

WELDINGPROS.NET - WELDING SYMBOLS HAND CHART

THE FOLLOWING HAND CHART WAS DESIGNED TO SUPPLEMENT ACTUAL WELDING BOOKS IN ORDER TO PROVIDE WELDERS WITH A QUICK AND EASY TO READ PDF DOCUMENT THAT CAN BE USED IN VARIETY OF WELDING TASKS.

THIS DOCUMENT WORKS BEST IF PRINTED AND HELD IN YOUR SHOP BUT IT CAN EASILY BE USED ON YOUR SMARTPHONE OR A COMPUTER THAT READS PDF.

STRUCTURE OF WELDING SYMBOL



Field weld symbol - Indicates that the weld is to be made on site and not in the welding shop.
Weld-All-Around symbol - Indicates that the weld is to be made over the entire circumference.
Arrow - The arrow line points towards the place that is supposed to be welded.
Reference line - Horizontal line. Contains details about the welding itself and weld variables.
Tail - It usually contains information for which there is no provision elsewhere. The tail can provide info about the welding process, the reference document, and the examination process.
Information above reference line - Indicates that the weld info is for the other side of the joint where the arrow points.
Information below the reference line - Indicates that the weld info is for the arrow side of the joint where the arrow points.

DETAIL DESIGNS



WELDINGPROS
WELDING KNOWLEDGE AT YOUR FINGERTIPS!

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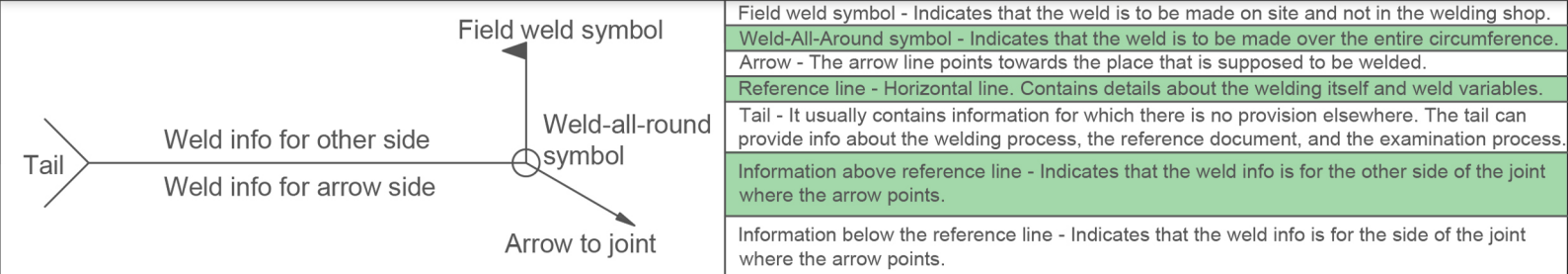
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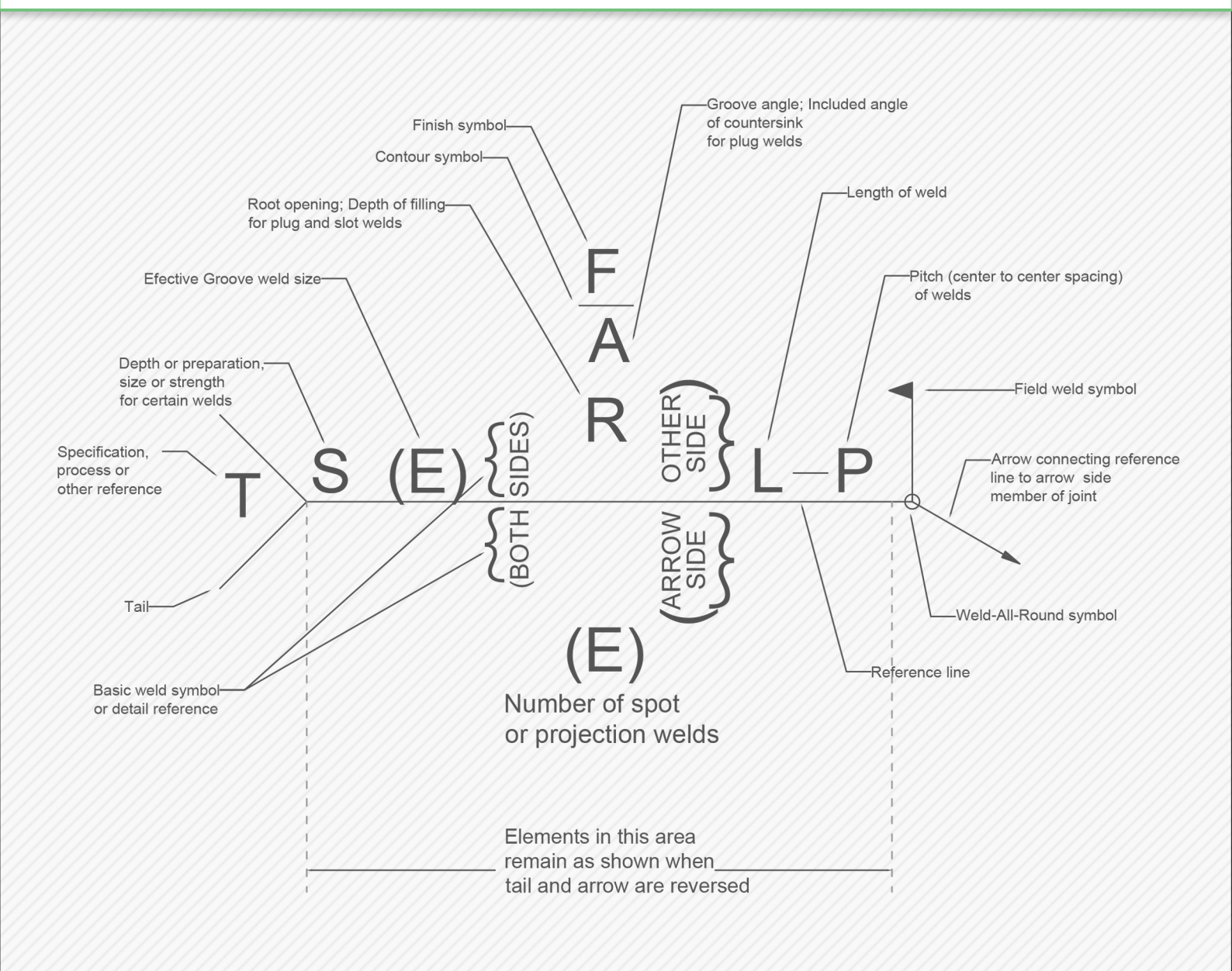
WELDING SYMBOLS INTRODUCTION

COMMONLY USED WELD SYMBOLS							SUPPLEMENTARY WELD SYMBOLS				
FILLET	PLUG/SLOT	SPOT / PROJECTION	SEAM	FLANGE			BACK/BACKING	MELT THRU	SURFACING	BACKING BAR	SPACER
				EDGE	CORNER						
GROOVE							WELD ALL AROUND	FLAG TOWARD ALL FIELD WELD	CONTOUR		
SQUARE	V	BEVEL	U	J	FLARE V	FLARE BEVEL			FLUSH	CONVEX	CONCAVE

STRUCTURE OF WELDING SYMBOL



DETAIL BREAKDOWN OF A WELDING SYMBOL



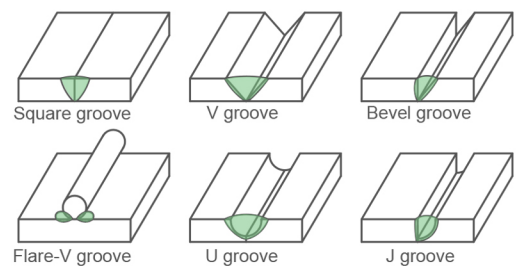
WELDING SYMBOLS CHART

SYMBOL	NAME / DETAILS ¹	ARROW SIDE	OTHER SIDE	BOTH SIDES
	Fillet weld , may have length, spacing and dimensions defined.			
	Square groove , may have root opening and depth of penetration defined.			
	V groove , may have angle, root opening, depth of penetration and preparation defined.			
	Bevel groove , may have side significance, angle, root opening, depth of penetration and preparation defined.			
	U groove , may have angle, root opening, depth of penetration and preparation defined.			
	J groove , may have side significance, angle, root opening, depth of penetration and preparation defined.			
	Flare V , may have depth of penetration and preparation defined.			
	Flare bevel , may have depth of penetration and preparation defined.			
	Edge weld , may have depth of penetration, length and spacing defined.			
	Plug/slot , may have hole dimensions, spacing, depth to fill and number of plugs/slots defined.			
	Spot weld , may have diameter at contact surface, number of welds and spacing defined.			
	Seam weld , may have width of bead, shear strength, length and spacing defined.			
	Stud weld , may have stud diameter, number of welds and spacing defined.		Arrow side only	Arrow side only
	Surfacing weld , may have thickness and length defined.		Arrow side only	Arrow side only

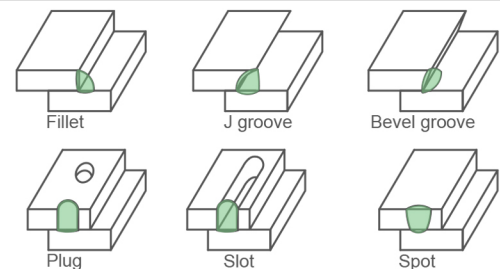
ADDITIONAL SYMBOL DETAILS				
CONTOURS		FINISH SYMBOLS		
Flush	Fillet example	Letter	Process	Example
		C	Chipping	
		M	Machining	
Concave	V groove example	G	Grinding	
		H	Hammering	
		P	Planishing	
Convex	J groove example	R	Rolling	
		U	Unspecified	

JOINT TYPES WITH EXAMPLE WELDS

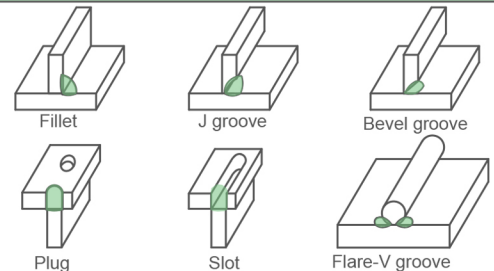
BUTT JOINT EXAMPLES



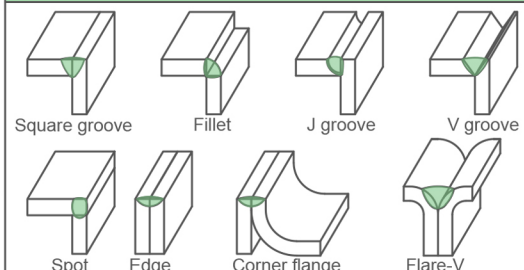
LAP JOINT EXAMPLES



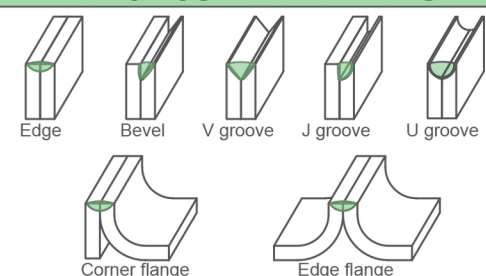
TEE JOINT EXAMPLES



CORNER JOINT EXAMPLES



EDGE JOINT EXAMPLES



SUPPLEMENTAL WELDING SYMBOLS ⁴

	Back/Backing on V groove example. Backing is deposited first in the groove / Back goes after actual weld.			
	Melt-thru on V groove example. May have height of back weld metal reinforcement.			
	Backing bar on Bevel groove example. May indicate with a letter "R" that is to be removed post weld.			
	Consumable insert on V groove example. May have specified dimensions, shape and material.			
	Spacer on double V groove example. May have specified dimensions, shape and material.			
	Field weld , A flag indicates that the weld should be made on site. Shown on fillet weld example.			
	Weld all around , Indicates that the weld is to be made over the entire circumference.			

Tail section of the weld will often contain additional information for many of the above presented welds. It is not a supplemental symbol per say but you will often find supplementing information in it.

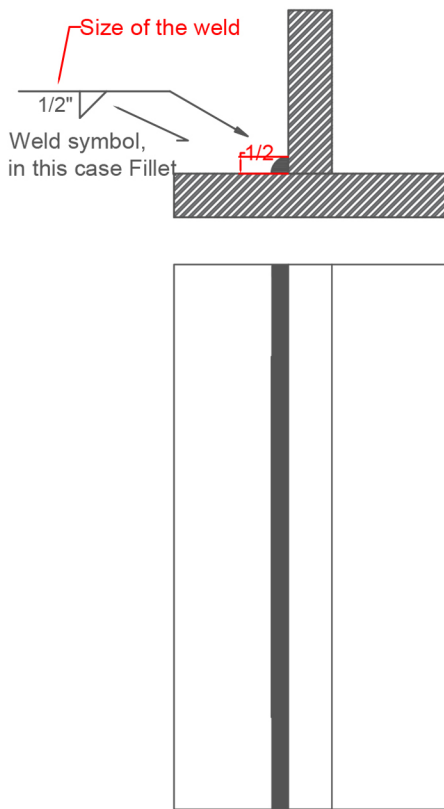
1. While the column presents the commonly associated information with the weld symbol keep in mind that there are other variables that can be specified with the symbol and especially in the tail section.
2. No side significance, made with spot resistance welder.
3. No side significance.
4. Supplemental symbols are not standalone. They supplement the main symbols. Arrow points where the main symbol is.

NUMBERS IN WELDING SYMBOLS

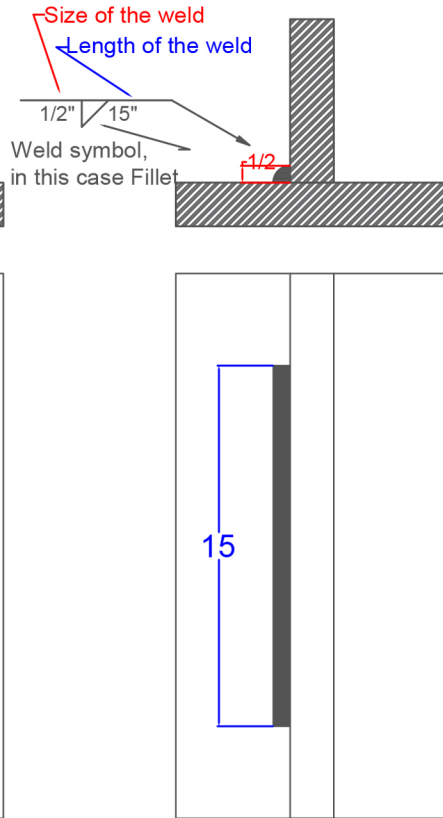
Numbers represent a valuable part of weld symbols. They provide certain info placed above and below the reference line. Welds, with the exception of plug and spot welds, come with a length component. It may refer to the length of the entire joint or a certain part of it. But if it refers to the entire length of the joint, then it is not given at all.

The weld width can usually be found on the left of the weld symbol, while the length is placed on the right side. As far as groove welds go besides the weld symbol, length, pitch, and size, info about the depth of penetration, groove angle, root opening, and the degree of beveling on the base metal can be added.

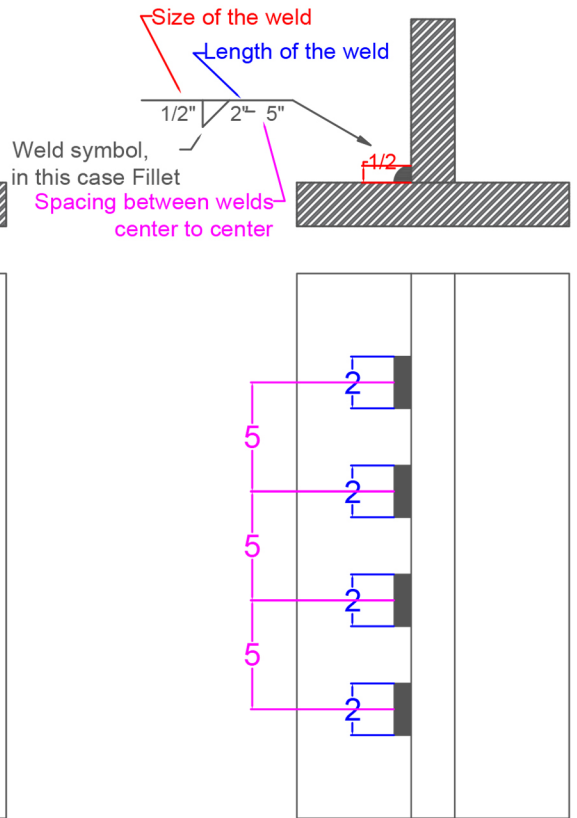
WELD LENGTH NOT DEFINED



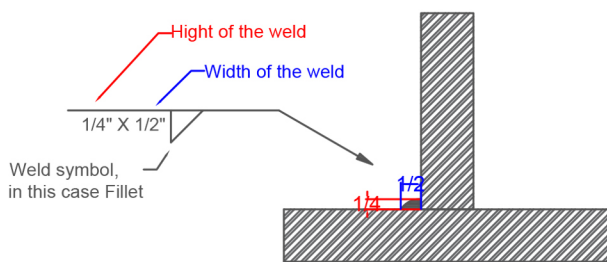
WELD LENGTH DEFINED



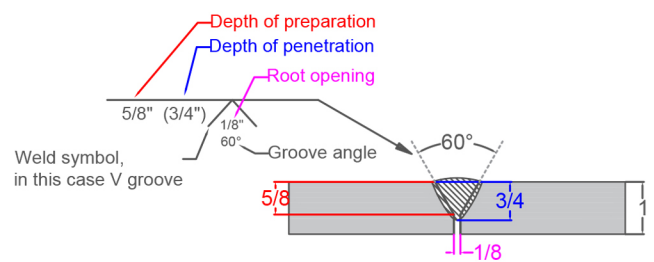
WELD LENGTH AND SPACING DEFINED



SIZE OF FILLET WELD HEIGHT / WIDTH NOT EQUAL

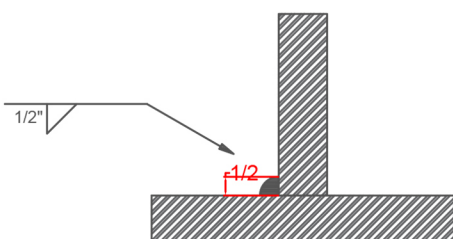


V GROOVE NUMBERING EXAMPLE

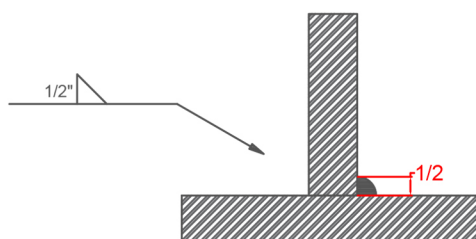


WELD ORIENTATION

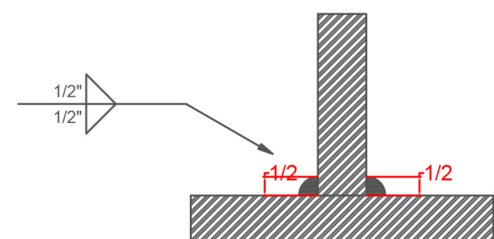
SYMBOL BELOW REFERENCE LINE



SYMBOL ABOVE REFERENCE LINE



SYMBOL ABOVE AND BELOW REFERENCE LINE

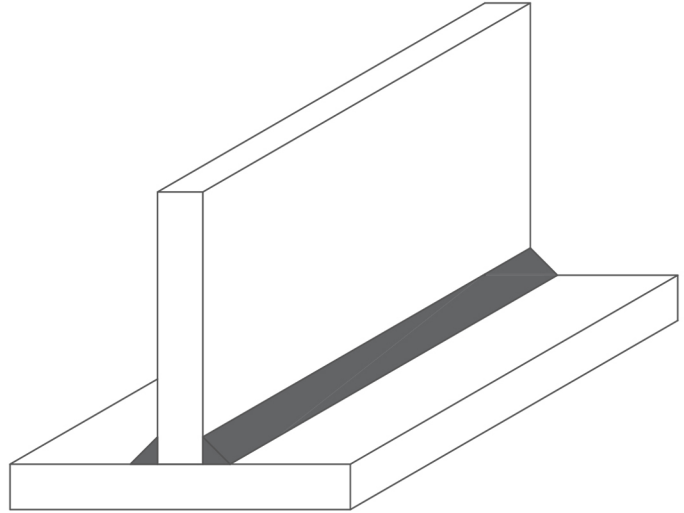
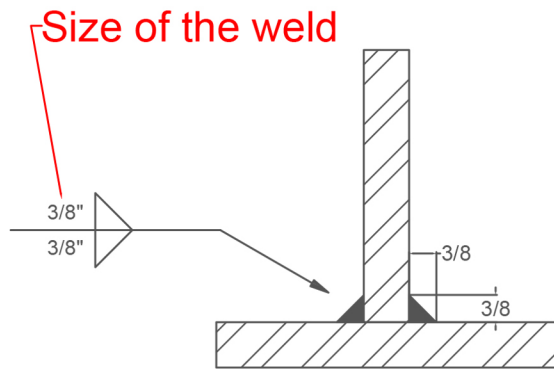


FILLET WELD EXAMPLES

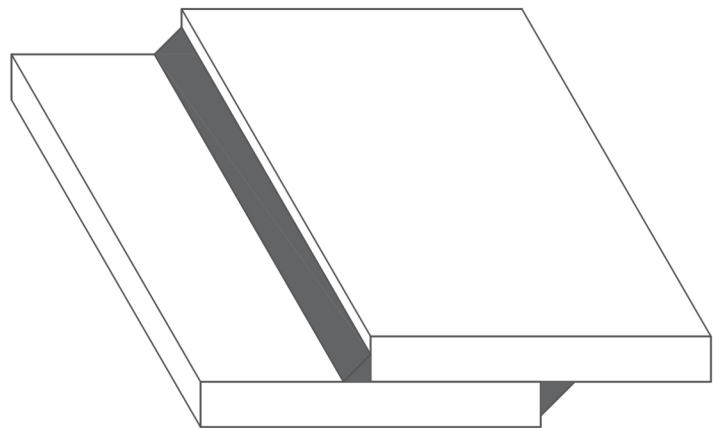
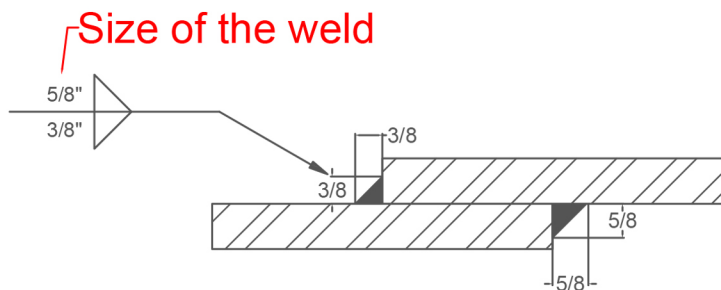
The Fillet weld is used to create lap joints, corner and T joints. This weld has a close to triangular cross-section similar to what its symbol looks like. But keep in mind that it's shape can also deviate from right triangular or isosceles triangle.

When making a fillet weld the weld metal gets deposited in the corner that is formed by the two elements to be joined. The weld then penetrates and fuses with the elements to form a solid joint.

FILLET WELD T JOINT EXAMPLE



FILLET WELD LAP JOINT EXAMPLE



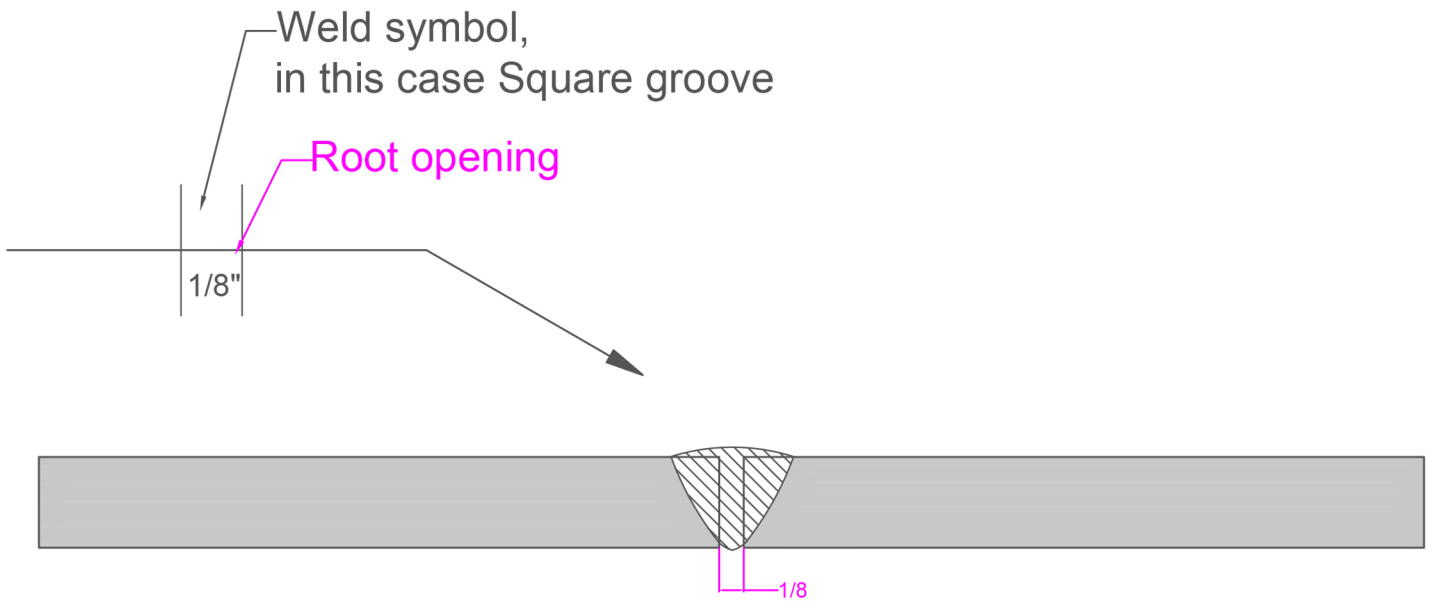
SQUARE GROOVE WELD EXAMPLES

Square groove weld means that you won't be beveling the edges at all.

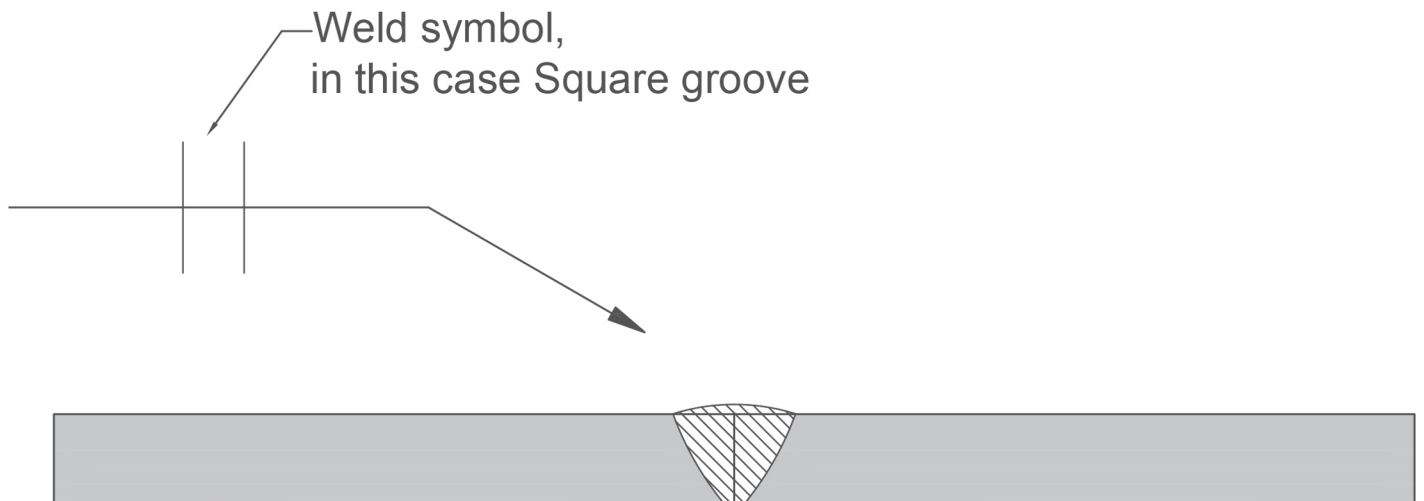
This weld is made by using a tight fit between the edges of the pieces or by giving them a root opening (separating them slightly as instructed on the symbol).

It is a very common weld that you will occur in welding work.

SQUARE GROOVE WITH ROOT OPENING EXAMPLE



SQUARE GROOVE NO ROOT OPENING EXAMPLE



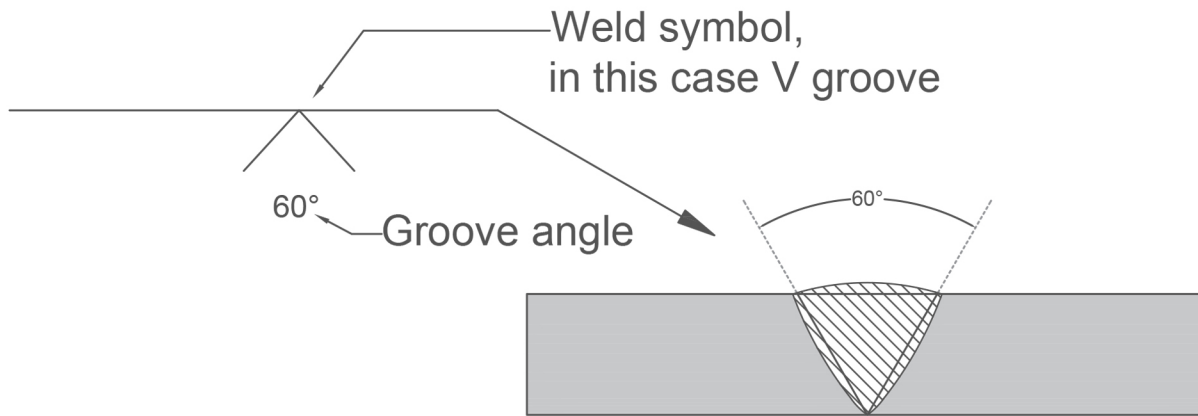
V GROOVE WELD EXAMPLES

Now the situation gets a bit more complex.

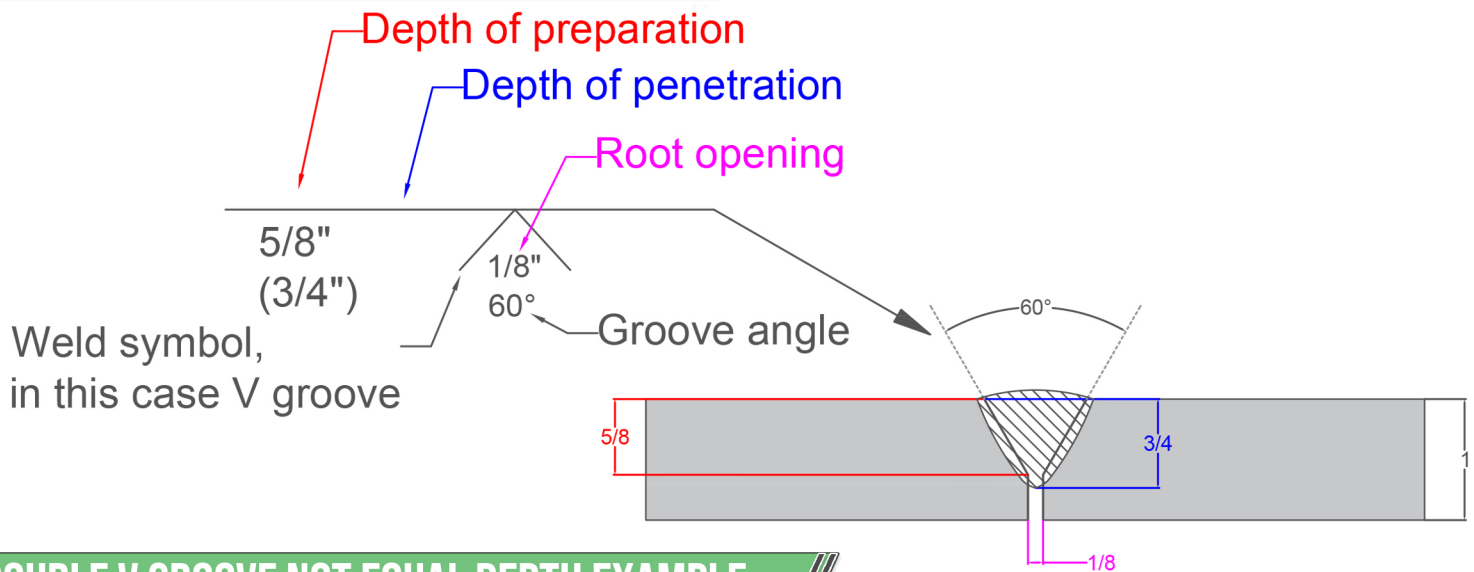
The edges of the V groove weld are to be chamfered in order to make a V-shaped opening between the pieces where the weld gets deposited.

The symbol can hold multiple variables like the angle between the pieces, root opening, weld penetration and preparation and of course any additional information in the tail.

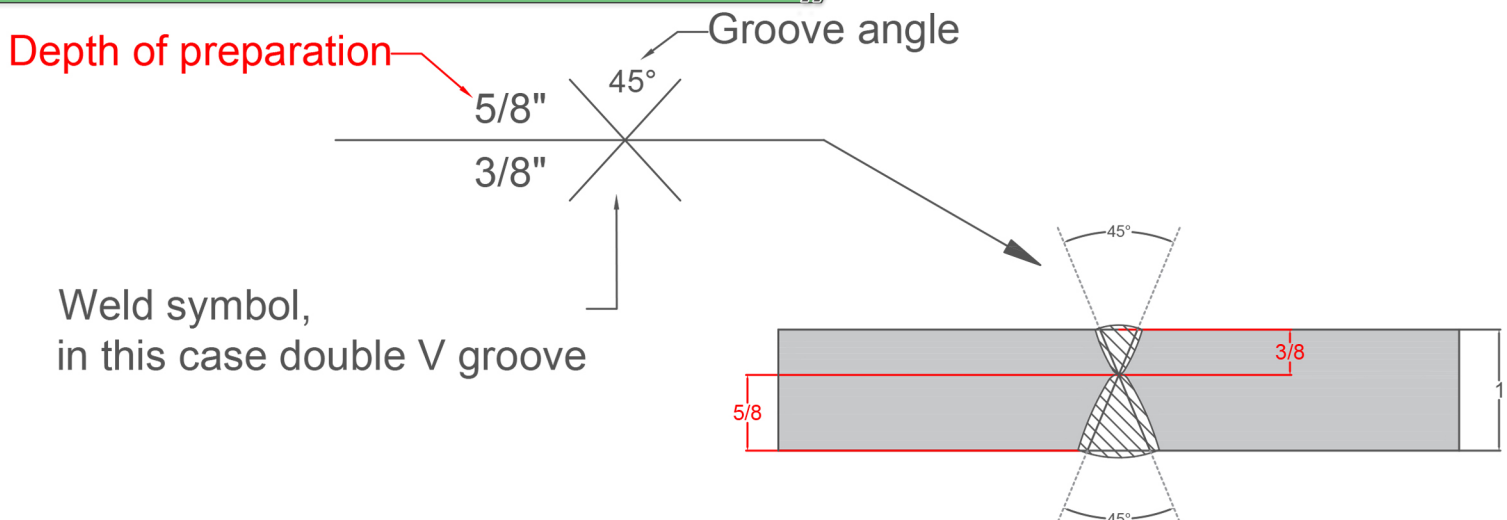
SIMPLE V GROOVE EXAMPLE



V GROOVE WITH ROOT OPENING EXAMPLE



DOUBLE V GROOVE NOT EQUAL DEPTH EXAMPLE



BEVEL GROOVE WELD EXAMPLES

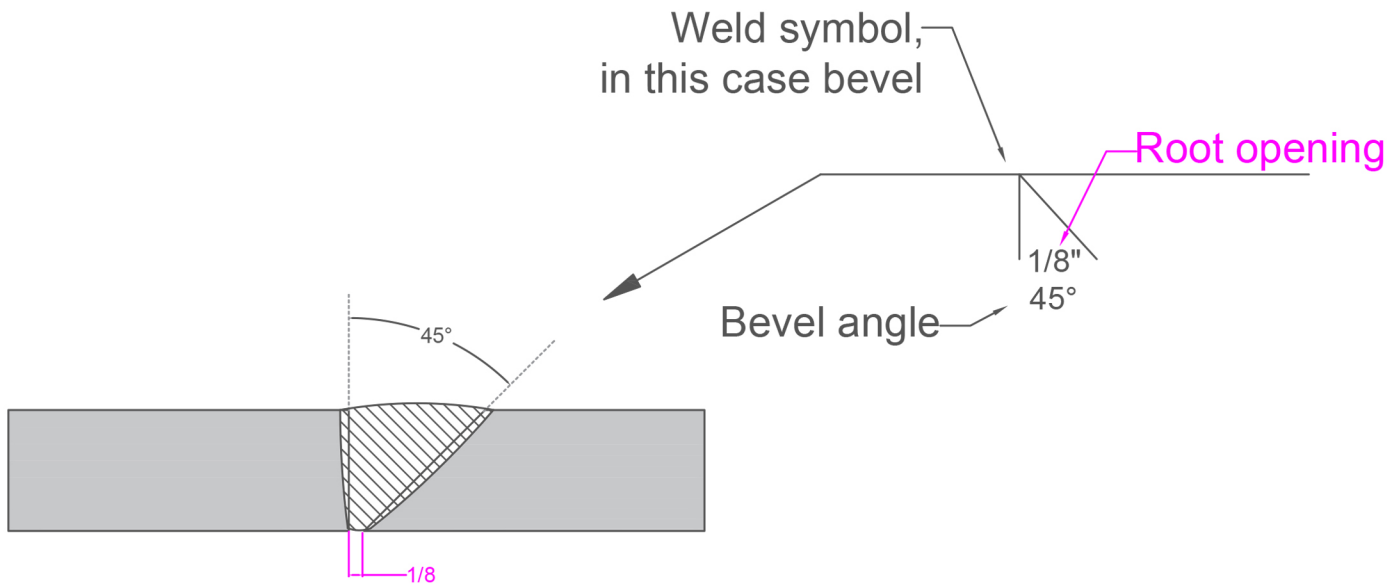
This weld is made by chamfering one piece while leaving the edge of another squared. Keep in mind that the bevel symbol's perpendicular line always remains drawn on the left side on the symbol regardless of the weld orientation.

We can have a side significance or no side preferences with the bevel weld.

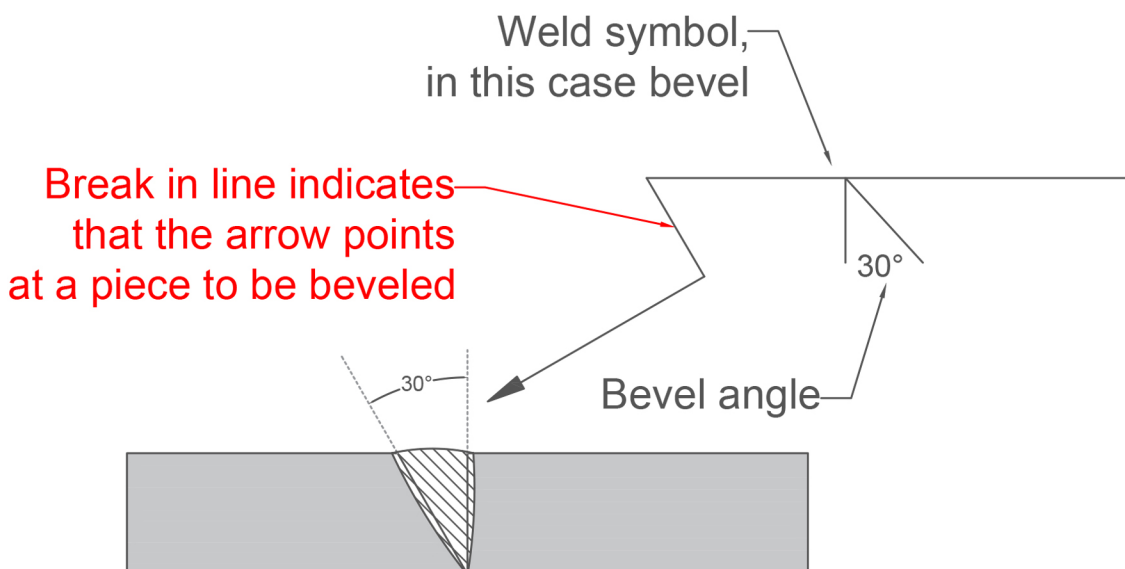
If a certain side is designated to receive the bevel then the engineer will specify this in the symbol by breaking the arrow line and pointing it toward the piece that's to be beveled. If there is no side significance then it is up to the welder to choose the bevel side.

Similar to the V groove the welding symbol can contain information such as the opening angle, depth of penetration, preparation and root opening.

BEVEL GROOVE EXAMPLE WITH ROOT OPENING - NO SIDE SIGNIFICANCE



BEVEL GROOVE EXAMPLE WITH A SPECIFIED SIDE TO RECEIVE BEVEL



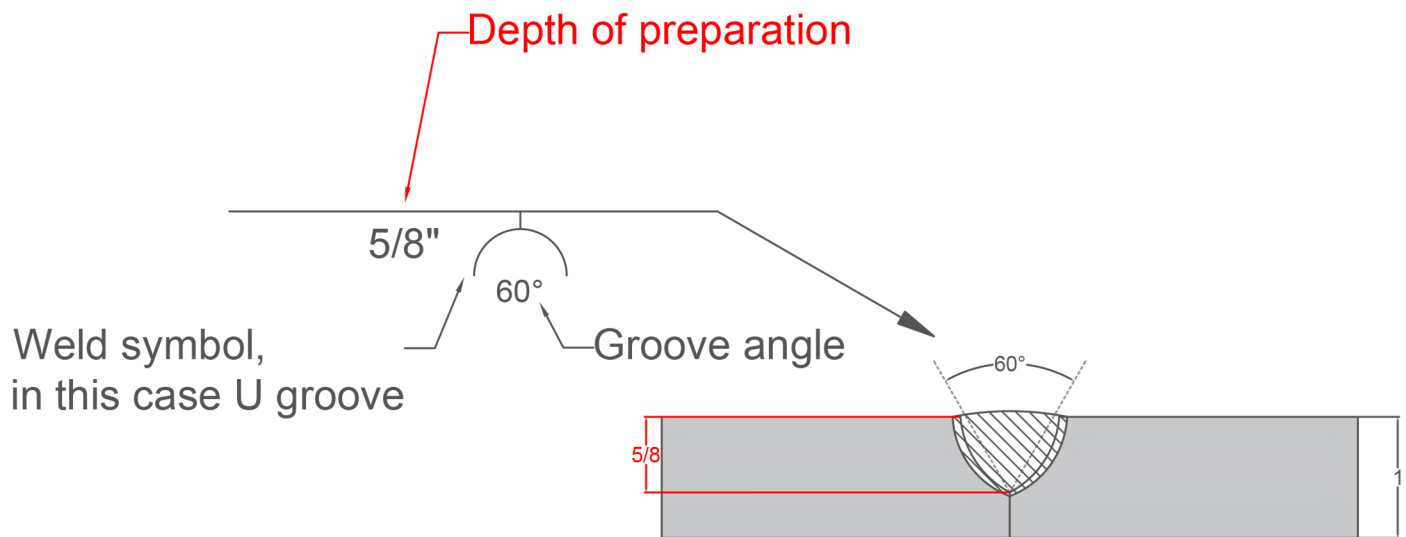
U GROOVE WELD EXAMPLE

This weld is less common than the two before but you should know how to read its symbol.

It is similar to the V groove weld but unlike the V groove, the U groove's pieces are to be given a concave treatment.

The weld symbol can have all of the elements of the V groove symbol.

SIMPLE U GROOVE EXAMPLE

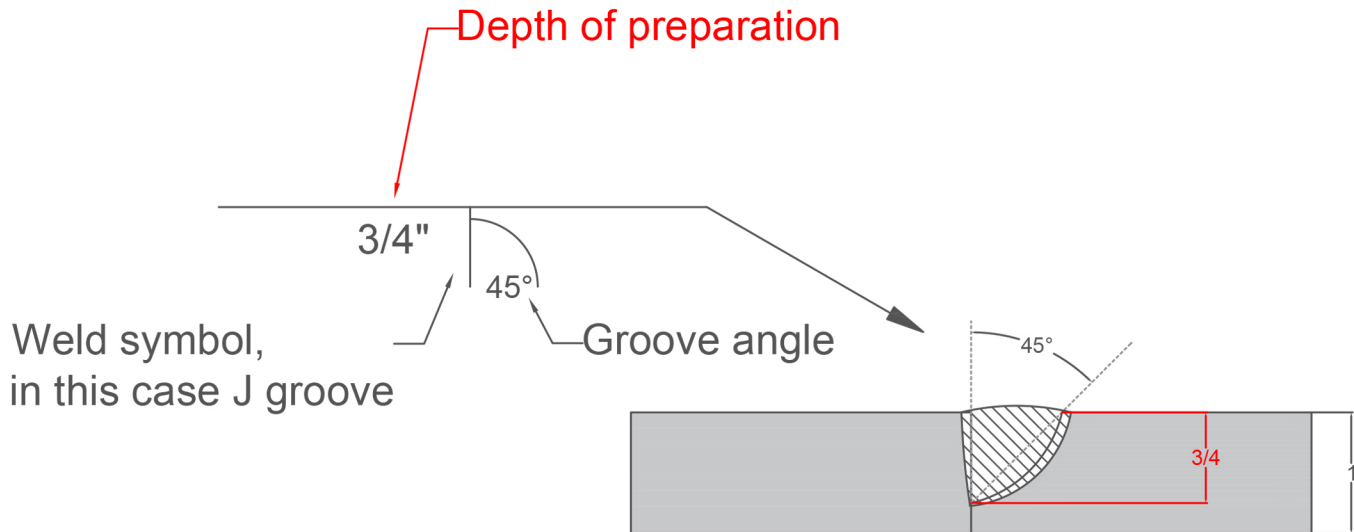


J GROOVE WELD EXAMPLES

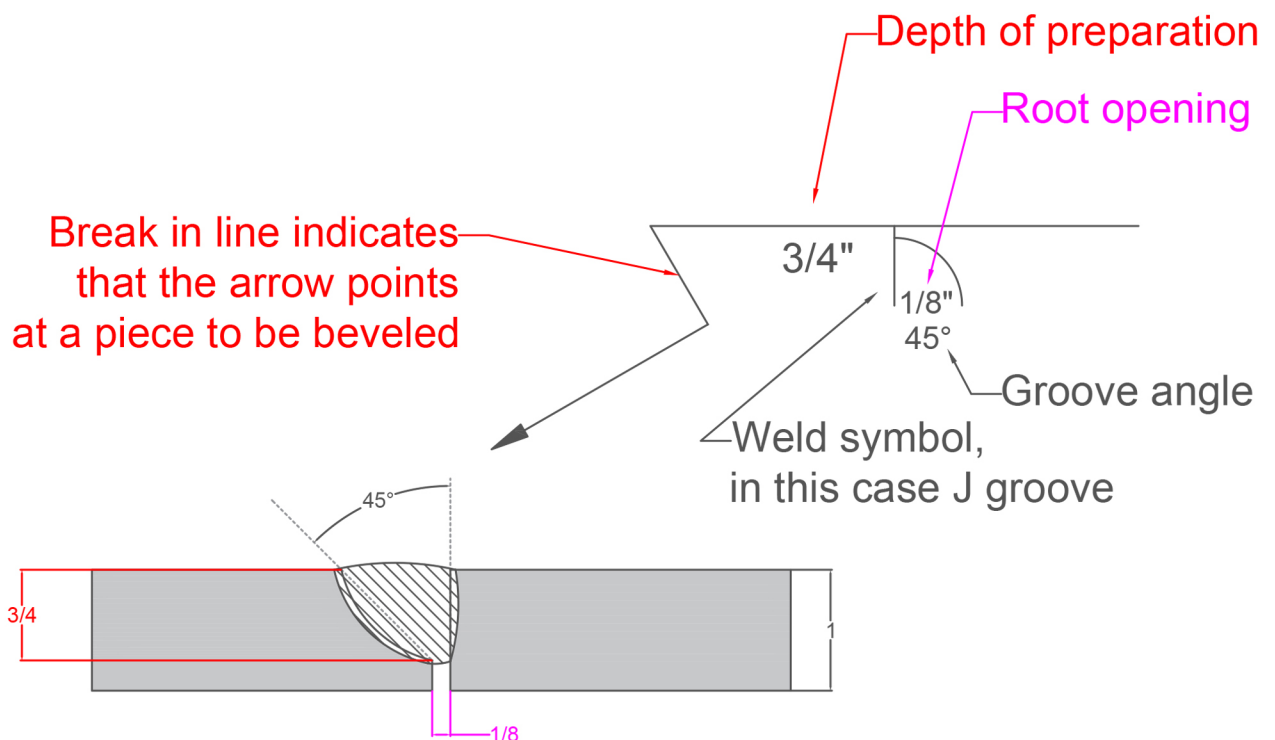
The J groove weld is to the bevel weld what is U groove to the V groove weld. It is very similar to the bevel weld. Only one side is treated while the other side is left square. The treated side has a concave treatment and that's where the J name comes from.

Just like with the bevel weld, the perpendicular line gets drawn on the left side and there is a break in the arrow line if there is a need to specify the side to receive the treatment.

SIMPLE J GROOVE EXAMPLE - NO SIDE SIGNIFICANCE



J GROOVE EXAMPLE WITH A SPECIFIED SIDE FOR TREATMENT

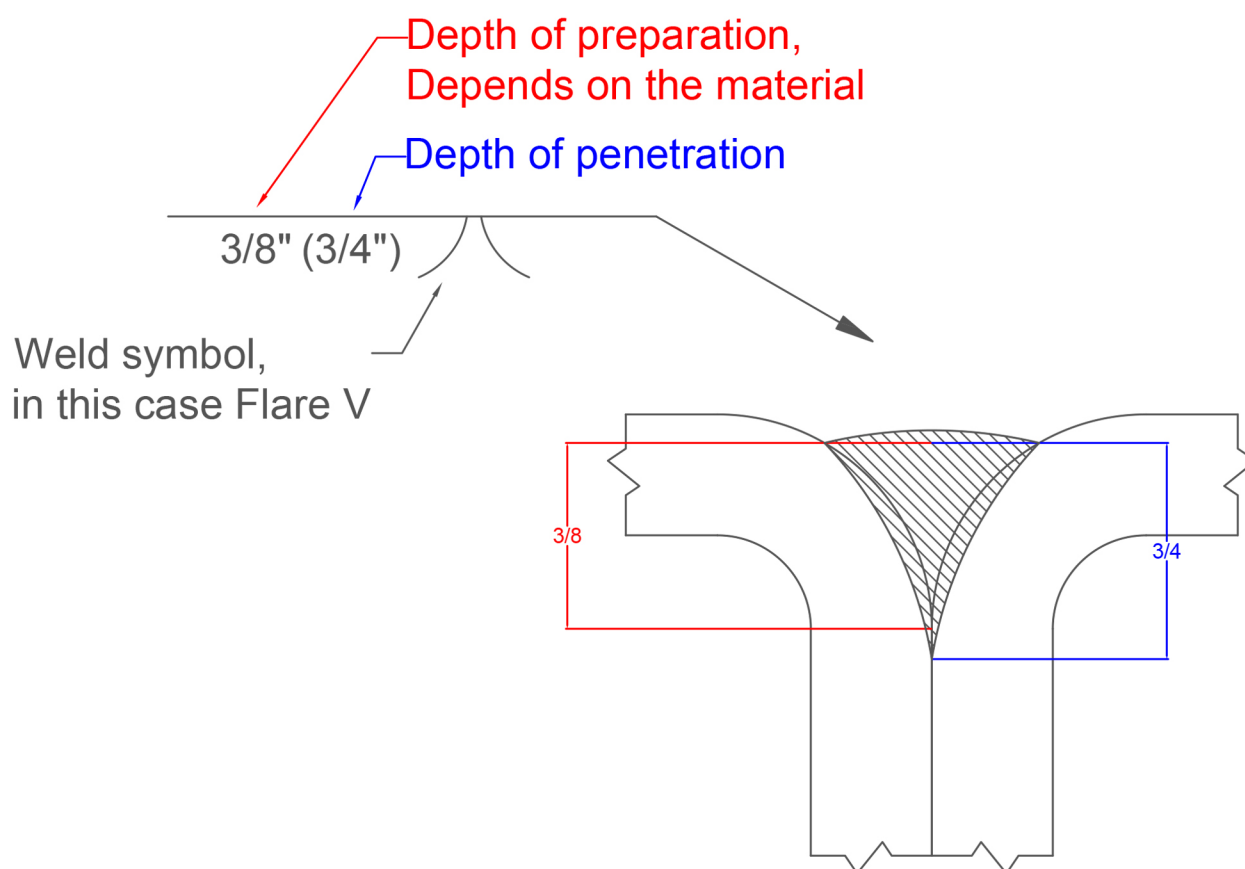


FLARE-V GROOVE WELD EXAMPLE

The Flare V groove is most often used to join together two curved or rounded pieces of metal.

The “depth of preparation” depends on the metal because this depth is formed by placing one piece to another. The dimension then depends on their dimensions. However, the actual depth of penetration matters the most here and is given as usual in the parentheses.

FLARE-V GROOVE EXAMPLE

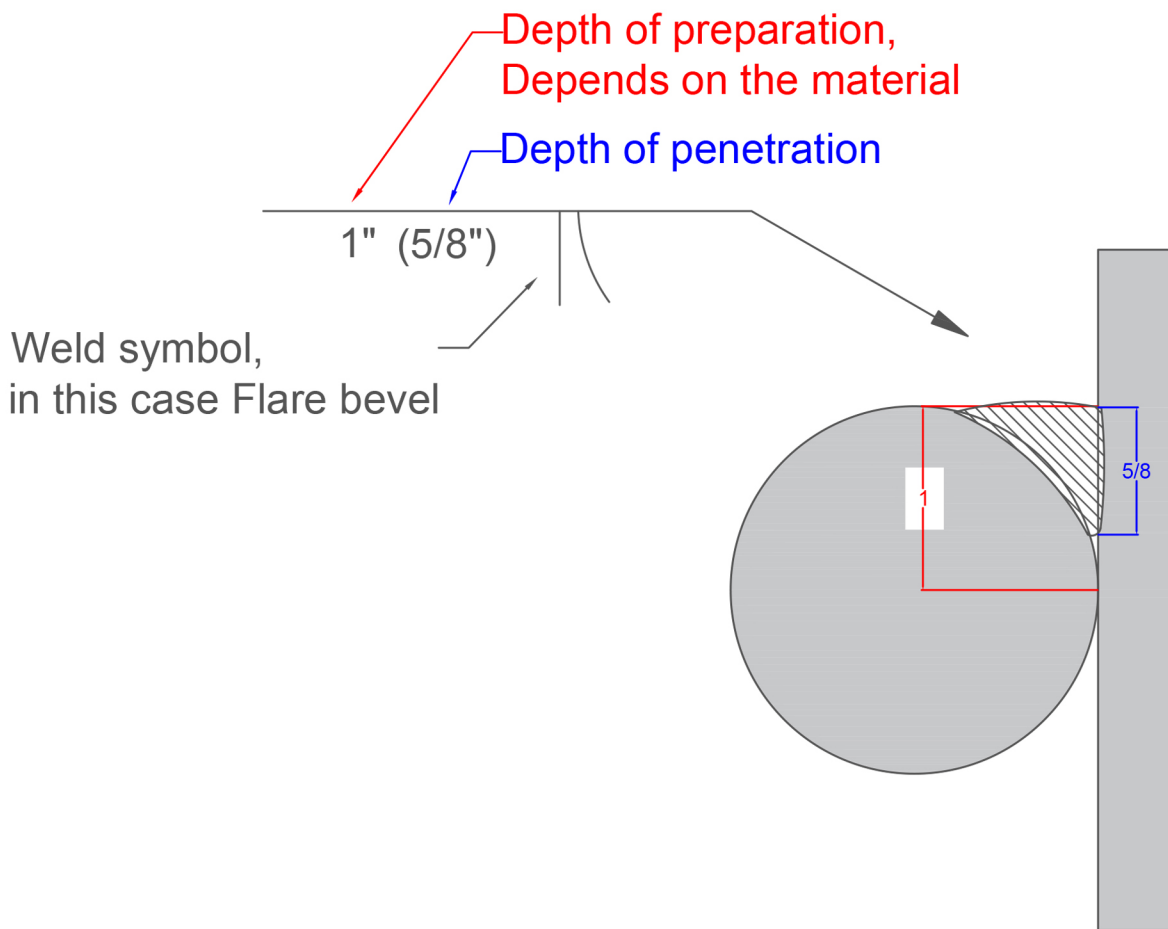


FLARE BEVEL GROOVE WELD EXAMPLE

This weld is most often used when joining a rounded piece to a flat one.

Just like the flare V before, the depth of the groove is formed by the two surfaces with the depth of penetration being the most important metric.

FLARE BEVEL GROOVE EXAMPLE

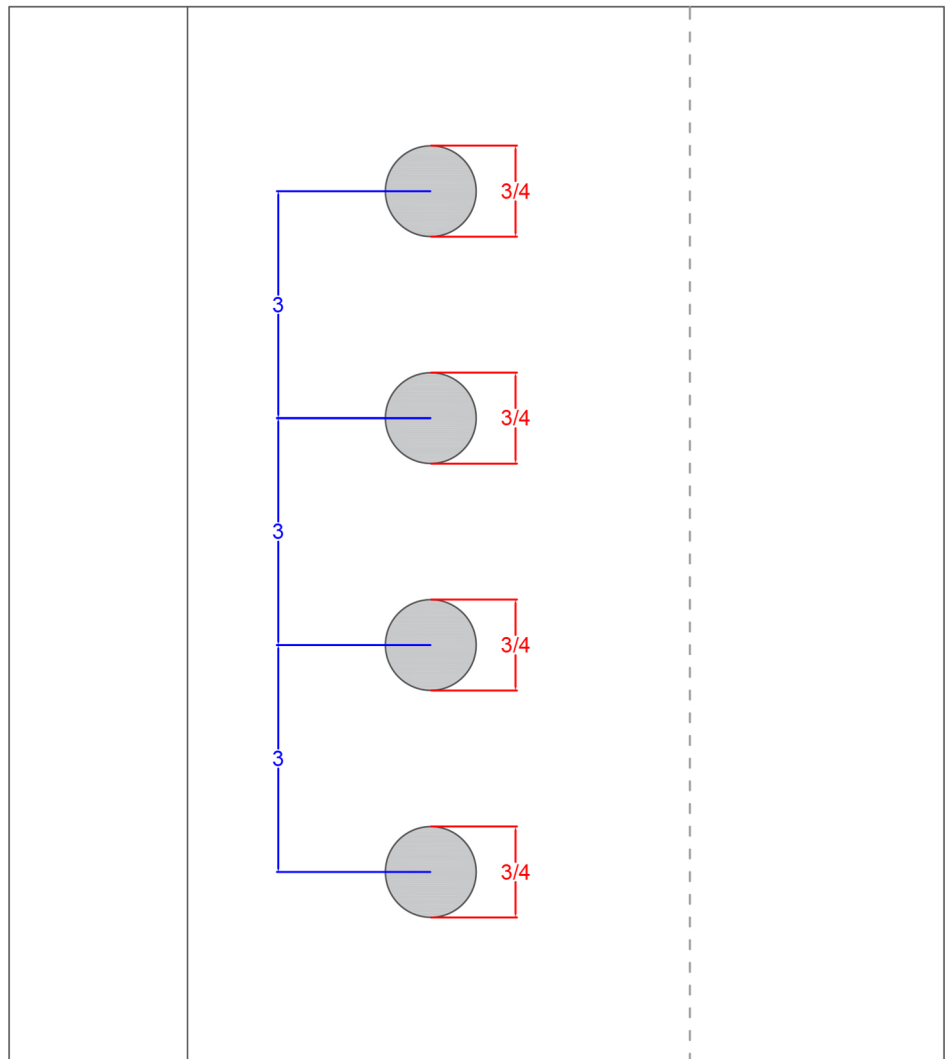
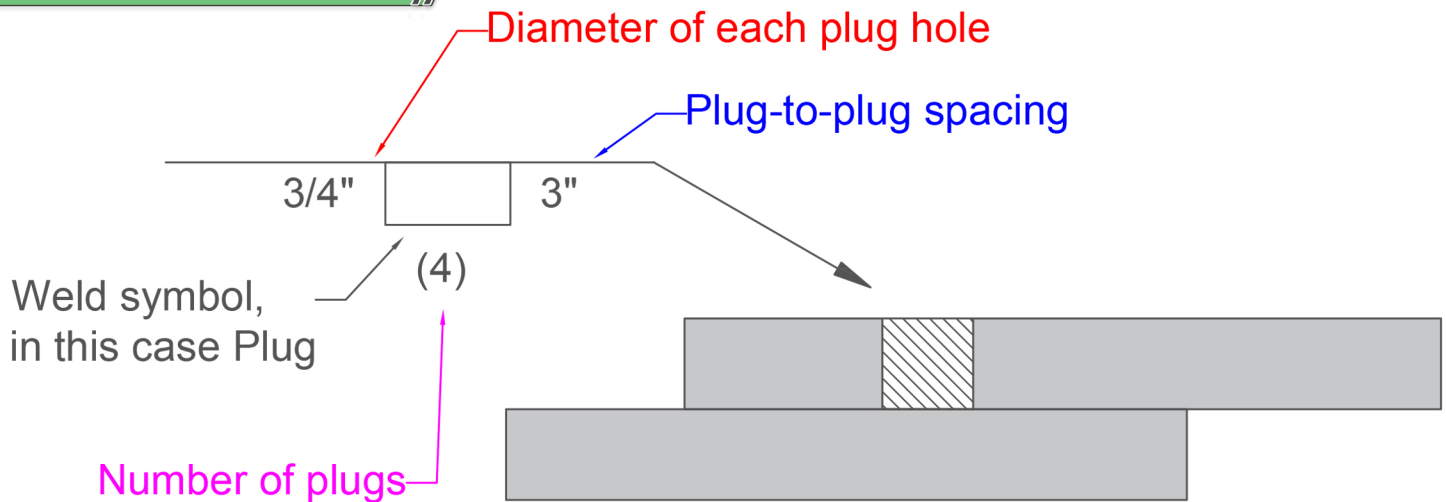


PLUG AND SLOT WELD EXAMPLES

Plug and Slot welds are used to join pieces that are overlapping. One of these pieces will have holes (plug welds have round holes / slot welds have elongated holes).

During the welding process, the holes are filled with the deposited weld metal which penetrates and fuses the two pieces to form a solid joint.

PLUG WELD EXAMPLE

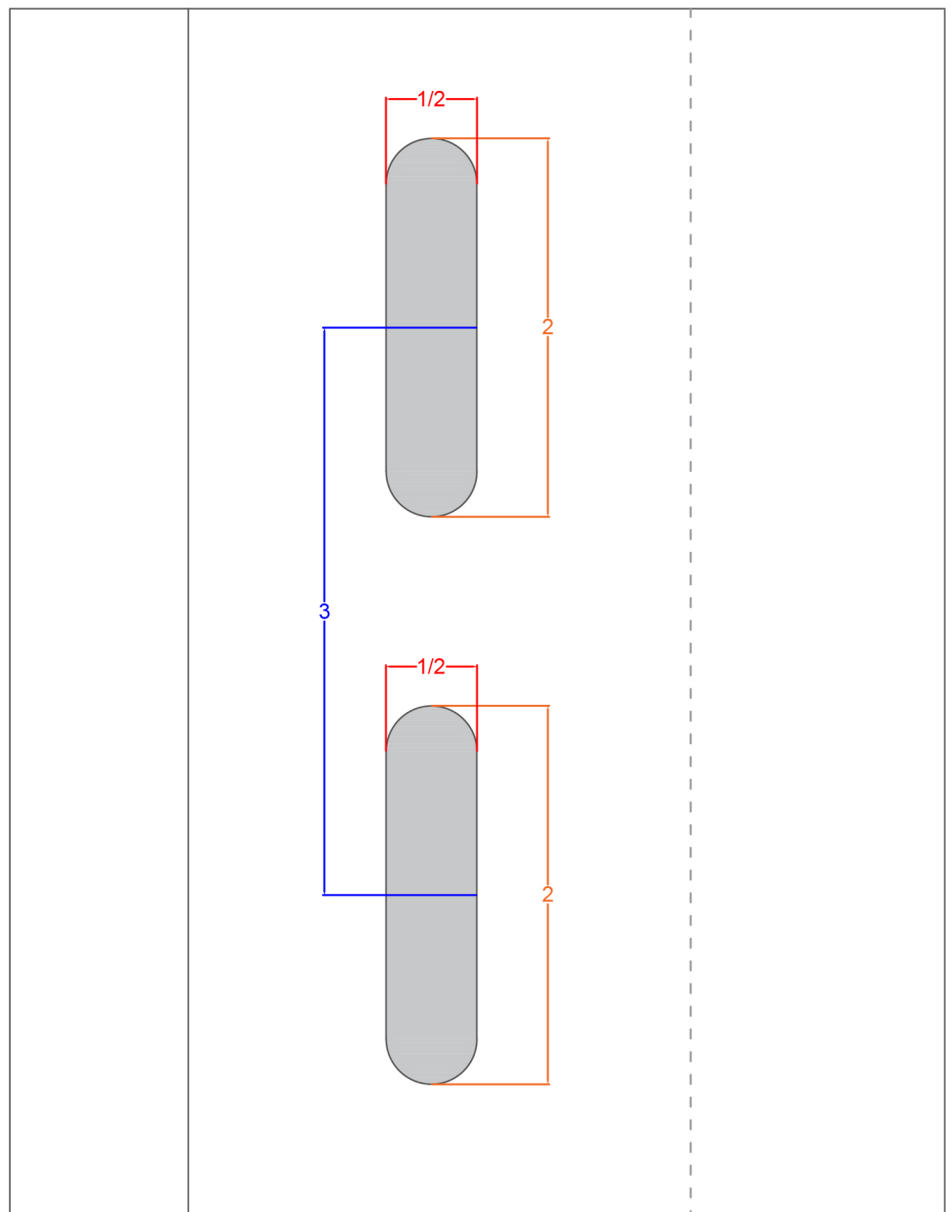
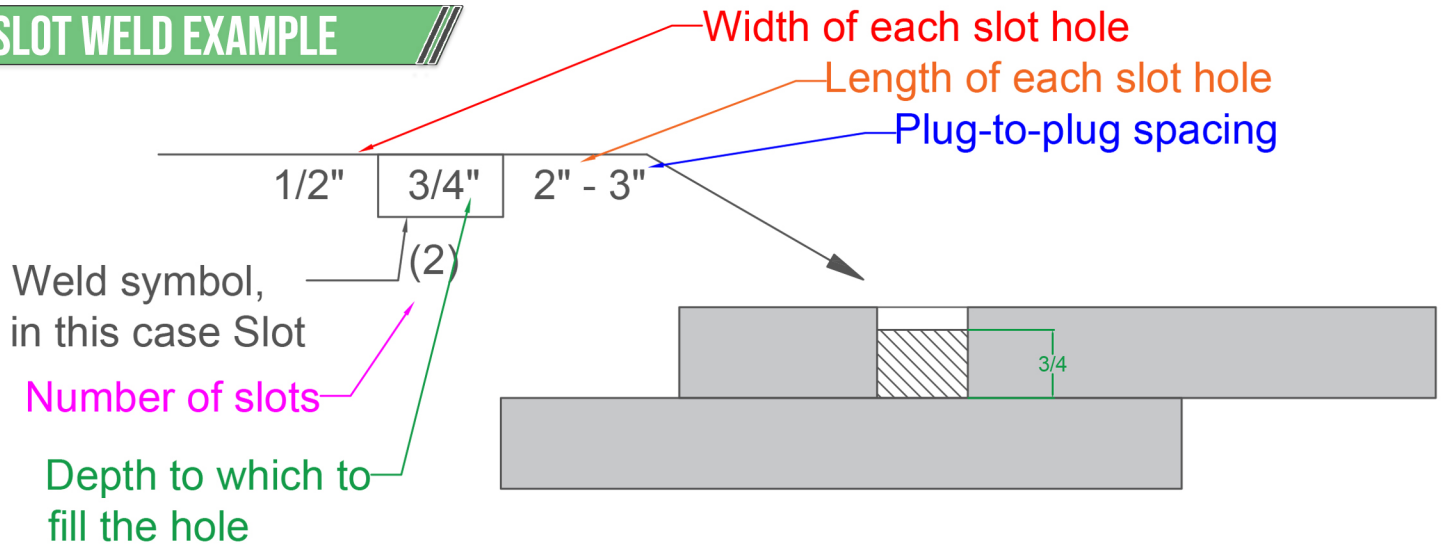


PLUG AND SLOT WELD EXAMPLES

Plug and Slot welds are used to join pieces that are overlapping. One of these pieces will have holes (plug welds have round holes / slot welds have elongated holes).

During the welding process, the holes are filled with the deposited weld metal which penetrates and fuses the two pieces to form a solid joint.

SLOT WELD EXAMPLE



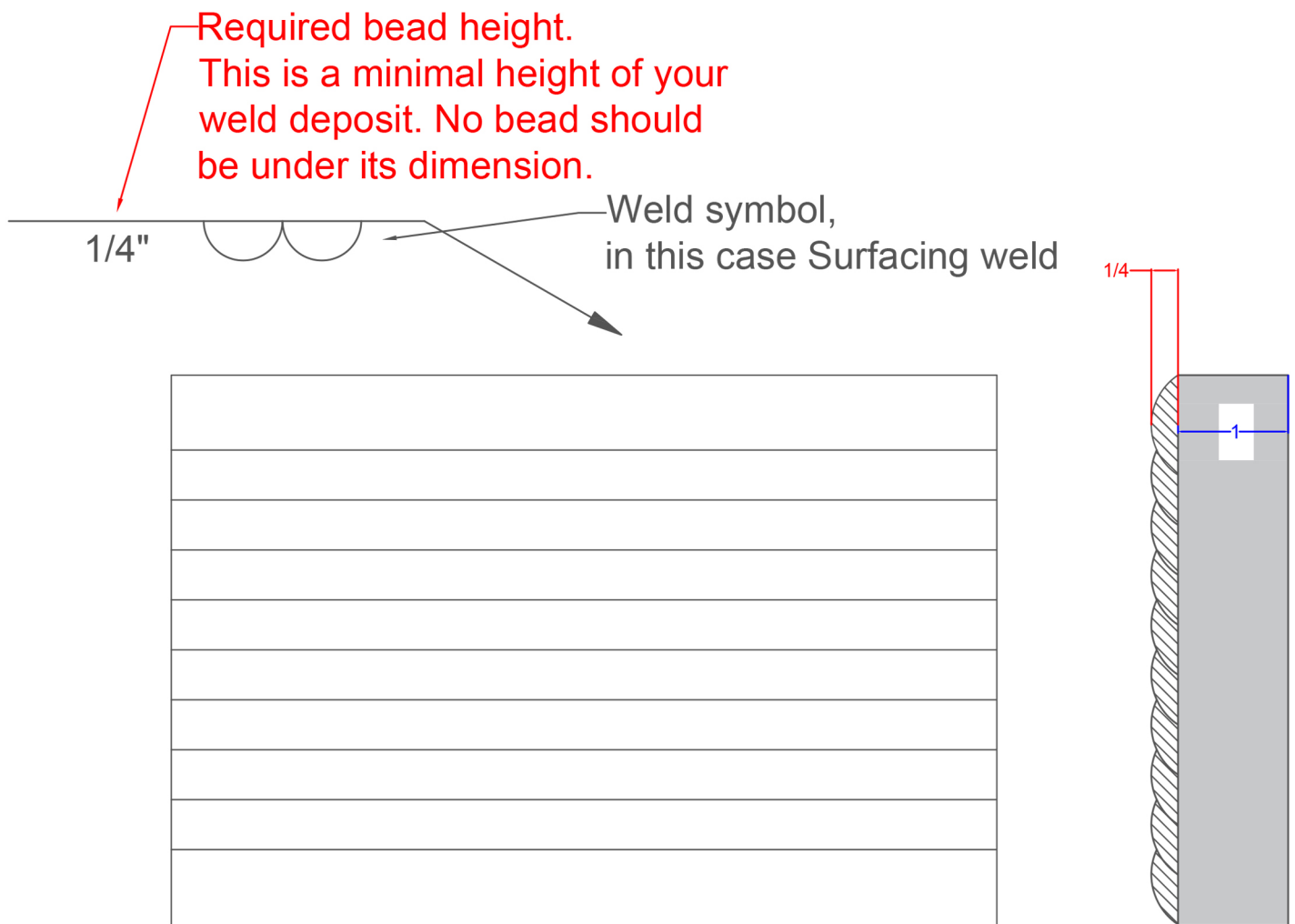
SURFACING WELD EXAMPLE

The surfacing welds are used when you need to apply welds over the entire surface of a welded piece (or a part of it).

Commonly used to reinforce a piece or to repair the worn down elements.

It can be made using single or multi-pass welds.

SURFACING WELD EXAMPLE

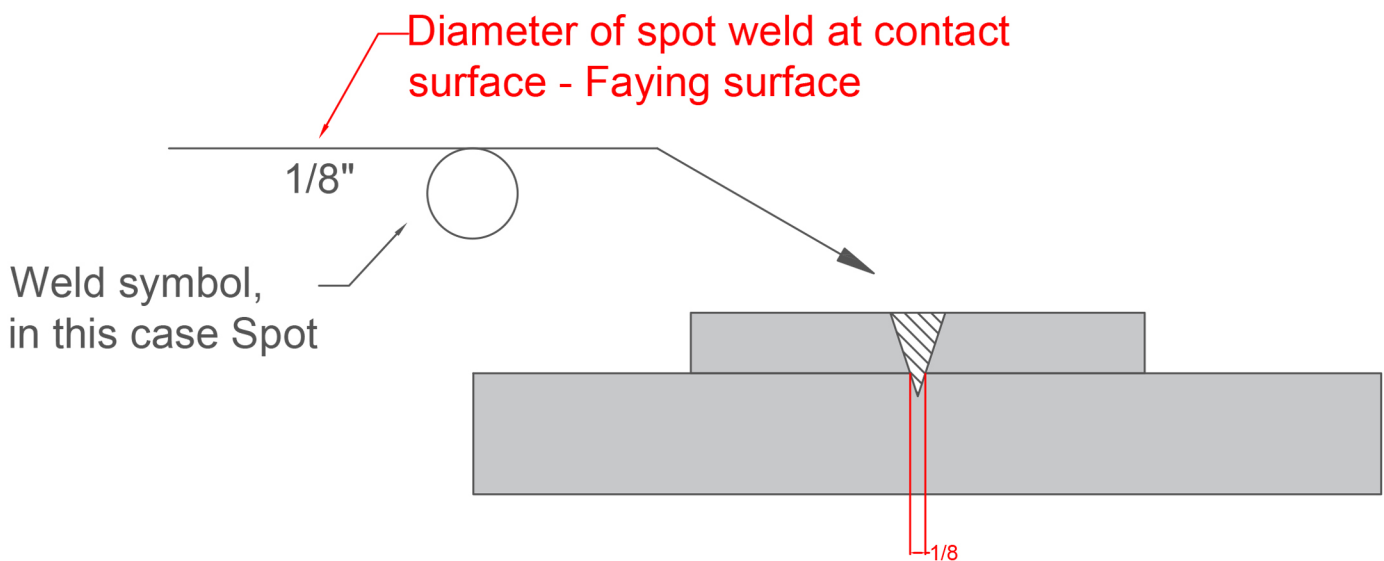


SPOT WELD EXAMPLES

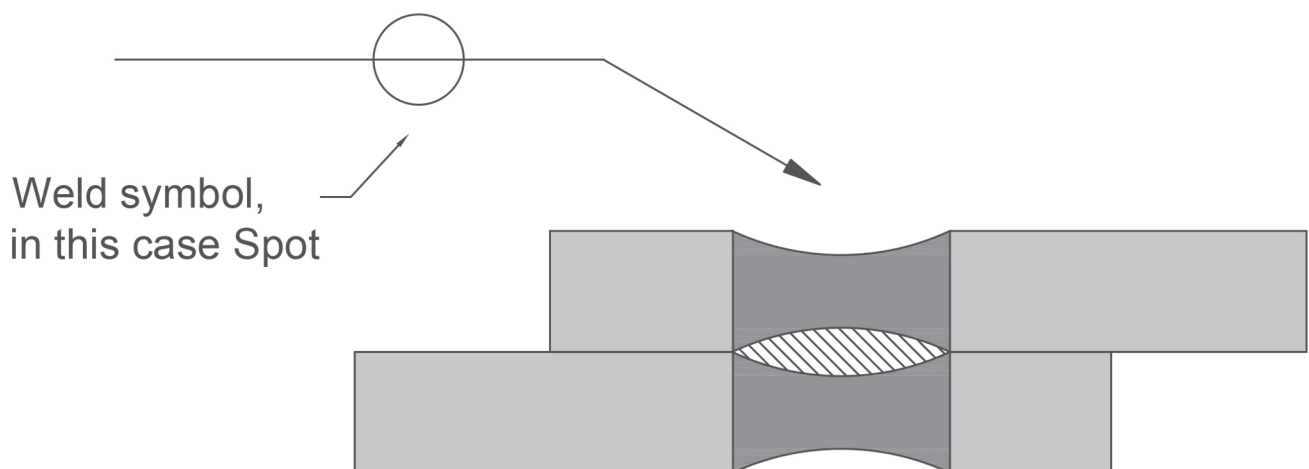
A spot weld is simply a weld that's applied to the surface of one joint that will melt into the faying surface creating metal due to high heat input.

The symbol is a plane circle that can be centered on the reference line or be placed above or under it.

SPOT WELD EXAMPLE



SPOT WELD NO SIDE SIGNIFICANCE - MADE USING A SPOT RESISTANCE WELDER

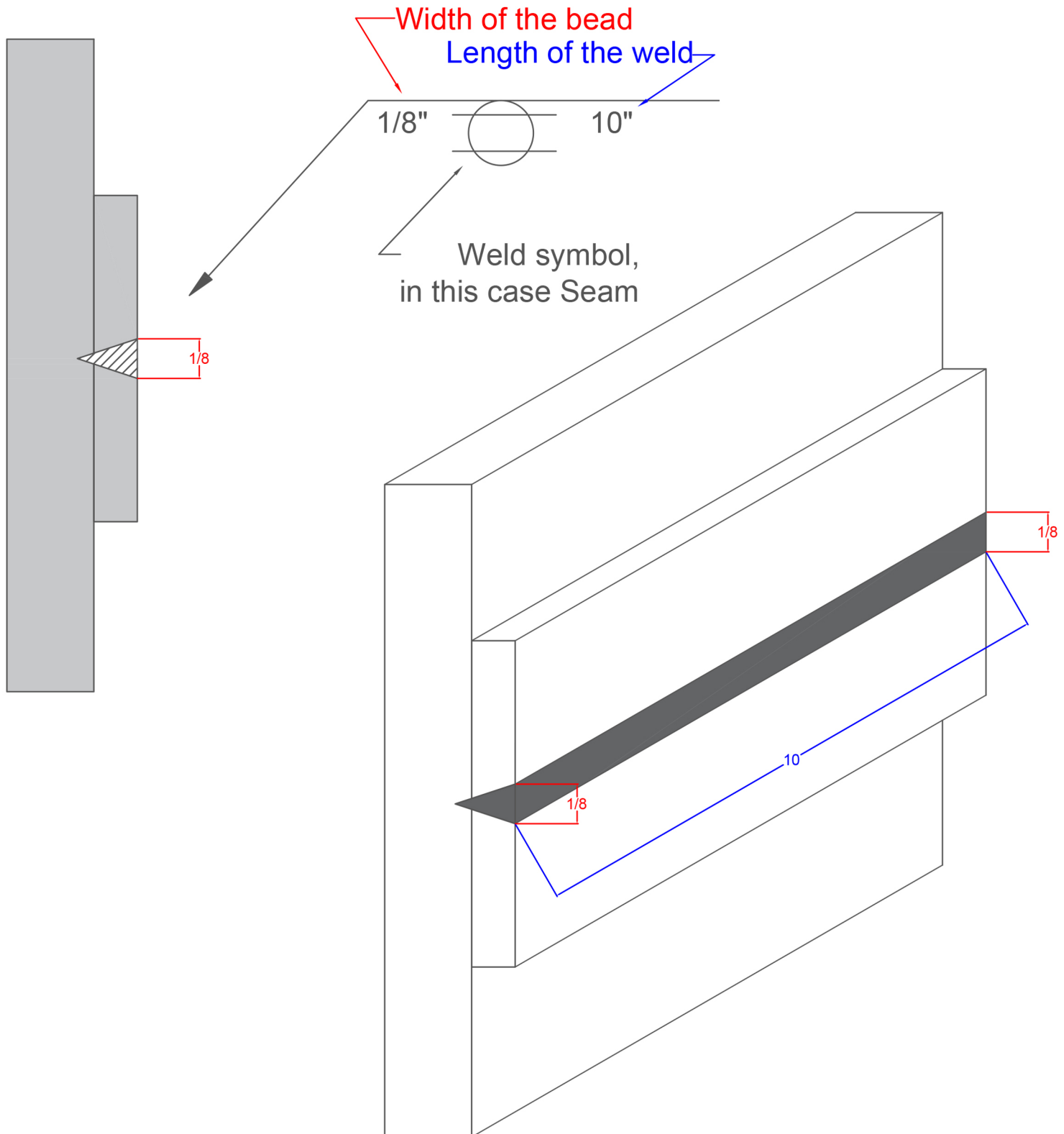


SEAM WELD EXAMPLE

Seam weld is quite similar to the spot weld with one major difference. It is not concentrated in one spot but is in a linear form.

The weld projects through the top surface and just like with the spot weld, it melts through into the material of the joint beneath it to form a solid joint using a high heat input. Additionally, just like with the fillet weld, in some cases it can have weld length and spacing defined between welds.

SEAM WELD EXAMPLE



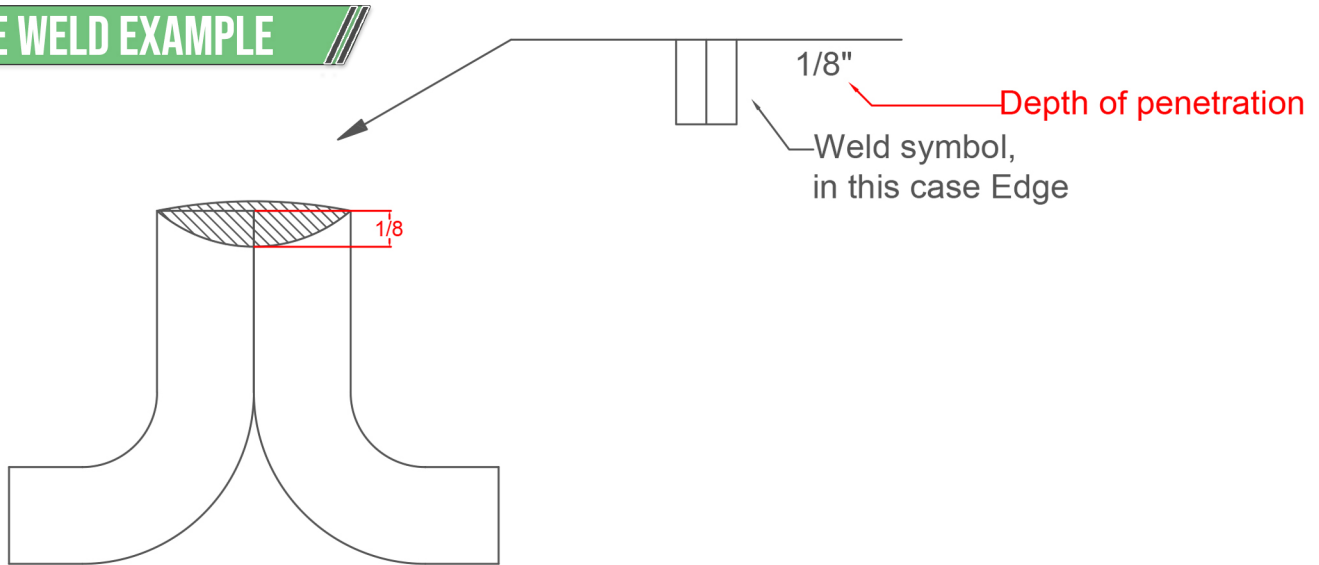
EDGE WELD EXAMPLES

Edge welds are most commonly applied to sheet or gauge metals.

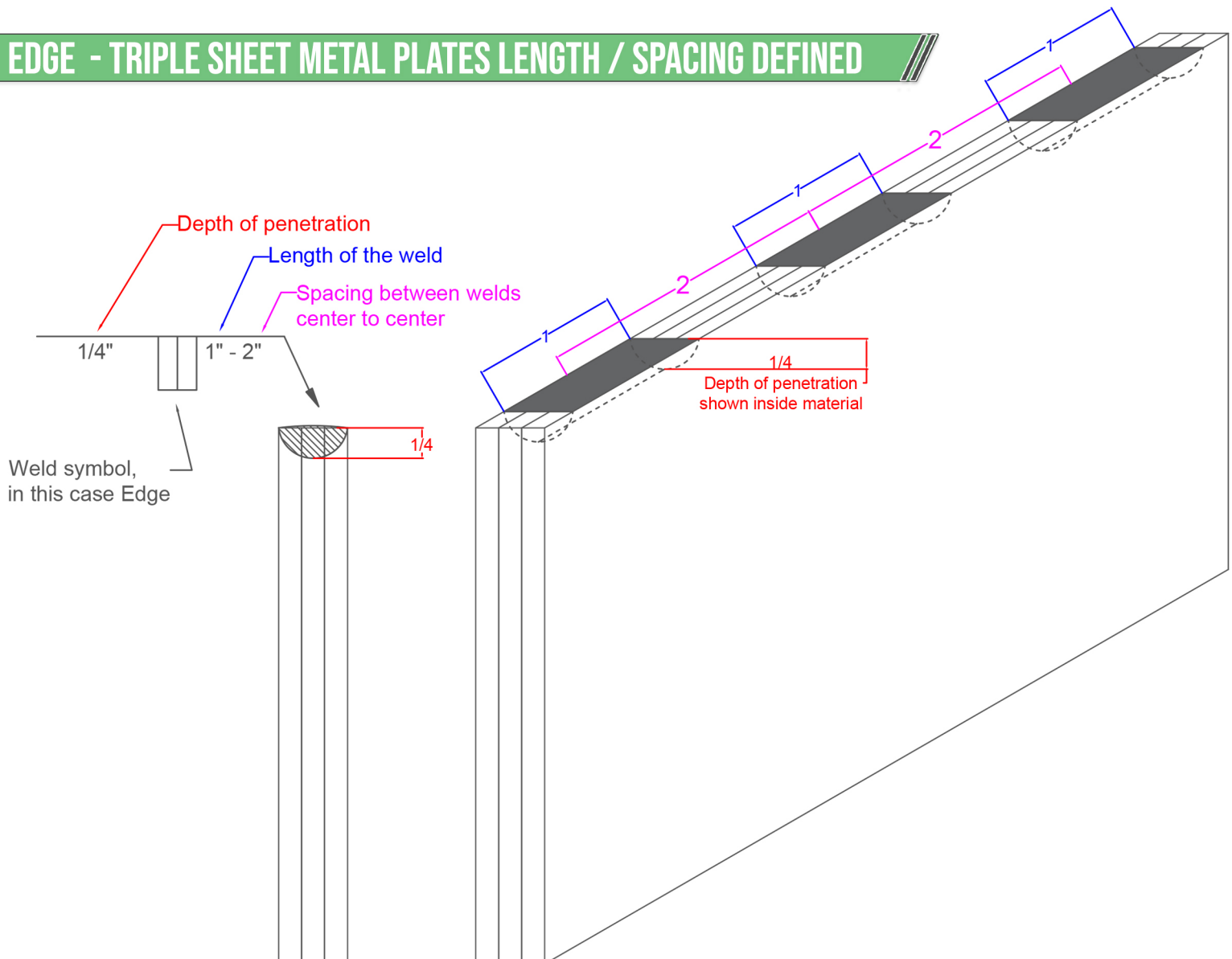
They can be used on a minimum of two sheets being welded on their edge or can be used with multiple sheet metals.

They have a depth of penetration defined and can have a length of weld and spacing between the welds defined as well.

SIMPLE EDGE WELD EXAMPLE



EDGE - TRIPLE SHEET METAL PLATES LENGTH / SPACING DEFINED

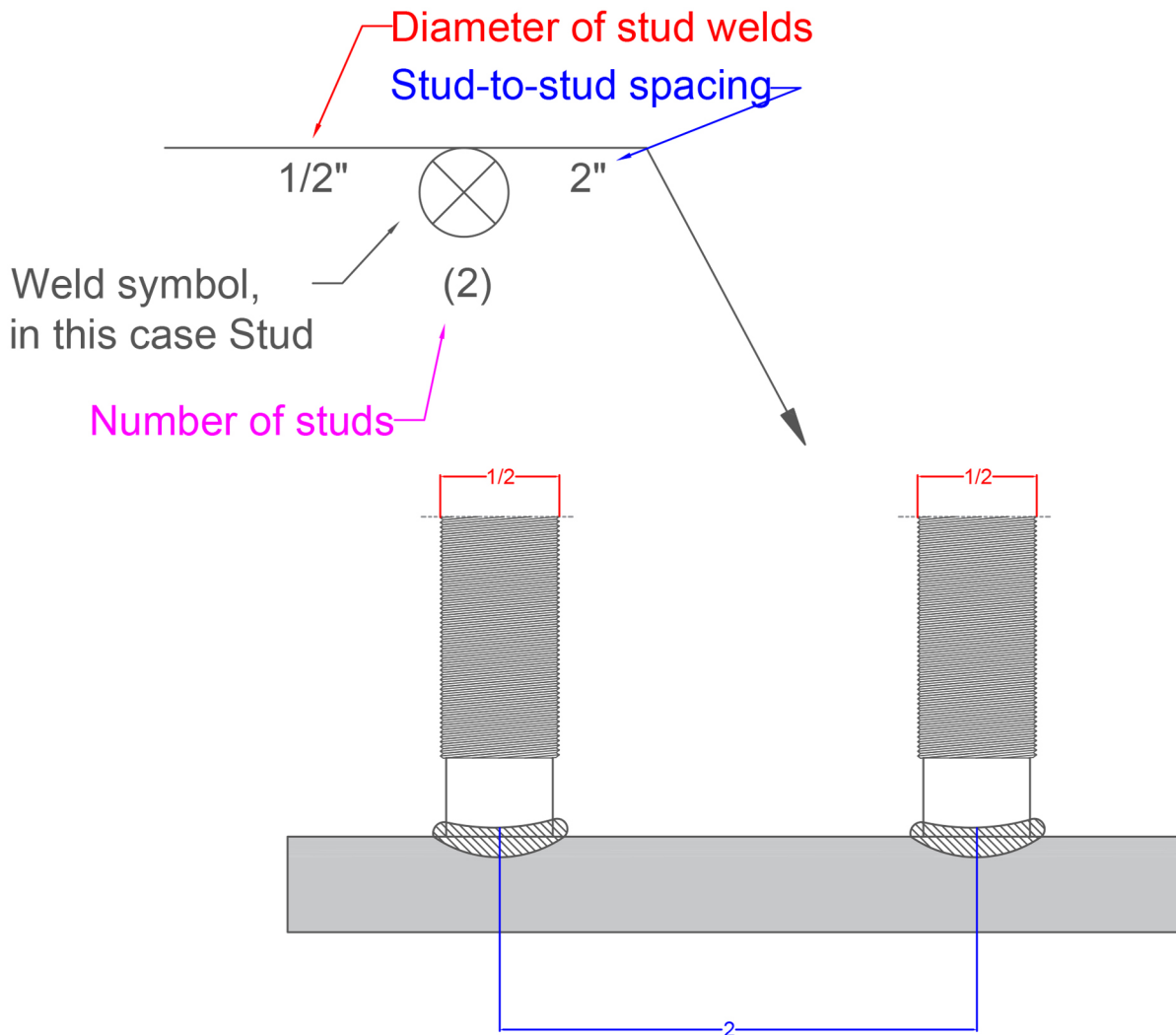


STUD WELD EXAMPLE

Stud welds are usually made using a stud welder which is a handheld or a standalone unit.

These welds are commonly produced in many welding shops so you should get familiar with the symbol.

STUD WELD EXAMPLE



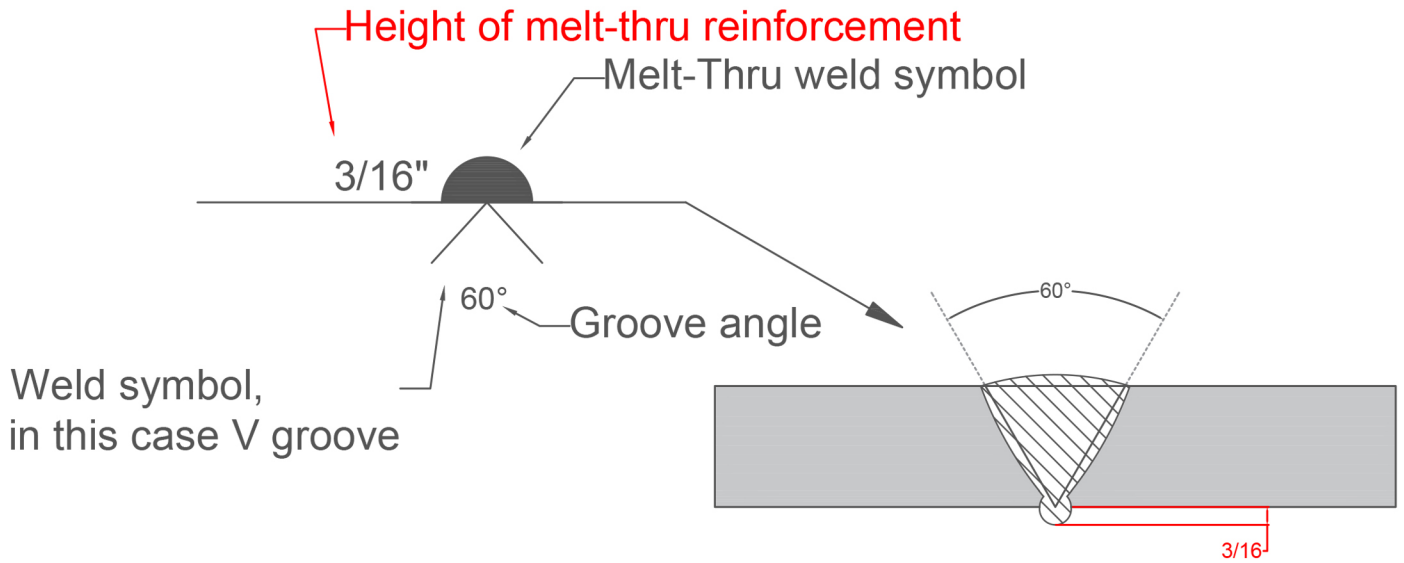
MELT-THRU WELD EXAMPLES

When it comes to the melt-thru symbol the root should be reinforced with weld metal on the back of the welded joint.

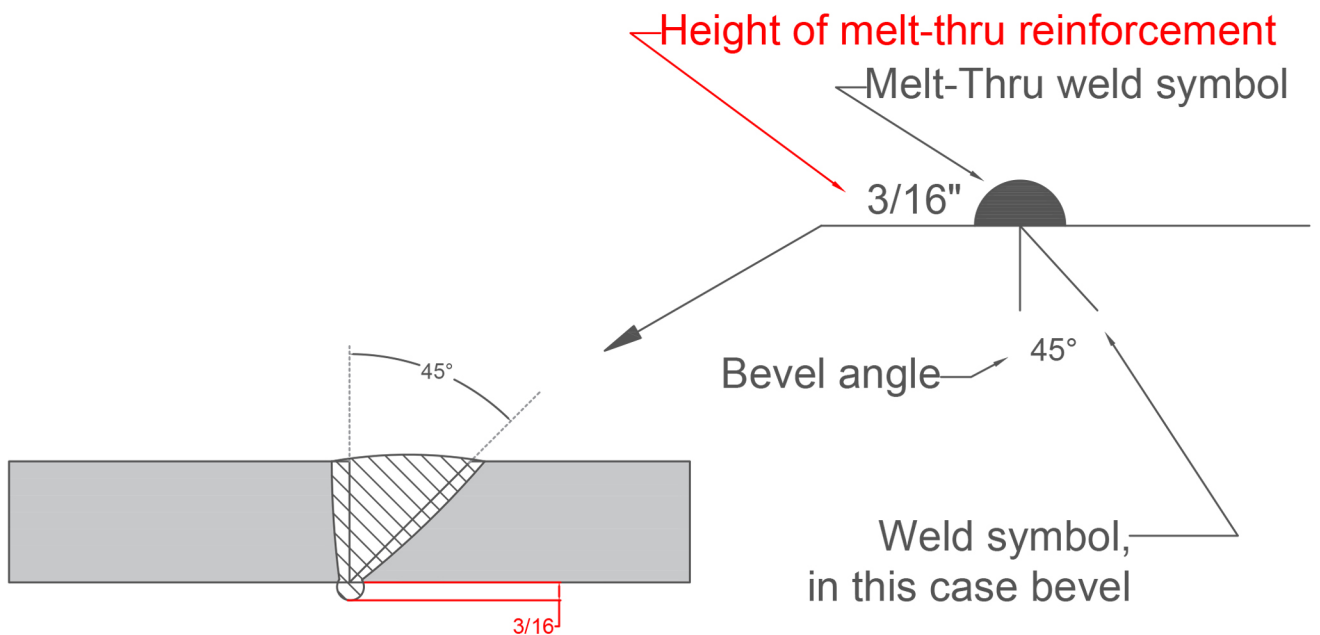
If the height of the reinforcement is indicated then you should make sure that it is achieved.

If indicated it will be on the left side of the melt-thru symbol which is located across the reference line from the main weld symbol. See the example below.

V GROOVE WITH MELT-THRU SYMBOL EXAMPLE



BEVEL GROOVE WITH MELT-THRU SYMBOL EXAMPLE

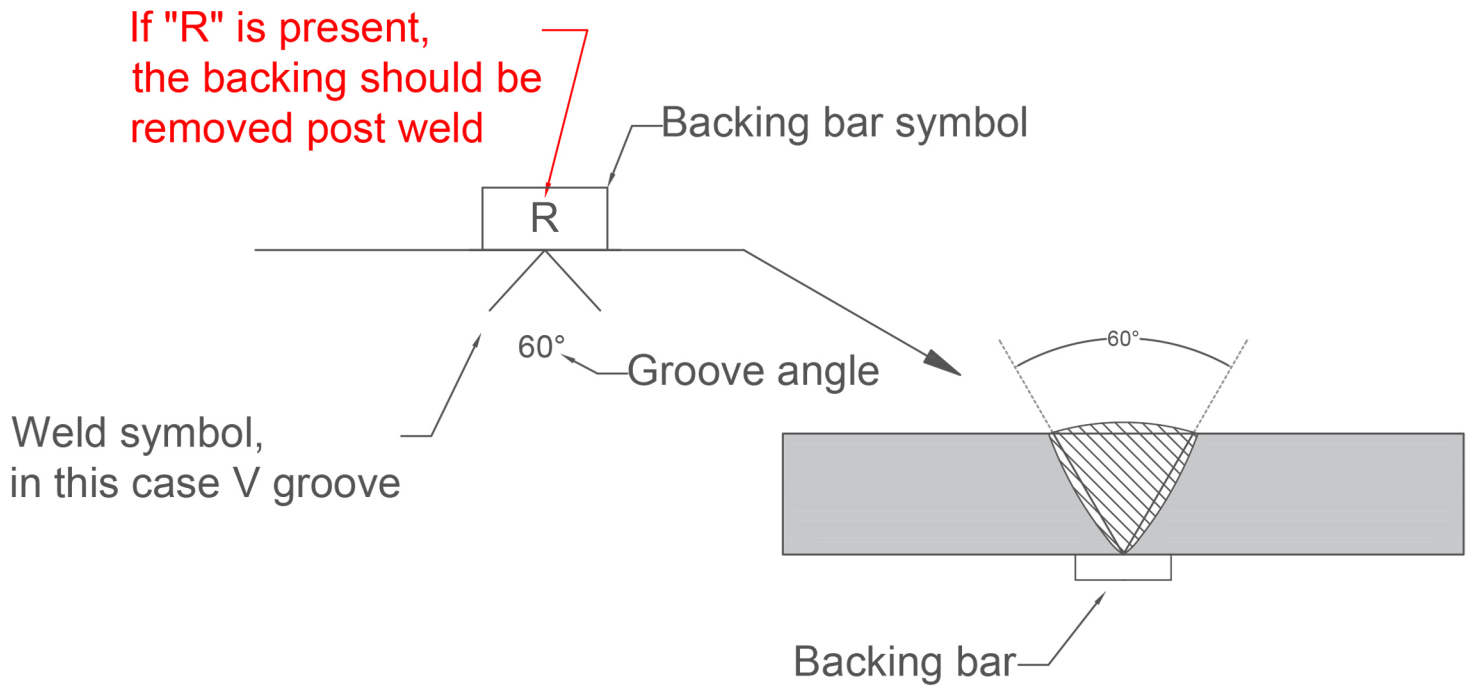


BACKING BAR WELD EXAMPLES

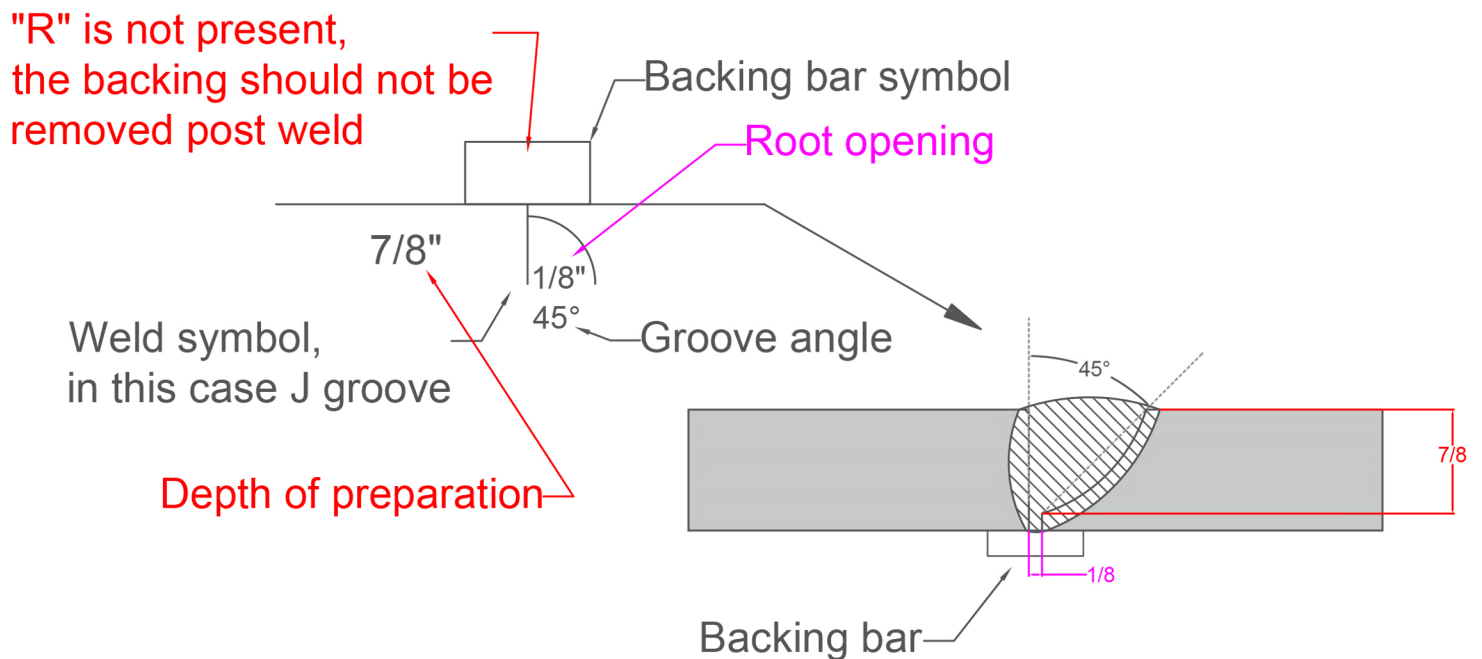
When this symbol is used to make the complete joint penetration it is located across the reference line from the basic symbol just like the melt-thru symbol.

If the letter "R" is placed inside the backing bar symbol then the bar needs to be removed post welding. If there is no letter then the bar should remain in place.

V GROOVE WITH BACKING BAR SYMBOL EXAMPLE



J GROOVE WITH BACKING BAR SYMBOL EXAMPLE



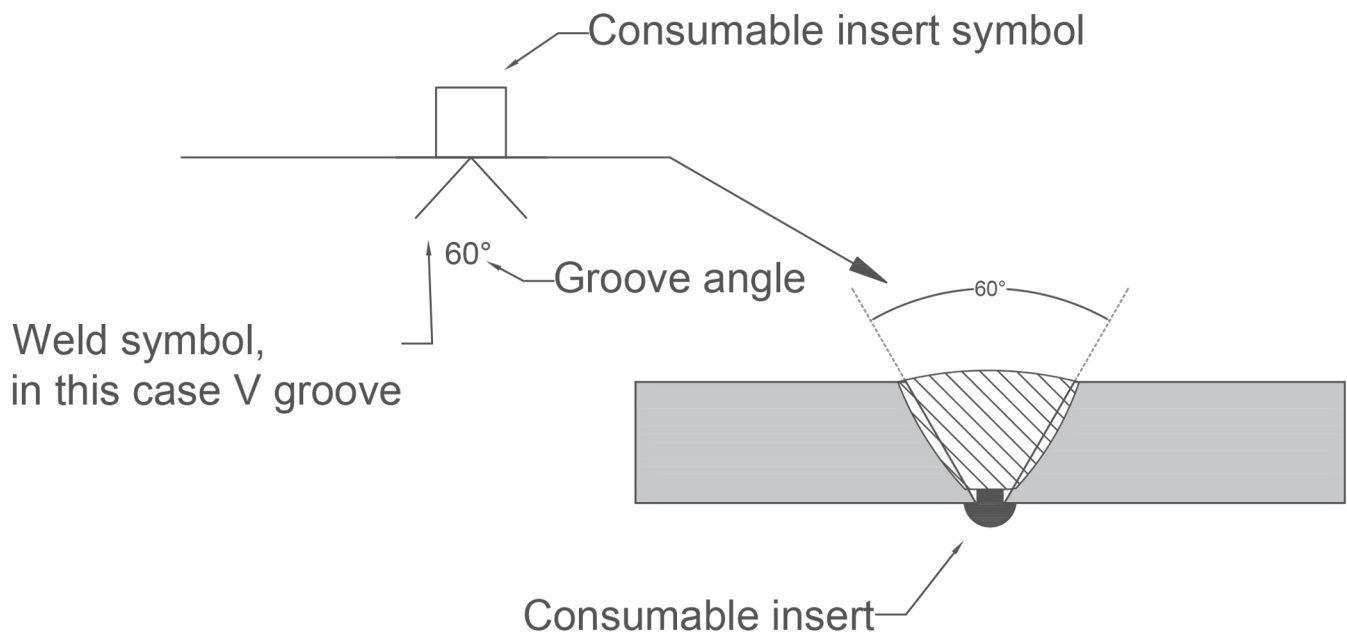
CONSUMABLE INSERT WELD EXAMPLE

If an insert is used within a welded joint that needs to become a part of the weld it is designated using the consumable insert welding symbol.

This symbol should have a specified shape, size and material.

Similar to the two before, this symbol is also placed on the opposite side of the groove weld symbol.

V GROOVE WITH CONSUMABLE INSERT SYMBOL EXAMPLE



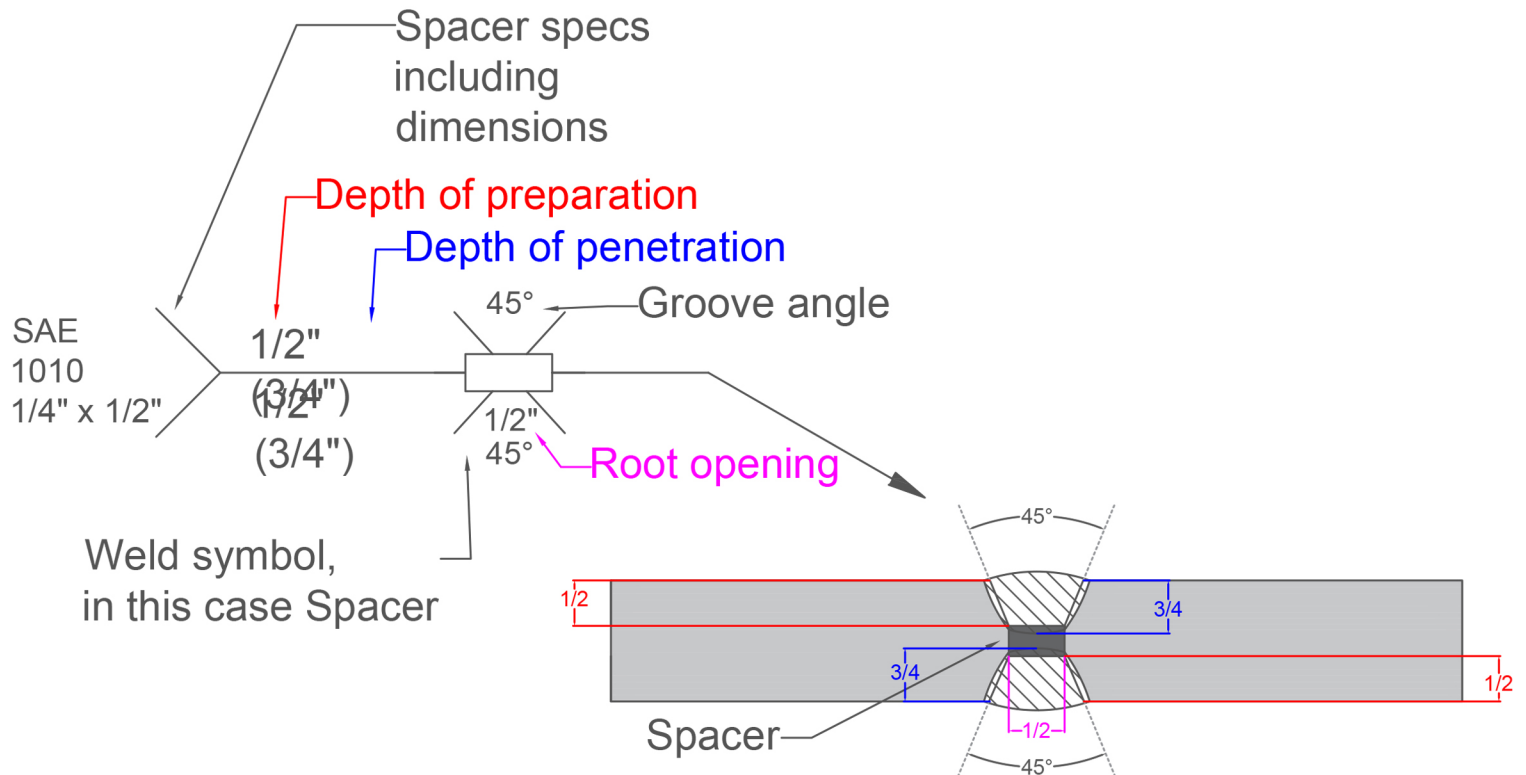
SPACER WELD EXAMPLE

Spacers can be used with double groove welds. In the case of these welds the bottom and the top are prepared according to their specified angle and depth of preparation and the spacer is added to the middle of the groove.

This symbol breaks the reference line as a rectangle that sits between the double groove welds.

If the depth of penetration is deeper than the depth of preparation, the weld should penetrate into the spacer as shown on the example below. The spacer specification should be provided in the tail. Root opening presents the width of the spacer itself.

V GROOVE WITH SPACER SYMBOL EXAMPLE

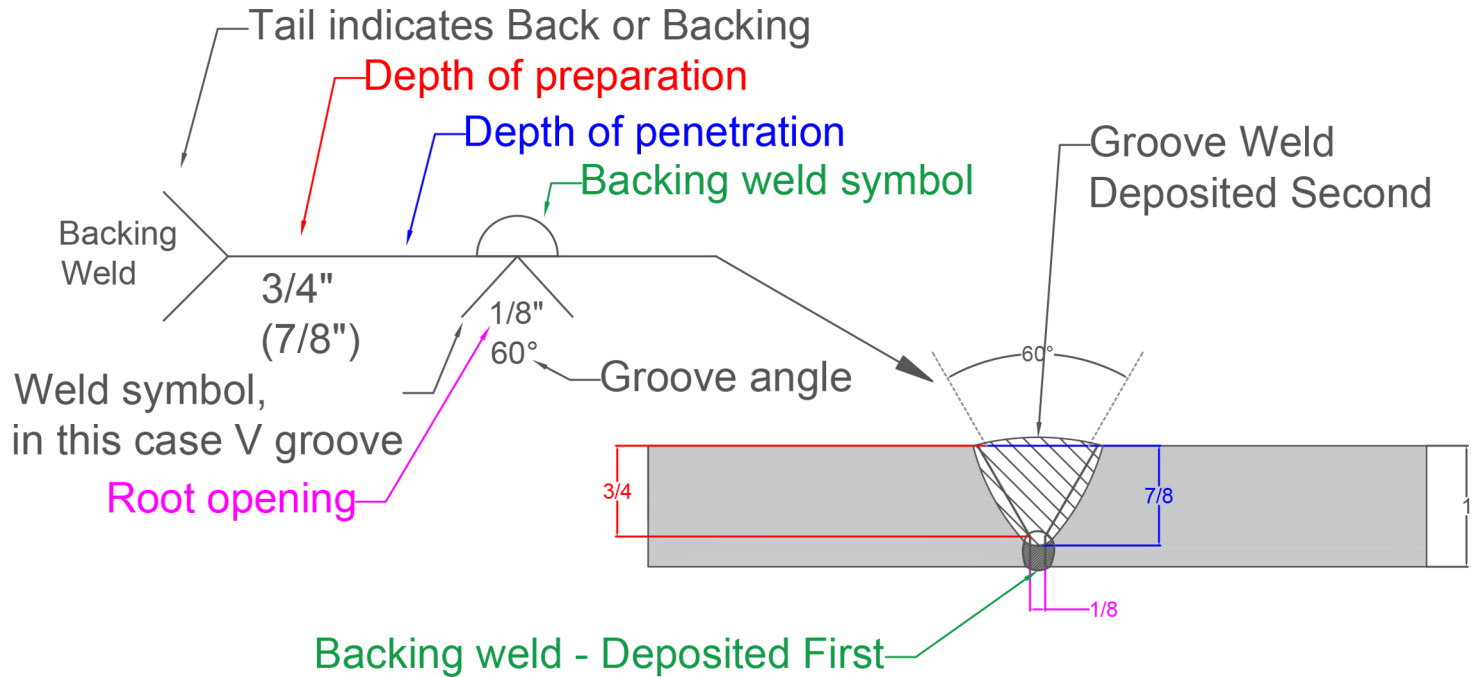


BACK / BACKING WELD EXAMPLES

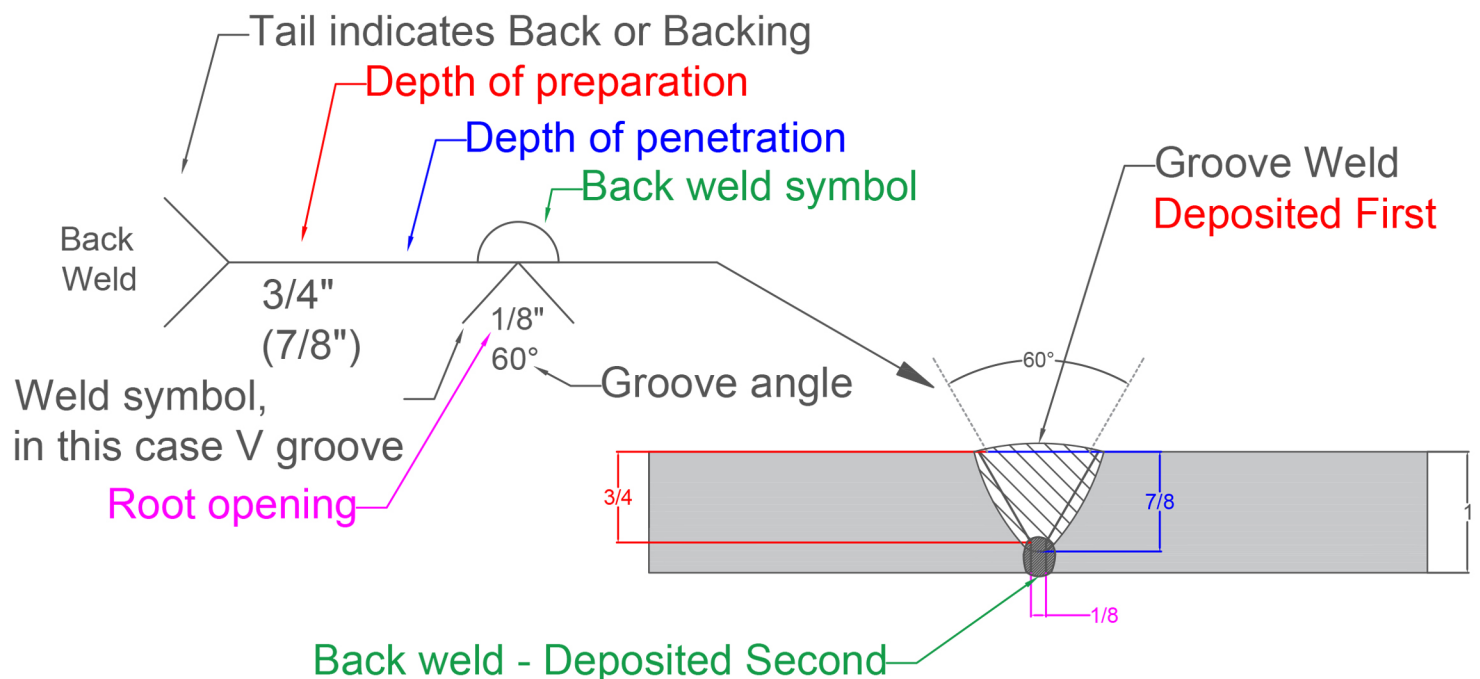
These two similar welds use the same symbol but are different. The backing weld is deposited before the main weld in the groove. Something like a pre-weld.

The back weld on another hand goes after the actual weld. You flip the welded piece and give it a back weld in the groove.

V GROOVE WITH BACKING SYMBOL EXAMPLE



V GROOVE WITH BACK SYMBOL EXAMPLE

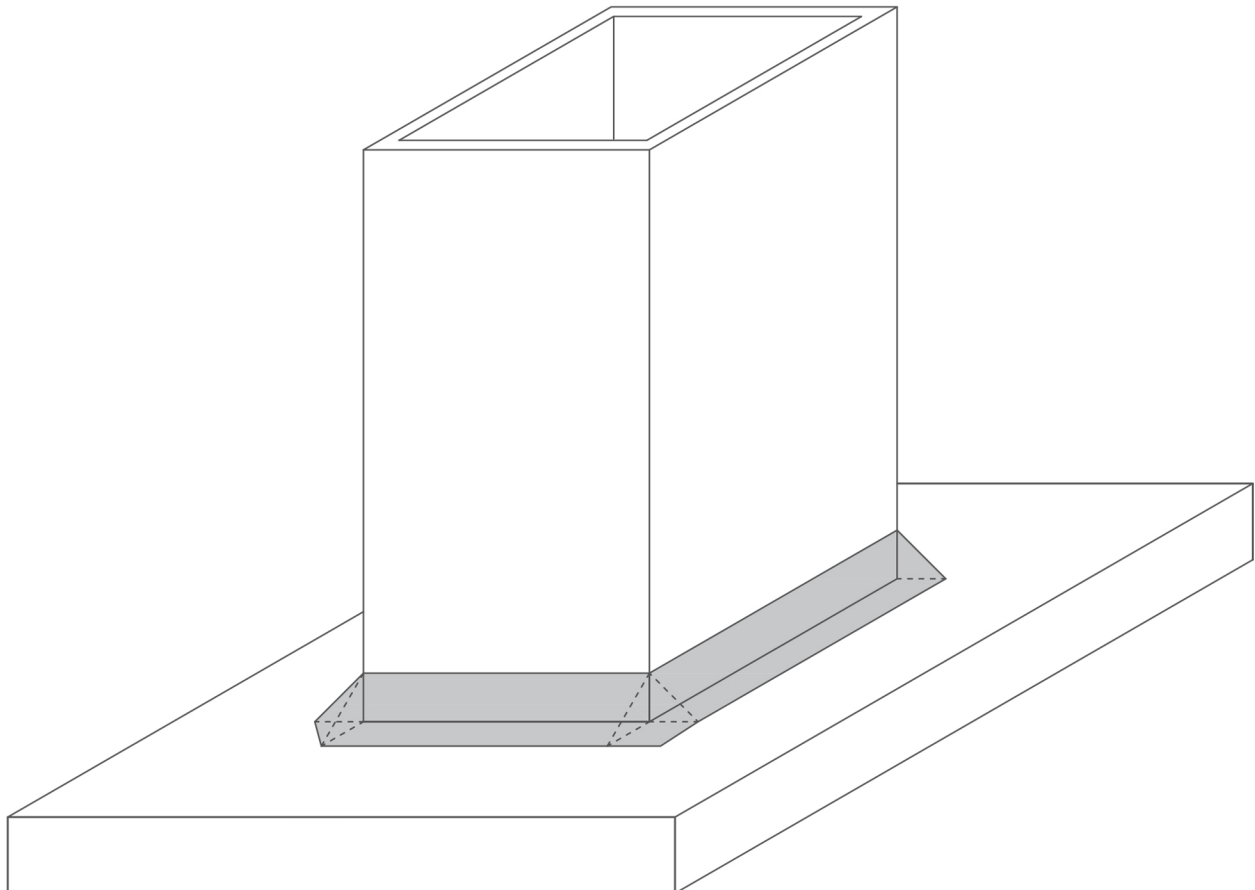
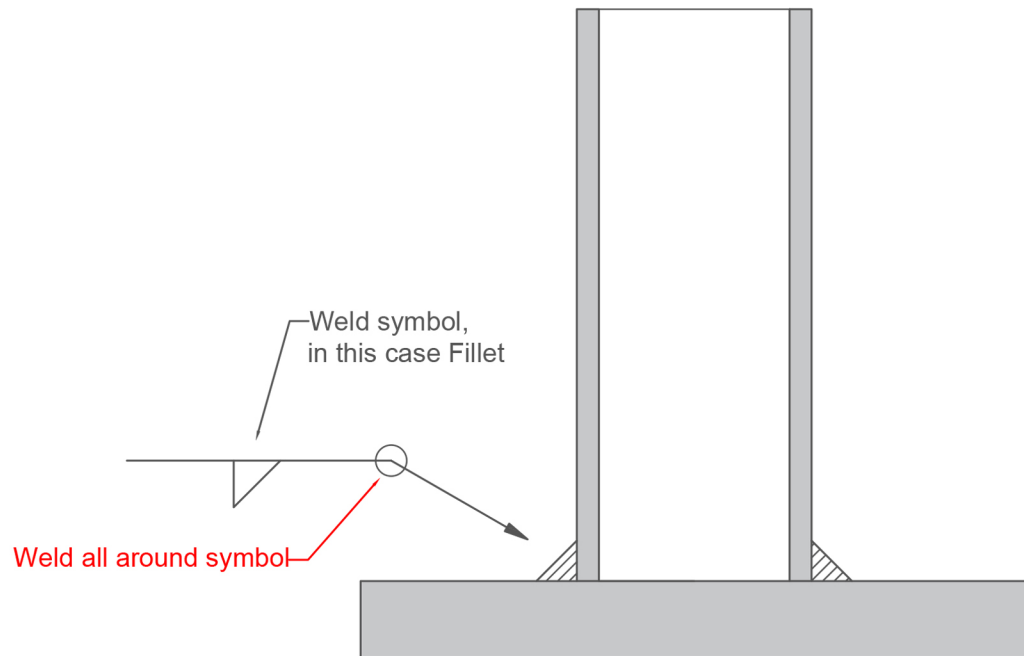


WELD ALL AROUND WELD EXAMPLE

The weld-all-round circle designates that the fillet weld needs to be placed all around the entire joint.

Just like the name suggests! The symbol is simple. A circle that is placed where the arrow lin and the reference line intersect.

WELD ALL AROUND SYMBOL ON A FILLET WELD EXAMPLE



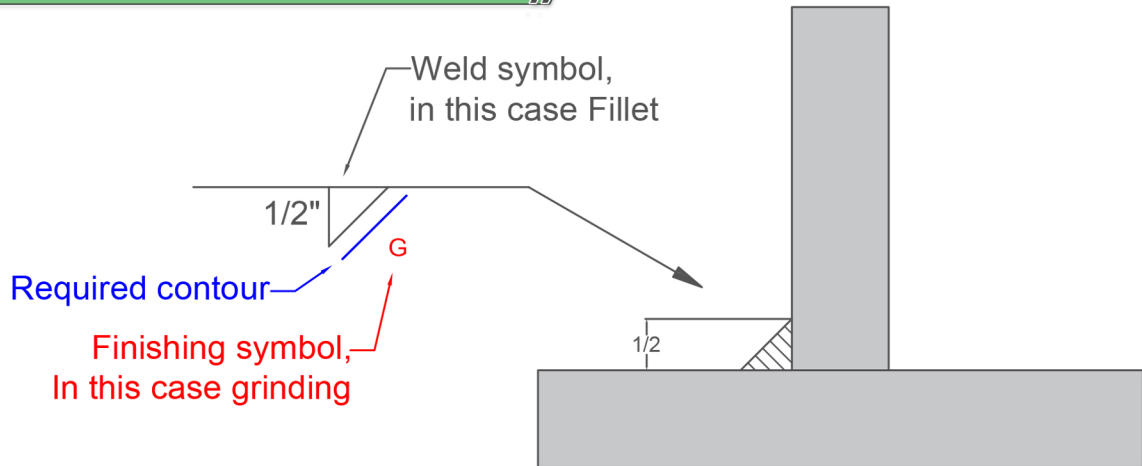
CONTOUR AND FINISHING EXAMPLES

Weld contour indicates how the surface of the weld should look like in the end. It states if it should be flush, concave or convex surface.

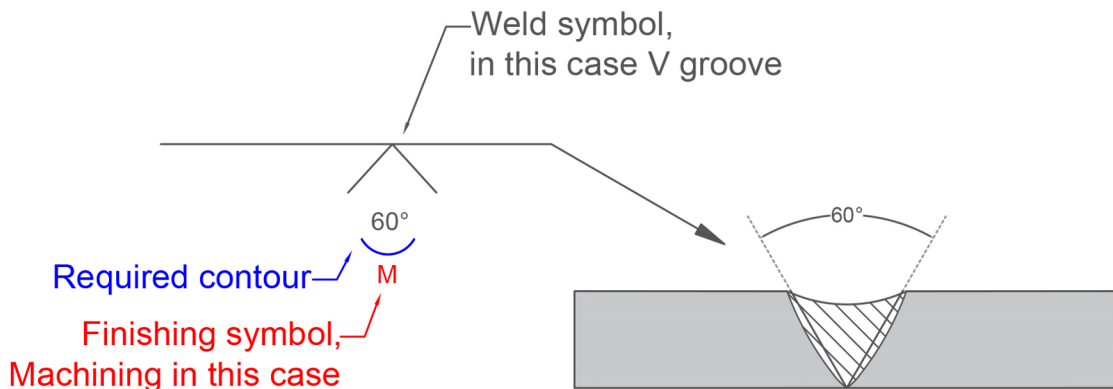
This is indicated by a line that is either straight, convex or concave along the symbol that represents the type of weld or at the weld groove angle on the symbol.

The finishing symbols explain how to achieve the desired weld contour. They indicate a specific process that is to be used. This is indicated on the weld symbol with a letter and each letter represents a process.

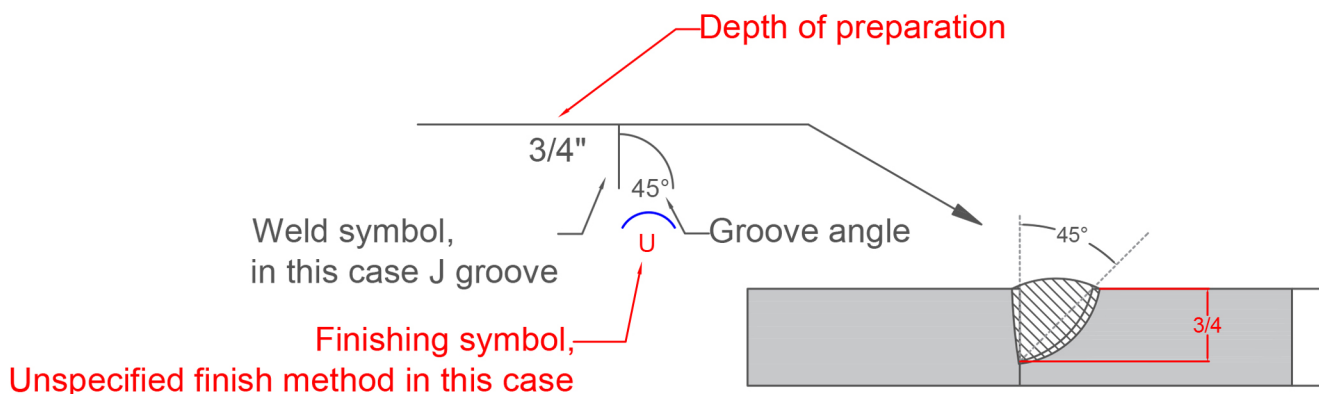
FILLET - FLUSH CONTOUR GRINDING FINISH



V GROOVE - CONCAVE CONTOUR MACHINING FINISH



J GROOVE - CONVEX CONTOUR UNSPECIFIED FINISH

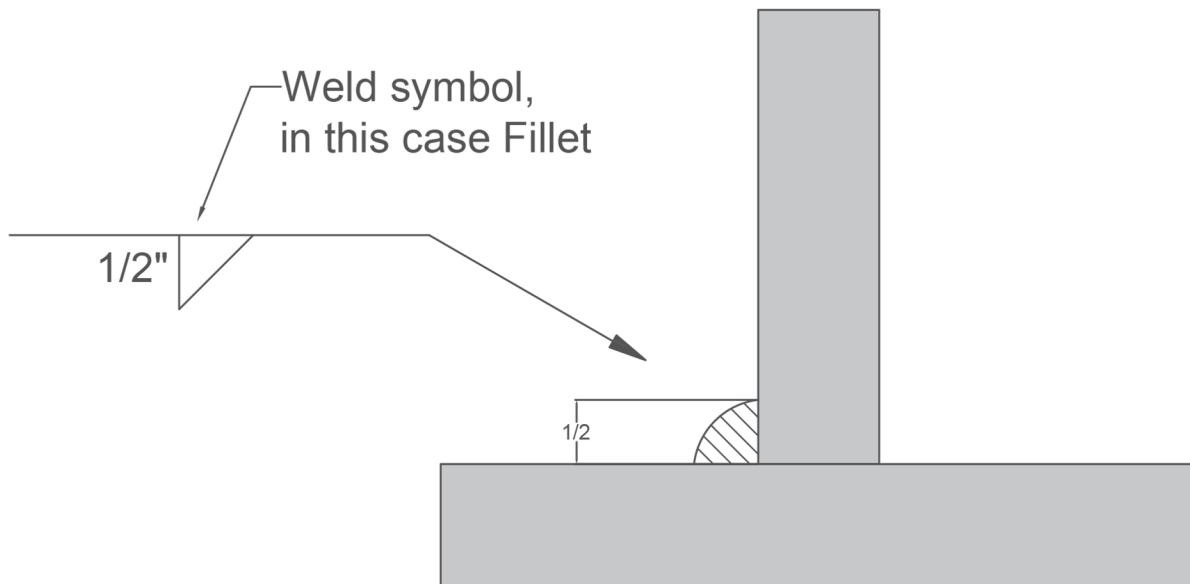


FIELD / SHOP MADE WELD EXAMPLES

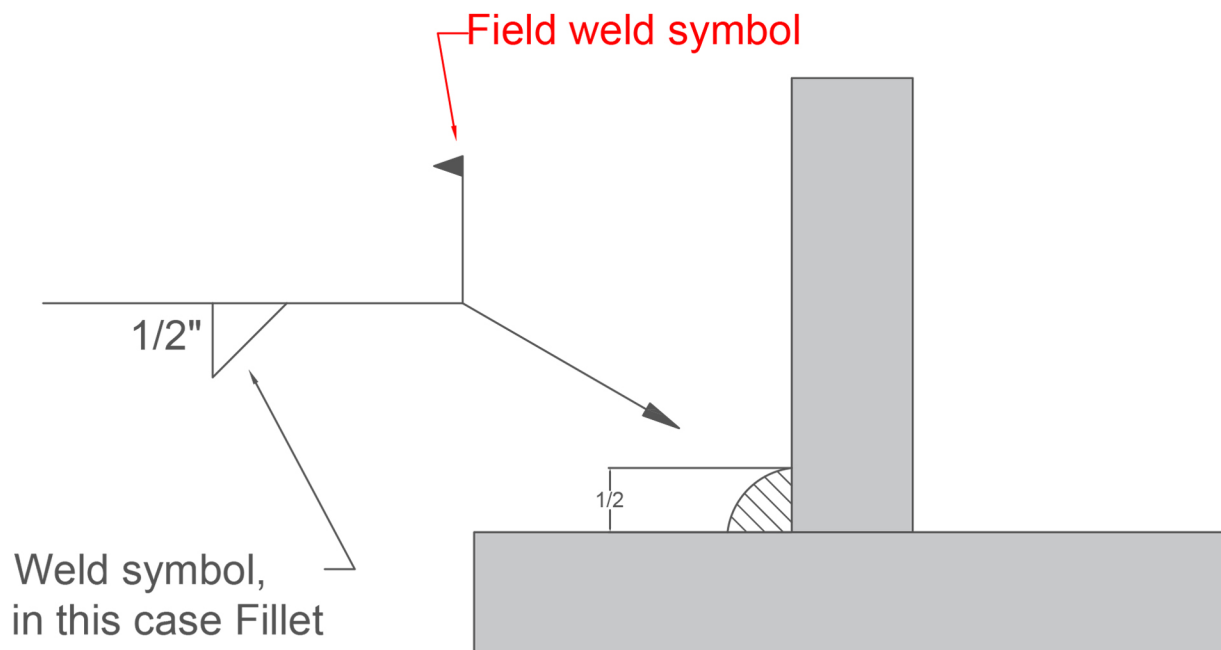
If you see a flag pole on the welding symbol then you should know that the weld is to be made on site instead of the weld shop.

This basically means "field weld – make it on the site". If the weld symbol doesn't have the flag pole then it should be made in the shop instead.

NO FLAG - MADE IN SHOP



FLAG - MADE ON SITE / FIELD WELD



RECOMMENDED FURTHER READING

This was an overview of the most common welding symbols with their applied examples. Keep in mind that there are other weld symbols and they can have additional variable elements not shown here. The welds presented in here are some of the most commonly used and are going to suffice the needs of most novice welders and even experienced welders who need a handy chart on hand while they work.

Below are some other recommended books and articles for welders.

WELDING SYMBOLS

STANDARD WELDING TERMS AND DEFINITIONS; INCLUDING TERMS FOR ADHESIVE BONDING, BRAZING, SOLDERING, THERMAL CUTTING, AND THERMAL SPRAYING:

<https://pubs.aws.org/p/1967/a30ma302020-standard-welding-terms-and-definitions-including-terms-for-adhesive-bonding-brazing-soldering-thermal-cutting-and-thermal-spraying>

STANDARD SYMBOLS FOR WELDING, BRAZING, AND NONDESTRUCTIVE EXAMINATION:

<https://pubs.aws.org/p/1040/a242012-standard-symbols-for-welding-brazing-and-nondestructive-examination>

USEFUL ARTICLES FROM WELDINGPROS.NET

HOW TO MIG WELD, WELDING TECHNIQUES FOR BEGINNERS:

<https://weldingpros.net/how-to-mig-weld/>

HOW TO STICK WELD, BASICS FOR BEGINNERS:

<https://weldingpros.net/how-to-stick-weld/>

HOW TO TIG WELD, SETUP AND TIPS FOR BEGINNERS:

<https://weldingpros.net/how-to-tig-weld/>

DIFFERENT TYPES OF WELDING GASES AND THEIR USE:

<https://weldingpros.net/types-of-welding-gases/>

WELDING FUMES DANGERS:

<https://weldingpros.net/welding-fumes-symptoms/>

QUALITY WELDING HELMETS - VARIOUS PRICE RANGES (ALWAYS UPDATED):

<https://weldingpros.net/best-welding-helmet/>

BEST WELDERS YOU CAN GET TODAY (ALWAYS UPDATED):

<https://weldingpros.net/best-mig-welder-reviews/> - MIG WELDERS

<https://weldingpros.net/best-tig-welder-reviews/> - TIG WELDERS

<https://weldingpros.net/best-stick-welder-reviews/> - STICK WELDERS



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