 (obligations), Part C (acceptance)
ET	Electromagnetic (Eddy Current) Testing	Surface	Arrow/other side — surface access matters	Per Engineer specification
AET	Acoustic Emission Testing	Specialized	Varies by application	Per Engineer specification
LT	Leak Testing	Specialized	Varies by application	Per Engineer specification
NRT	Neutron Radiographic Testing	Volumetric	Centered — no side preference	Per Engineer specification
PRT	Proof Testing	Specialized	Varies by application	Per Engineer specification

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> *Surface methods detect what you can almost see. Volumetric methods find what you never will. The symbol tells you which side matters — and for RT and UT, neither side does.*
>
> — CWI field perspective, based on A2.4 §17.5

SECTION 6

Arrow Side & Other Side Rules — A2.4 §6.2–6.5

Arrow Side vs Other Side

Weld symbols placed **below** the reference line specify the arrow side of the joint (the side the arrow points to). Symbols placed **above** the reference line specify the other side. Per `§6.2`.

Broken Arrow Rule

When only one joint member is to be prepared (bevel-groove, J-groove, flare-bevel), the arrow shall have one break and point toward that member. The arrow need not be broken if it is apparent which member is to be prepared, and shall not be broken if there is no preference. Per `§6.4.1`.

Fillet Weld Arrow

For fillet welds, the arrow may or may not be broken to indicate weld locations. There is no requirement to break the arrow for fillet welds as there is for single-bevel or J-groove welds. Per `§6.4.2`.

Combination Weld Symbols

For joints requiring more than one weld type (e.g., fillet + groove), a symbol shall be used to specify each weld. Per `§6.5`.

Multiple Arrows

Two or more arrows may be used with a single reference line to point to locations where identical welds are specified. Per `§6.6`.

SECTION 7

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Tail Contents — A2.4 §6.12

Process Designation

`SMAW` Shielded Metal Arc Welding (stick)

`FCAW-S` Self-Shielded Flux Cored Arc Welding

`GMAW` Gas Metal Arc Welding (MIG)

`GTAW` Gas Tungsten Arc Welding (TIG)

`GTAW-AU` Automatic GTAW (suffix from Table A5)

References & Special Types

`WPS-01` Refers to specific Welding Procedure Specification document. Per `§6.12.2`.

`TYP` "Typical" — avoids repeating identical symbols. User must identify all applicable joints. Per `§6.12.3`.

`DET A` Cross-section or detail reference when basic symbols are inadequate. Per `§6.12.4`.

Omission Rule

`(no tail)` When no references are required, the tail may be omitted from the welding symbol entirely. Per `§6.12.5`.

`Drawing note` Drawing notes may provide weld information without repeating it in the symbol. Per `§6.12.6`.

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SECTION 8

Multiple Reference Lines — A2.4 §6.7–6.8

Sequence of Operations

Two or more reference lines indicate a sequence of operations. The **first operation** is specified on the reference line **nearest the arrow**. Subsequent operations are specified sequentially on additional reference lines. Per §6.7.1.

Supplementary Data

The tail of additional reference lines may be used to specify data supplementary to welding symbol information (e.g., process data, standards references). Per §6.7.2.

Symbols on Each Line

Symbols (including supplementary symbols such as field weld flags) shall be placed on the reference line for each operation to which they are applicable. Per §6.7.3.

Subreference Lines (Distinct from Multiple Ref Lines)

For joints transitioning from one type to another (e.g., pipe), multiple **subreference lines** branch from a single reference line. Unlike multiple reference lines, the **sequence of welding is undetermined** — subreference lines indicate joint type variation, not welding order. Per §6.8.

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SECTION 9

Process Letter Designations — A2.4 Table A2

Placed in the tail of the welding symbol per §6.12.1. Application mode suffixes (Table A5) may be appended: -MA Manual, -SA Semiautomatic, -AU Automatic, -ME Mechanized, -RO Robotic, -AD Adaptive Control.

Arc Welding Processes (most common)

CODE	PROCESS	NOTES
SMAW	Shielded Metal Arc Welding	Stick/manual. D1.1 prequalified for all positions.
GMAW	Gas Metal Arc Welding	MIG/MAG. External shielding gas required.
GMAW-P	Pulsed Gas Metal Arc Welding	Pulsed transfer. Better control on thin material.
GMAW-S	Short Circuiting Gas Metal Arc Welding	Short-circuit transfer. Sheet metal, root passes.
GTAW	Gas Tungsten Arc Welding	TIG. High-quality root passes, thin materials.
GTAW-P	Pulsed Gas Tungsten Arc Welding	Pulsed TIG. Better heat control.
FCAW	Flux Cored Arc Welding	Tubular wire. Higher deposition than SMAW.
FCAW-G	Gas Shielded Flux Cored Arc Welding	Dual-shield. External gas + flux core.
FCAW-S	Self-Shielded Flux Cored Arc Welding	Innershield. No external gas. Field/outdoor use.
SAW	Submerged Arc Welding	Highest deposition. Flat/horizontal only.
SAW-S	Series Submerged Arc Welding	Dual-wire SAW for wider coverage.
PAW	Plasma Arc Welding	Constricted arc. Keyhole technique for CJP.
EGW	Electrogas Welding	Vertical-up, single pass. Heavy plate.
SW	Arc Stud Welding	Shear connectors. D1.1 Clause 9.
CAW	Carbon Arc Welding	Copper alloy backing. Repair applications.

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View all 136 process designations (Table A2 complete)

CODE	PROCESS
`AB`	Adhesive Bonding
`AAW`	Air Acetylene Welding
`ABW`	Arc Braze Welding
`AC`	Arc Cutting
`AG`	Arc Gouging
`ASP`	Arc Spraying
`AW`	Arc Welding
`B`	Brazing
`BB`	Block Brazing
`B-CA`	Controlled-Atmosphere Brazing
`BW`	Braze Welding
`CAC`	Carbon Arc Cutting
`CAC-A`	Air Carbon Arc Cutting
`CAG`	Carbon Arc Gouging
`CAW`	Carbon Arc Welding
`CEW`	Coextrusion Welding
`CW`	Cold Welding
`DB`	Dip Brazing
`DFB`	Diffusion Brazing
`DFW`	Diffusion Welding
`DS`	Dip Soldering
`EBB`	Electron Beam Brazing
`EBBW`	Electron Beam Braze Welding
`EBC`	Electron Beam Cutting
`EBW`	Electron Beam Welding
`EBW-HV`	High Vacuum Electron Beam Welding

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CODE	PROCESS
`EBW-MV`	Medium Vacuum Electron Beam Welding
`EBW-NV`	Nonvacuum Electron Beam Welding
`EFW`	Electrofusion Welding
`EGW`	Electrogas Welding
`ESW`	Electroslag Welding
`ESW-CG`	Consumable Guide Electroslag Welding
`ESW-NG`	Narrow Gap Electroslag Welding
`EW`	Extrusion Welding
`EXB`	Exothermic Brazing
`EXBW`	Exothermic Braze Welding
`EXW`	Explosion Welding
`FB`	Furnace Brazing
`FCAW`	Flux Cored Arc Welding
`FCAW-G`	Gas Shielded Flux Cored Arc Welding
`FCAW-S`	Self-Shielded Flux Cored Arc Welding
`FFW`	Flow Fusion Welding
`FLSP`	Flame Spraying
`FLSP-P`	Powder Flame Spraying
`FLSP-W`	Wire Flame Spraying
`FOW`	Forge Welding
`FRW`	Friction Welding
`FRW-DD`	Direct Drive Friction Welding
`FRW-I`	Inertia Friction Welding
`FS`	Furnace Soldering
`FSW`	Friction Stir Welding
`FW`	Flash Welding
`GMAC`	Gas Metal Arc Cutting
`GMAW`	Gas Metal Arc Welding

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CODE	PROCESS
GMAW-P	Pulsed Gas Metal Arc Welding
GMAW-S	Short Circuiting Gas Metal Arc Welding
GTAC	Gas Tungsten Arc Cutting
GTAW	Gas Tungsten Arc Welding
GTAW-P	Pulsed Gas Tungsten Arc Welding
HEBC	High Energy Beam Cutting
HEBW	High Energy Beam Welding
HGW	Hot Gas Welding
HIPW	Hot Isostatic Pressure Welding
HPW	Hot Pressure Welding
HTW	Heated Tool Welding
HVOF	High Velocity Oxyfuel Spraying
IB	Induction Brazing
INS	Iron Soldering
IRB	Infrared Brazing
IRS	Infrared Soldering
IRW	Infrared Welding
IS	Induction Soldering
IW	Induction Welding
LBB	Laser Beam Brazing
LBBW	Laser Beam Braze Welding
LBC	Laser Beam Cutting
LBC-A	Laser Beam Air Cutting
LBC-EV	Laser Beam Evaporative Cutting
LBC-IG	Laser Beam Inert Gas Cutting
LBC-O	Laser Beam Oxygen Cutting
LBW	Laser Beam Welding
MIAW	Magnetically Impelled Arc Welding

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CODE	PROCESS
`OAC`	Oxygen Arc Cutting
`OAW`	Oxyacetylene Welding
`OC`	Oxygen Cutting
`OC-F`	Flux Cutting
`OC-P`	Metal Powder Cutting
`OFC`	Oxyfuel Gas Cutting
`OFC-A`	Oxyacetylene Cutting
`OFC-H`	Oxyhydrogen Gas Cutting
`OFC-N`	Oxynatural Gas Cutting
`OFC-P`	Oxypropane Cutting
`OFW`	Oxyfuel Gas Welding
`OG`	Oxygen Gouging
`OHW`	Oxyhydrogen Welding
`OLC`	Oxygen Lance Cutting
`PAC`	Plasma Arc Cutting
`PAG`	Plasma Arc Gouging
`PAW`	Plasma Arc Welding
`PEW`	Percussion Welding
`PGW`	Pressure Gas Welding
`PSP`	Plasma Spraying
`PW`	Projection Welding
`RB`	Resistance Brazing
`RFW`	Radio Frequency Welding
`ROW`	Roll Welding
`RS`	Resistance Soldering
`RSEW`	Resistance Seam Welding
`RSEW-HF`	High-Frequency Seam Welding
`RSEW-I`	Induction Seam Welding

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CODE	PROCESS
`RSEW-MS`	Mash Seam Welding
`RSW`	Resistance Spot Welding
`RW`	Resistance Welding
`RW-PC`	Pressure-Controlled Resistance Welding
`S`	Soldering
`SAW`	Submerged Arc Welding
`SAW-S`	Series Submerged Arc Welding
`SMAC`	Shielded Metal Arc Cutting
`SMAW`	Shielded Metal Arc Welding
`SPW`	Spin Welding
`SSW`	Solid-State Welding
`SW`	Arc Stud Welding
`TB`	Torch Brazing
`TC`	Thermal Cutting
`TG`	Thermal Gouging
`THSP`	Thermal Spraying
`TS`	Torch Soldering
`TW`	Thermite Welding
`USS`	Ultrasonic Soldering
`USW`	Ultrasonic Welding
`UW`	Upset Welding
`UW-HF`	High-Frequency Upset Welding
`UW-I`	Induction Upset Welding
`VPSP`	Vacuum Plasma Spraying
`VW`	Vibration Welding
`WS`	Wave Soldering

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SECTION 10

Finishing Designators — A2.4 §6.13

Added adjacent to the contour symbol. Specifies the mechanical method to achieve the required weld face contour. Does not specify quality of finish.

C **Chipping**	**G** **Grinding**	**H** **Hammering**	**M** **Machining**
P **Planishing**	**R** **Rolling**	**U** **Unspecified** Method left to fabricator	

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FAQ

Frequently Asked Questions

What is included in the comprehensive A2.4 symbol reference?

All A2.4:2020 weld symbol types (fillet, 8 groove variants, plug, slot, spot, seam, stud, surfacing, backing, edge), 10 NDE examination method symbols (RT, UT, MT, PT, VT, ET), 9 supplementary symbols, 136 process letter designations, 7 finishing designators, and D1.1:2025 clause cross-references for each symbol type.

How do I print this as a multi-page PDF?

Press Ctrl+P (Windows/Linux) or Cmd+P (Mac) and select Save as PDF. The reference is optimized for print with automatic page breaks between sections, a footer on each page, and all expandable sections fully opened.

What is the difference between surface and volumetric NDE methods?

Surface methods (MT, PT, VT, ET) examine the weld surface or near-surface region and have arrow-side or other-side significance on the symbol. Volumetric methods (RT, UT) penetrate the full weld thickness and are typically centered on the reference line with no side preference per A2.4 section 17.5.5.

Where does the process designation go on a welding symbol?

Per A2.4 section 6.12.1, the welding process letter designation (e.g., SMAW, GMAW, FCAW-S) is placed in the tail of the welding symbol. An application mode suffix from Table A5 may be added (e.g., GTAW-AU for automatic gas tungsten arc welding). The tail may be omitted when no process reference is needed per section 6.12.5.

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What is the arrow side vs other side rule?

Weld symbols placed below the reference line specify the arrow side of the joint (the side the arrow points to). Symbols placed above the reference line specify the other side. For welds requiring preparation of only one member (bevel-groove, J-groove, flare-bevel), the arrow shall have a break and point toward the member to be prepared, per A2.4 section 6.4.1.

What goes in the tail of a welding symbol?

The tail may contain: the welding process letter designation from Table A2 (e.g., SMAW, GTAW-AU), a specification or code reference, a WPS number, or a detail/cross-section reference when basic symbols are inadequate. The designation TYP (typical) avoids repeating identical symbols. When no references are required, the tail may be omitted entirely, per A2.4 section 6.12.

How do multiple reference lines indicate sequence?

Two or more reference lines indicate a sequence of operations. The first operation is specified on the reference line nearest the arrow; subsequent operations are specified sequentially on additional reference lines. This is distinct from subreference lines, where multiple weld types branch from a single reference line and the welding sequence is undetermined, per A2.4 sections 6.7.1 and 6.8.

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