

Standard Symbols for Welding, Brazing, and Nondestructive Examination



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An American National Standard

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American National Standards Institute
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Standard Symbols for Welding, Brazing, and Nondestructive Examination

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Prepared by the
American Welding Society (AWS) A2 Committee on Definitions and Symbols

Under the Direction of the
AWS Technical Activities Committee

Approved by the
AWS Board of Directors

Abstract

This standard establishes a method for specifying certain welding, brazing, and nondestructive examination information by means of symbols, including the examination method, frequency, and extent. Detailed information and examples are provided for the construction and interpretation of these symbols.



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Foreword

This foreword is not part of this standard but is included for informational purposes only.

Joining processes and examination methods cannot take their proper place as fabricating tools unless means are provided for conveying information from the designer to joining and inspection personnel. The symbols in this publication are intended to be used to facilitate communication from the designer to fabrication and inspection personnel. Statements such as “to be welded throughout” or “to be completely welded,” on a drawing have the effect of transferring the design responsibility from the designer to production personnel, who cannot be expected to know design requirements. In the interest of safety, using a general statement is dangerous as the welder is not expected to know the requirements of the weld.

This standard does not dictate welding tolerances, dimensions or design requirements. Information presented herein is to show how to convey this information.

The symbols presented in this standard were developed to provide the means for placing welding, brazing, and nondestructive examination information on two-dimensional drawings. In practice, many users will need only a few of the symbols, and, if they desire, can select only the parts of the system that fit their needs. Applicability to three dimensional digital models is being researched and will be covered more extensively in future editions.

The publication AWS A2.4 came into existence in 1976 as a result of combining and superseding two earlier documents, A2.0, *Standard Welding Symbols*, and A2.2, *Nondestructive Testing Symbols*. Both of these early documents had their origins in work done jointly by the American Welding Society and the American Standards Association (ASA) Sectional Committee Y32. AWS A2.0 was first published in 1947 and was revised in 1958 and 1968. AWS A2.2 first appeared in 1958 and was revised in 1969.

The evolution of AWS A2.4, *Standard Symbols for Welding, Brazing, and Nondestructive Testing*, is shown below:

ANSI/AWS A2.4-76	<i>Symbols for Welding and Nondestructive Testing;</i>
ANSI/AWS A2.4-79	<i>Symbols for Welding and Nondestructive Testing, Including Brazing;</i>
ANSI/AWS A2.4-86	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination;</i>
ANSI/AWS A2.4-93	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination;</i>
ANSI/AWS A2.4-98	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination;</i>
AWS A2.4:2007	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination;</i>
AWS A2.4:2012	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination;</i>
AWS A2.4:2020	<i>Standard Symbols for Welding, Brazing, and Nondestructive Examination.</i>

This eighth edition of AWS A2.4 includes the following revised content:

- Detailed usage for flare groove welds.
- Diameter symbol, Ø, is now no longer a part of the plug weld symbol as it was in the previous edition. However, it is still needed when designating the plug dimension on the welding symbol.
- The use of the contour symbol without a designated mechanical postweld finishing method previously meant that the contour of the weld had to be obtained by welding only. This requirement no longer applies and now allows the contour of the weld to be achieved by any method (e.g., welding or mechanical) as seen fit at the work site. The flat contour symbol is now limited to fillet welds, while the flush symbol is used for other welds, such as groove, plug, and slot.

- Combination groove weld symbol designating two different edge shapes. This is a major change in which one groove weld symbol may be drawn backward (e.g., flare bevel and bevel) to demonstrate actual configuration of the weld joint.
- The use of multiple subreference lines to designate a groove weld extending around a joint where there is no clear point where the joint transitions from one joint type to another.
- Spot and seam welds—the ability to designate size or strength by placing a value to the left of the weld symbol has been modified. The dimension to the left of the weld symbol will only designate the size of the weld. If strength is needed, this information will be required to be specified as a note in the tail of the welding symbol.
- Flash and upset welding symbols are no longer supported; therefore, the welding symbol if needed is recommended to be a reference line and arrow with either “FW” or “UW” designated in the tail of the welding symbol.
- Figures now have new number designations to reflect the clause in which they are referenced.
- The clause for the symbol for nondestructive examination has been rewritten and expanded.

Revisions to the 2020 edition are identified by underlines as well as vertical lines in the margin next to the figures.

Comments and suggestions for the improvement of this standard are welcome. They should be sent to the Secretary, AWS A2 Committee on Definitions and Symbols, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166.

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Standard Symbols for Welding, Brazing, and Nondestructive Examination

1. General Requirements

1.1 Scope. This standard presents a system for indicating welding, brazing, and nondestructive examination requirements. The system includes provisions for the graphical representation of welds, brazes, and nondestructive examination methods with conventions for specifying, at a minimum, the location and extent of their application. Optional elements and supplementary symbols provide a means for specifying additional requirements. Requirements not detailed on the symbol used for welding, brazing, or nondestructive examination shall be provided or referenced elsewhere on the drawing.

Both figures and illustrations are used to depict the use of symbols. Figures are referenced by number within this document to show the correct format and application of symbols used to convey welding, brazing, and nondestructive examination information. An illustration is an un-numbered graphical representation of an example application described within the associated text without providing additional technical requirements. Figures and illustrations are not intended to represent recommended welding, brazing, nondestructive examination, or design practices.

The clause addressing brazing uses the same symbols and conventions as for welding, with the addition of the scarf symbol. The clause addressing symbols for nondestructive examination represents nondestructive examination methods as discussed in the latest edition of AWS B1.10M/B1.10, *Guide for the Nondestructive Examination of Welds*.

The limitations included in specifications and codes are also beyond the scope of this standard.

1.2 Units of Measurement. This standard does not require units of measure. Therefore, no equivalents or conversions are contained except when they are cited in examples.

1.3 Safety. Safety and health issues and concerns are beyond the scope of this standard and therefore are not addressed herein.

Safety and health information is available from the following sources:

American Welding Society:

- (1) ANSI Z49.1, *Safety in Welding, Cutting, and Allied Processes*
- (2) AWS Safety and Health Fact Sheets
- (3) Other safety and health information on the AWS website

Material or Equipment Manufacturers:

- (1) Safety Data Sheets supplied by materials manufacturers
- (2) Operating Manuals supplied by equipment manufacturers

Applicable Regulatory Agencies

Work performed in accordance with this standard may involve the use of materials that have been deemed hazardous, and may involve operations or equipment that may cause injury or death. This standard does not purport to address all safety and health risks that may be encountered. The user of this standard should establish an appropriate safety program to address such risks as well as to meet applicable regulatory requirements. ANSI Z49.1 should be considered when developing the safety program.

2. Normative References

The document listed below is referenced within this publication and is mandatory to the extent specified herein. For undated references, the latest edition of the referenced standard shall apply. For dated references, subsequent amendments or revisions of the publication may not apply since the relevant requirements may have changed.

American Welding Society (AWS) document:

AWS A3.0M/A3.0, Standard Welding Terms and Definitions, Including Terms for Adhesive Bonding, Brazing, Soldering, Thermal Cutting, and Thermal Spraying.

3. Terms and Definitions

AWS A3.0M/A3.0, *Standard Welding Terms and Definitions*, provides the basis for terms and definitions used herein. However, the following terms and definitions are included below to accommodate usage specific to this document.

examination method designation. A letter designation incorporated into a symbol for nondestructive examination to specify the examination method. See Table A6.

supplementary symbol. A graphic character incorporated into a symbol for welding, brazing, or nondestructive examination to communicate additional requirements. See Figures 4.2 and 17.2.

weld symbol. A graphic character connected to the reference line of a welding symbol specifying the joint geometry or weld type. See also **welding symbol**.

welding symbol. A graphical representation of the specifications for producing a welded joint. See also **weld symbol**.

4. Basic Welding Symbols

4.1 Distinction Between Weld Symbol and Welding Symbol. As defined in AWS A3.0M/A3.0, there is a distinction between the terms weld symbol and welding symbol. The weld symbol indicates the type of weld and, when used, is a part of the welding symbol.

4.2 Basis of Reference. In the present system, the joint is the basis of reference. The arrow side is the side of the joint to which the arrow of the welding symbol points. The other side is the side of the joint opposite the arrow side.

4.3 Weld Symbols. Weld symbols shall be as shown in Figure 4.1. The symbols shall be drawn in contact with the reference line.

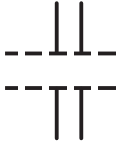
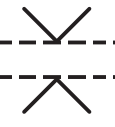
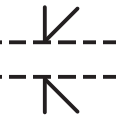
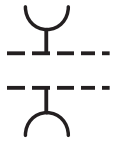
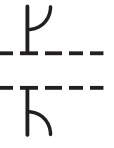
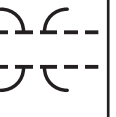
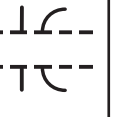
4.4 Supplementary Symbols. Supplementary symbols to be used in connection with welding symbols shall be as shown in Figure 4.2.

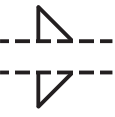
4.5 Welding Symbols. A welding symbol may consist of several elements (see Figure 4.3). Only a horizontal reference line and the arrow are required elements (see D4.5 in Annex D for commentary on use of just a reference line and arrow). Additional elements may be included to convey specific welding information. Alternatively, welding information may be conveyed by other means such as by drawing notes or details, specifications, standards, codes, or other drawings that eliminate the need to include the corresponding elements in the welding symbol.

The tail of the symbol is used for designating additional information such as a specification, process, strength for certain welds, identification of the filler metal or electrode, peening, backgouging, or other operations or references necessary for making the weld or braze.

All elements, when used, shall have specific locations within the welding symbol as shown in Figure 4.3. Mandatory requirements regarding each element in a welding symbol refer to the location of the element and should not be interpreted as a necessity to include the element in every welding symbol.

4.6 Welding Symbol Placement. The arrow of the welding symbol shall point to a line, location, or area that conclusively identifies the joint, location, or area to be welded.

GROOVE							
SQUARE	V	BEVEL	U	J	FLARE-V	FLARE-BEVEL	SCARF ^a
							

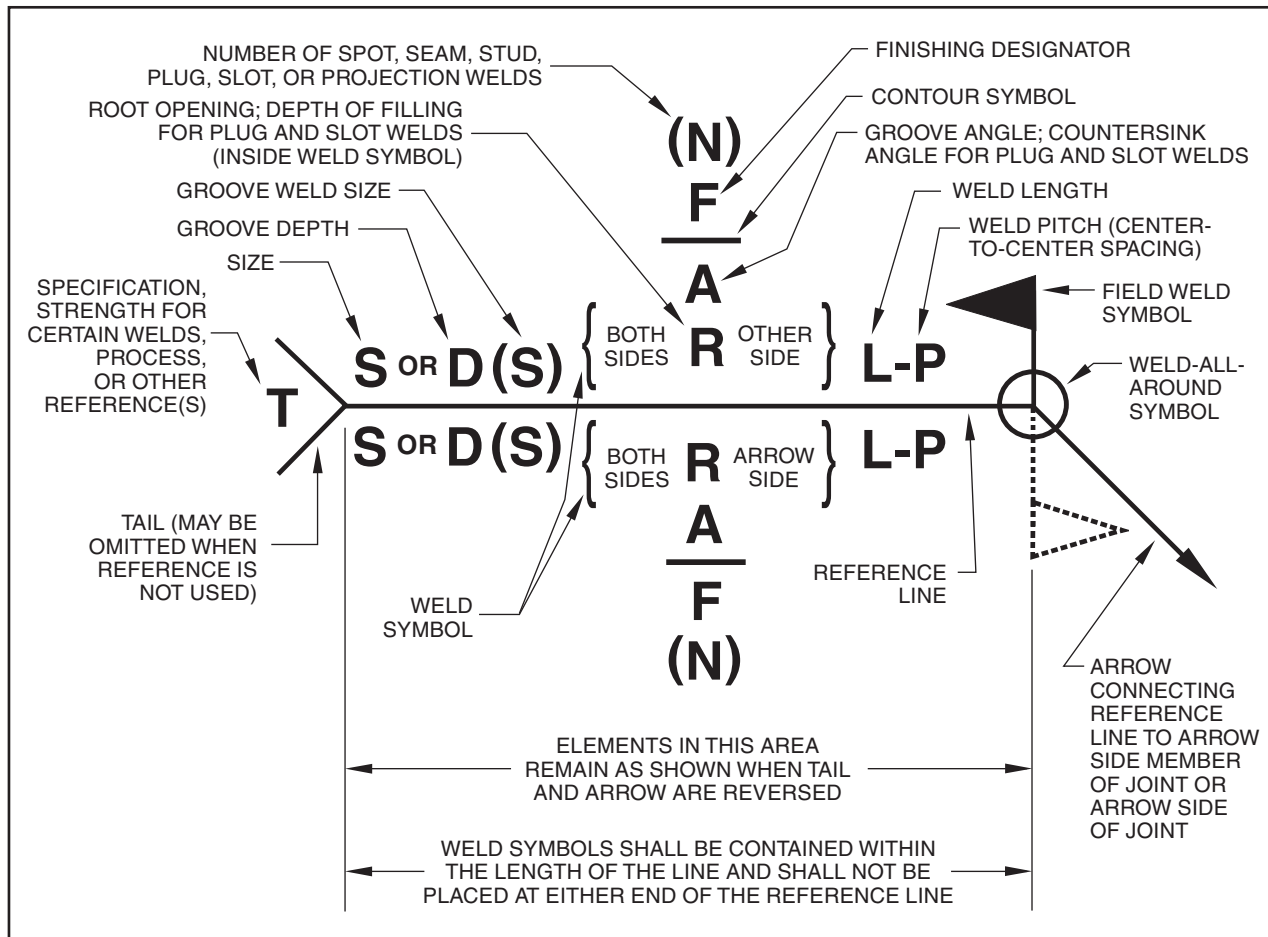
FILLET	PLUG OR SLOT	STUD	SPOT OR PROJECTION	SEAM	BACK OR BACKING	SURFACING	EDGE
							

^aUsed for brazed joints only (see Clause 16).

Figure 4.1—Weld Symbols

WELD-ALL-AROUND	FIELD WELD	MELT-THROUGH	CONSUMABLE INSERT (SQUARE)	BACKING (RECTANGLE)	SPACER (RECTANGLE)	CONTOUR		
						FLUSH OR FLAT	CONVEX	CONCAVE
								

Figure 4.2—Supplementary Symbols



Note: See D4.5 in Annex D for commentary on Figure 4.3.

Figure 4.3—Standard Location of the Elements of a Welding Symbol

5. Joint Types

The basic welding joint types—butt, corner, T-, lap, and parallel—are shown in Figure 5.1. Joint type designators are shown in Annex A, Table A1.

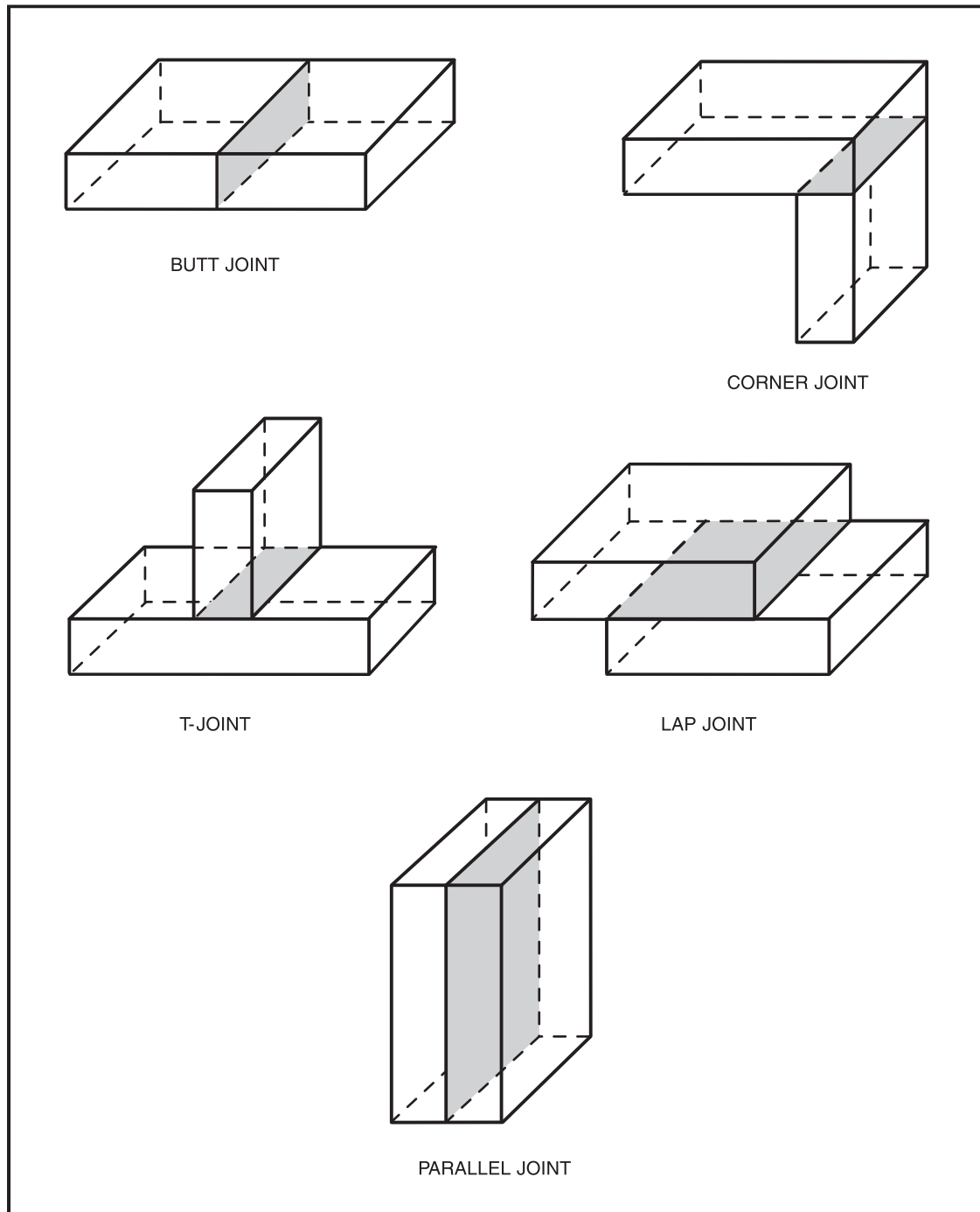
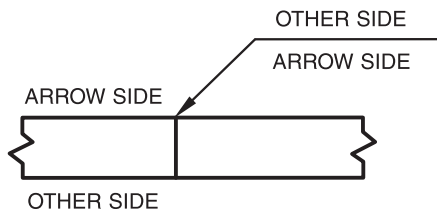


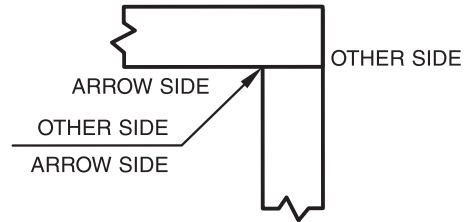
Figure 5.1—Joint Types

6. General Provisions for Welding Symbols

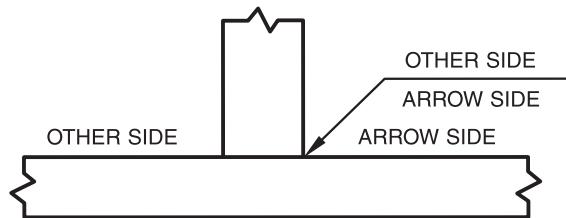
6.1 Arrow Location Significance. Information applicable to the arrow side of a joint shall be placed below the reference line. Information applicable to the other side of a joint shall be placed above the reference line.



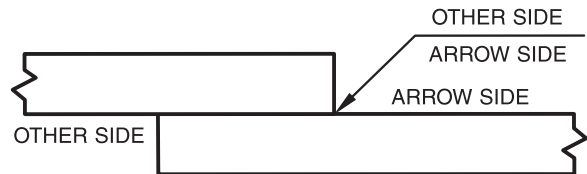
(A) BUTT JOINT



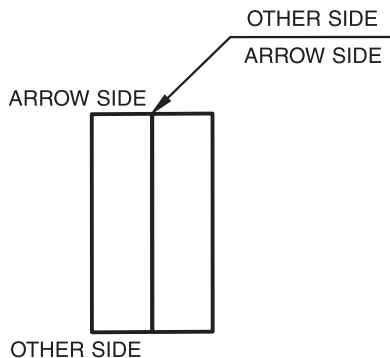
(B) CORNER JOINT



(C) T-JOINT



(D) LAP JOINT



(E) PARALLEL JOINT

6.1.1 Fillet, Groove, and Edge Weld Symbols. For these symbols, the arrow shall contact the outer surface of one of the joints, and this side shall be considered the arrow side of the joint. The side opposite the arrow side of the joint shall be considered the other side of the joint (see Figure 6.1).

6.1.2 Plug, Slot, Spot, Projection, and Seam Weld Symbols. For these symbols, the arrow shall contact the outer surface of one of the joint members at the center-line of the desired weld. The member toward which the arrow points shall be considered the arrow-side member. The other joint member shall be considered the other-side member (see the figures cited in Clauses 9 through 12).

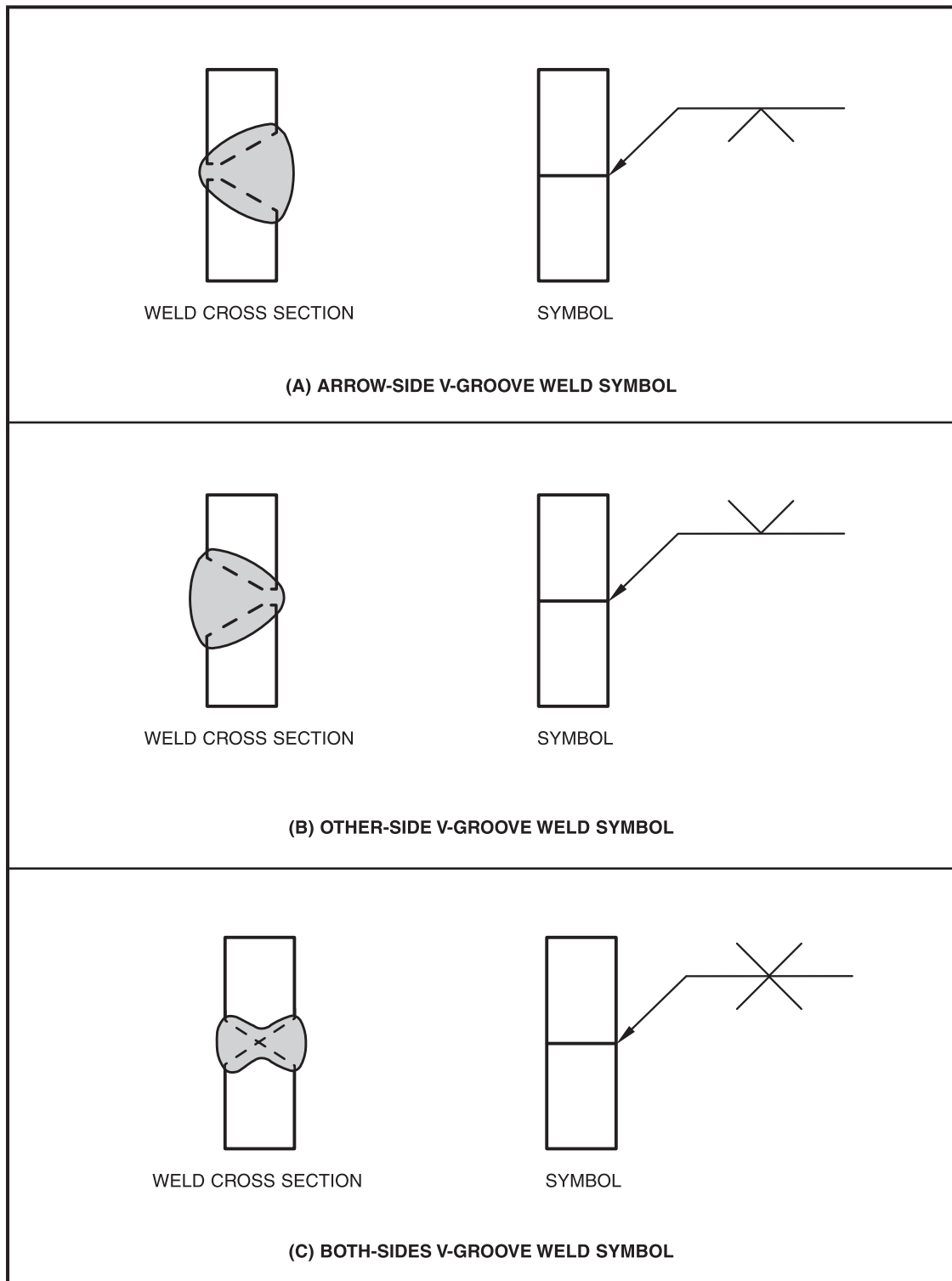
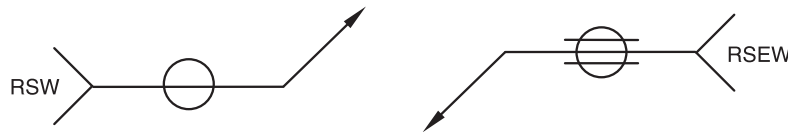


Figure 6.1—Application of Weld Symbols to Indicate the Arrow Side, the Other Side, and Both Sides

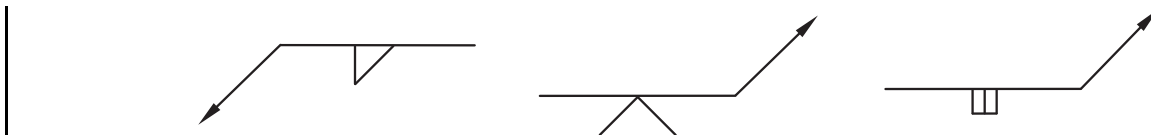
6.1.3 Symbols with No Side Significance. Some weld symbols have no arrow-side or other-side significance, although supplementary symbols used in conjunction with them may have such significance (see [11.1.1.3](#) and [12.1.1.3](#)).



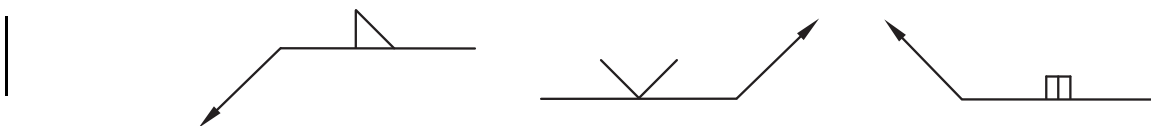
6.1.4 Arrow-Side Only Symbols. Stud and surfacing welds are applied on a surface rather than at a joint and shall be shown only as arrow-side welds.

6.2 Weld Location with Respect to the Joint

6.2.1 Arrow Side. Welds on the arrow side of the joint shall be specified by placing the weld symbol below the reference line (see 6.1.1).

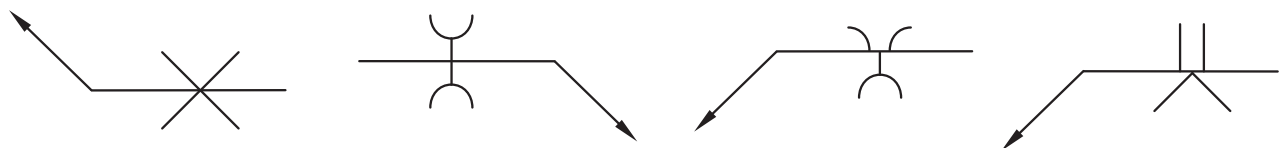


6.2.2 Other Side. Welds on the other side of the joint shall be specified by placing the weld symbol above the reference line (see 6.1.1).

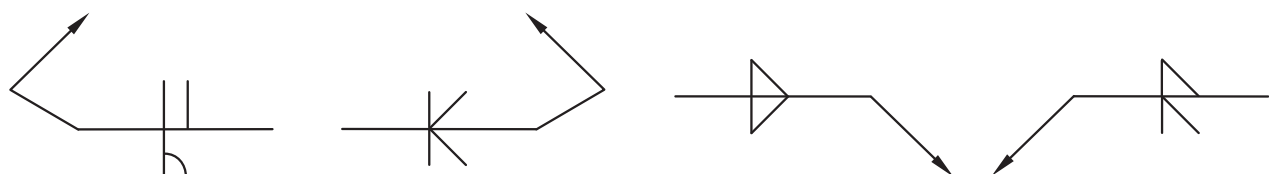


6.2.3 Both Sides. Welds on both sides of the joint shall be specified by placing weld symbols both below and above the reference line.

6.2.3.1 Symmetrical Weld Symbols. If the weld symbols used on both sides of the reference line have axes of symmetry perpendicular to the reference line, these axes of the symbols shall be directly aligned across the reference line. Staggered intermittent welds are an exception.



6.2.3.2 Nonsymmetrical Weld Symbols. If either of the weld symbols used lacks an axis of symmetry perpendicular to the reference line, the leftmost points of contact with the reference line shall be aligned. Staggered intermittent welds are an exception.

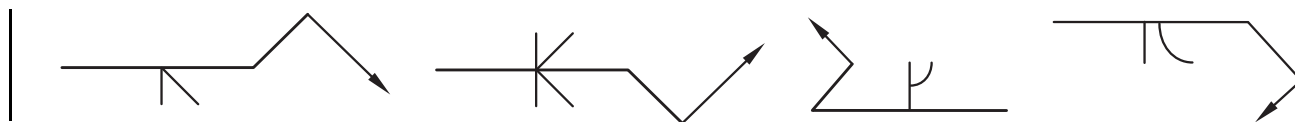


6.3 Specific Weld Symbol Orientation. Fillet, bevel-groove, J-groove, and flare-bevel-groove weld symbols shall be drawn with the perpendicular leg always to the left.



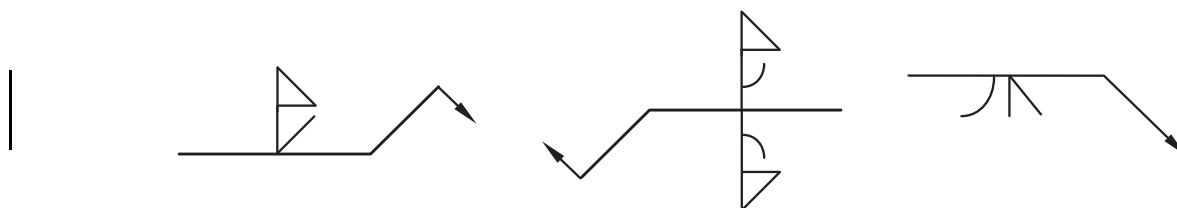
6.4 Break in the Arrow

6.4.1 Groove Welds. When only one joint member is to be prepared (e.g., bevel-groove, J-groove, flare-bevel), the arrow shall have one break and point toward that member (see Figure 6.2). The arrow need not be broken if it is apparent which member is to be prepared (see Figure 6.3). It shall not be broken if there is no preference as to which member is to be prepared. A broken arrow need not be used for joints where combined welds are to be specified and it is apparent which member is to be prepared.

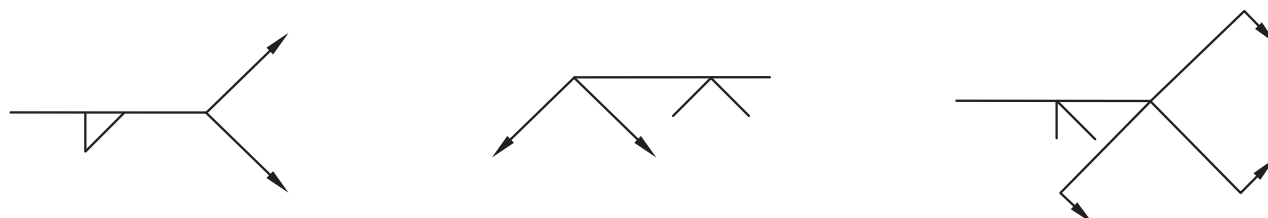


6.4.2 Fillet Welds. The arrow may or may not be broken to indicate fillet weld locations [see Figure 6.4(A)].

6.5 Combination Weld Symbols. For joints requiring more than one weld type, a symbol shall be used to specify each weld (see 7.14 and Figure 6.3).



6.6 Multiple Arrows. Two or more arrows may be used with a single reference line to point to locations where identical welds are specified [see Figures 6.4(A) and 6.5].



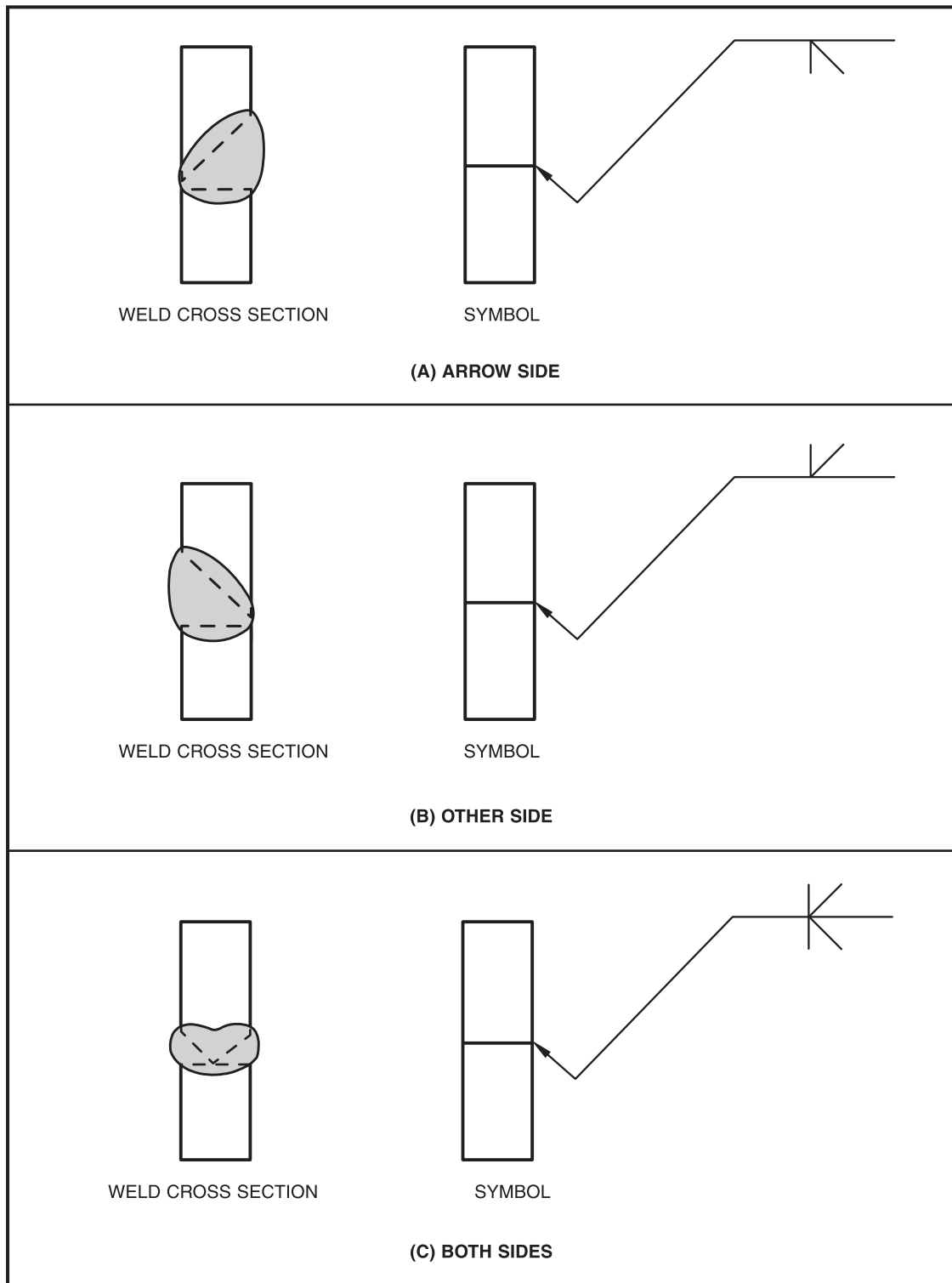


Figure 6.2—Application of the Break in the Arrow of the Welding Symbol

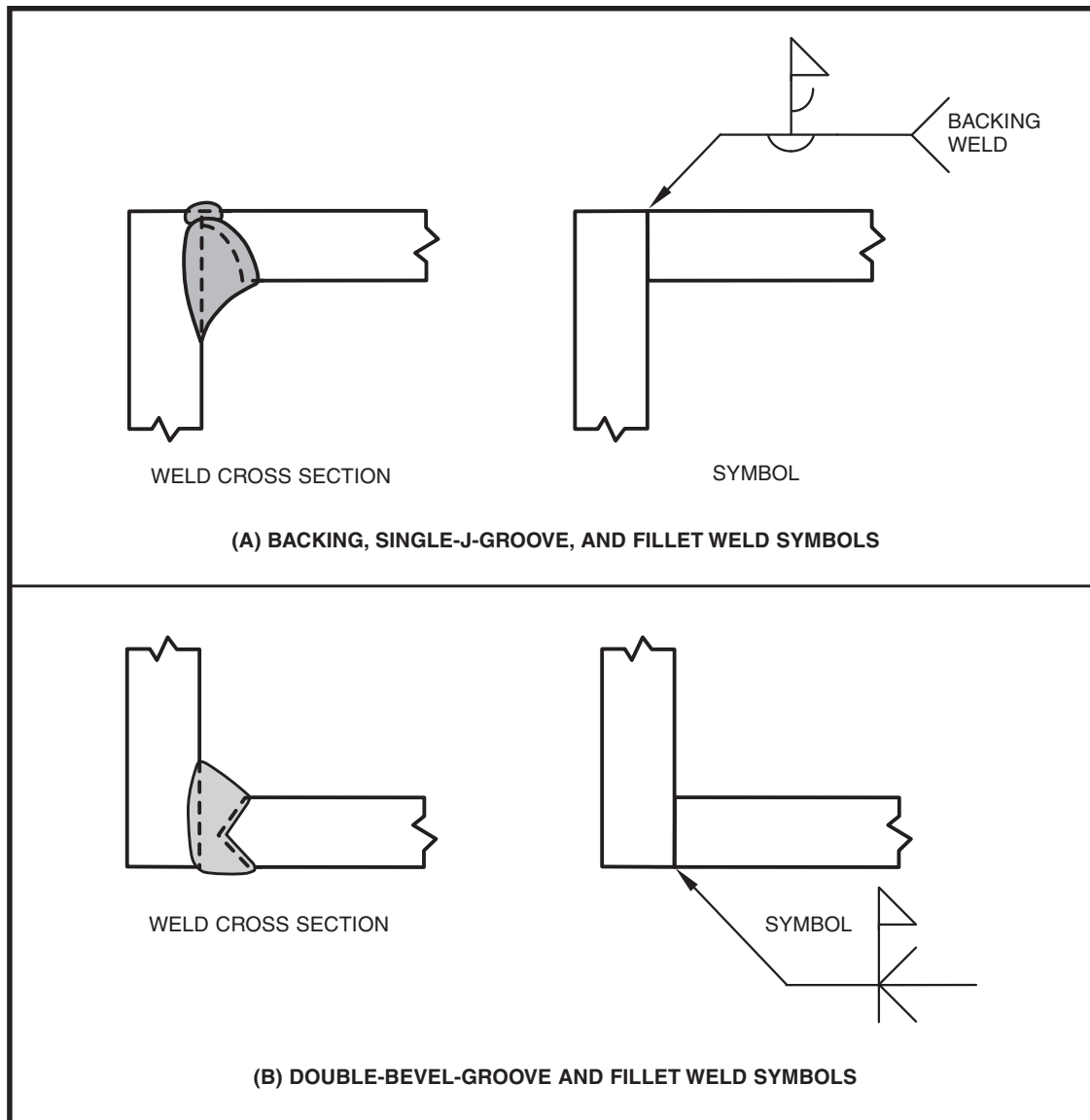


Figure 6.3—Application of Combination Weld Symbols

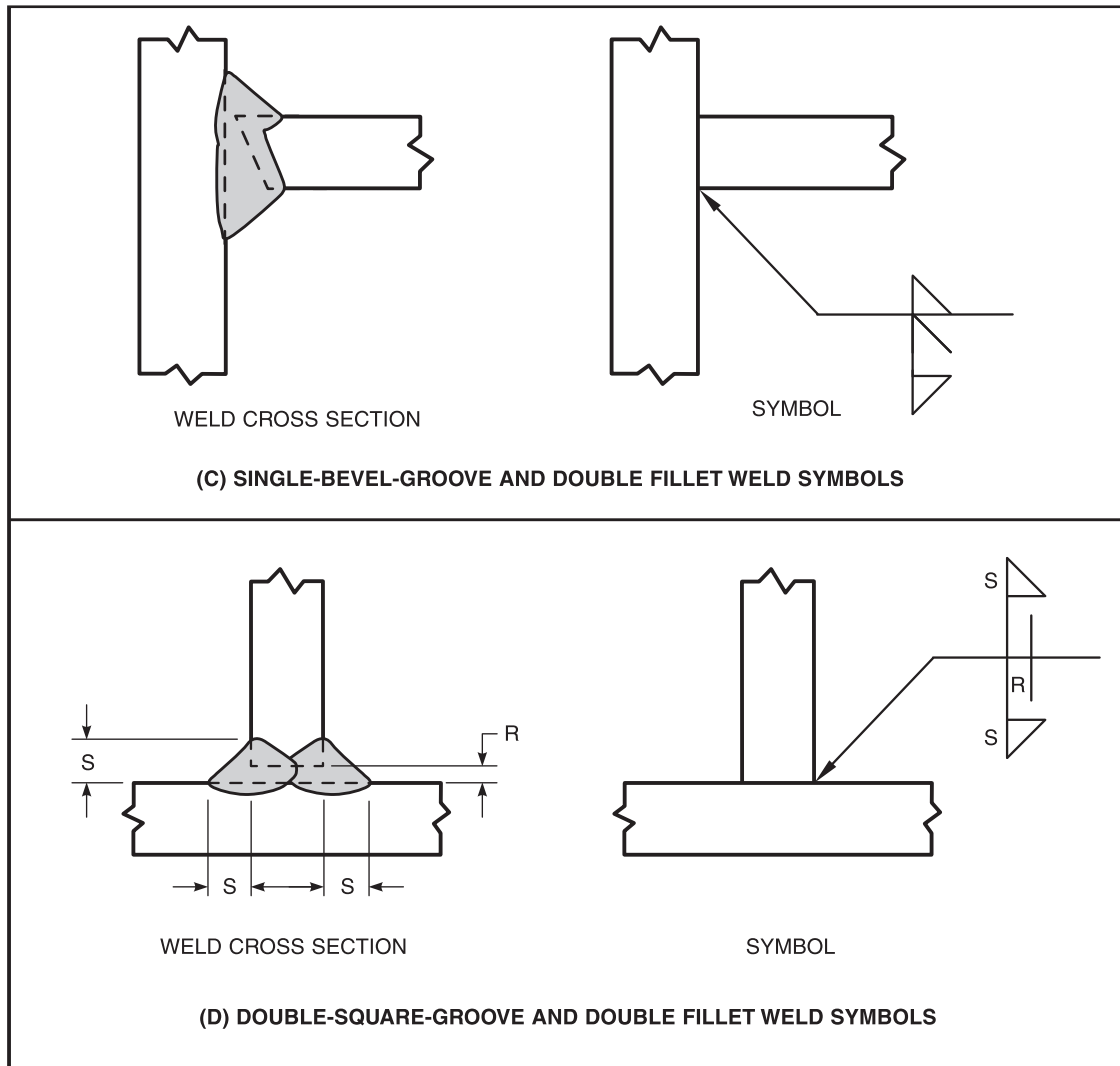


Figure 6.3 (Continued)—Application of Combination Weld Symbols

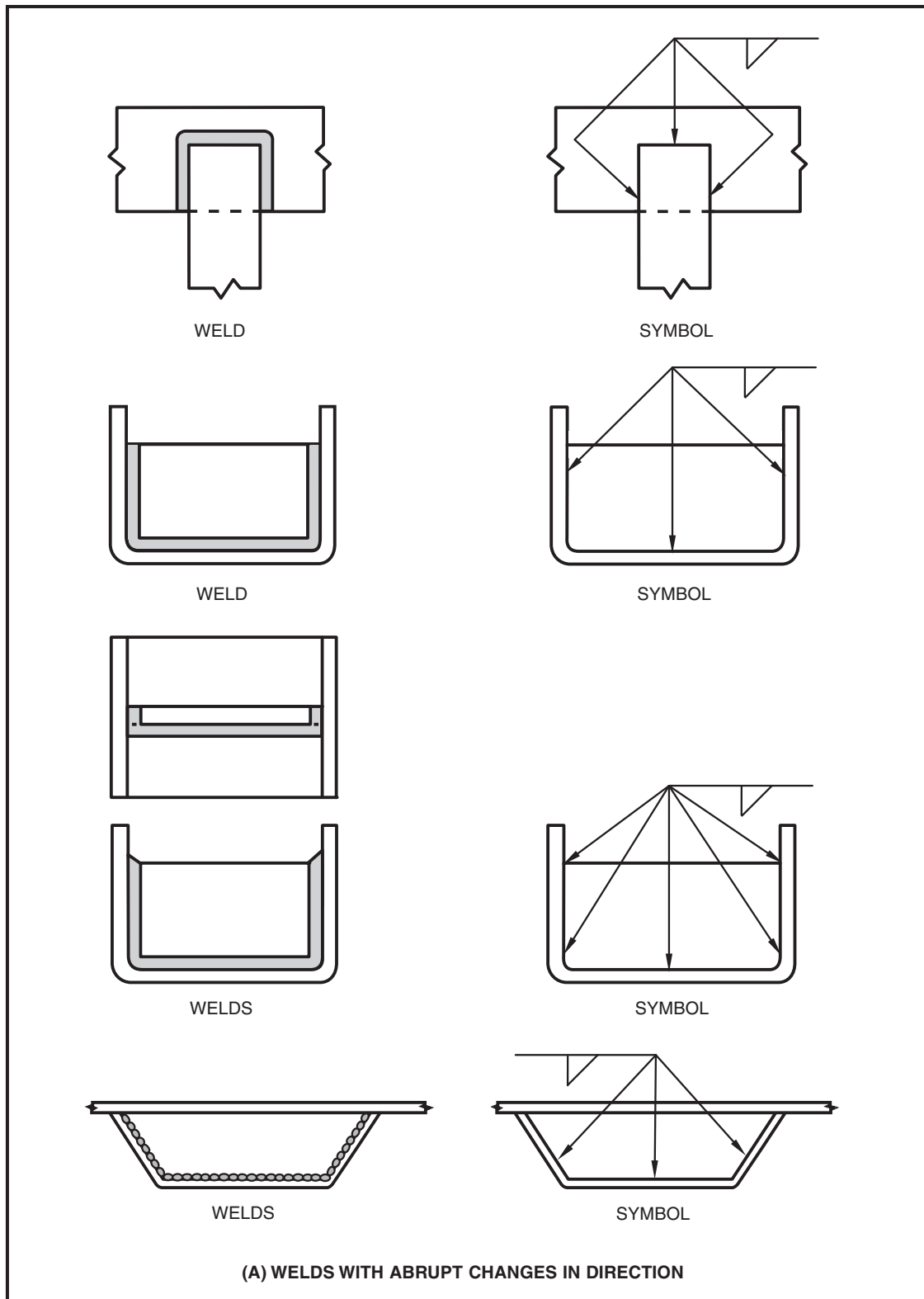


Figure 6.4—Application of the Symbol for the Specification of the Extent of Welding

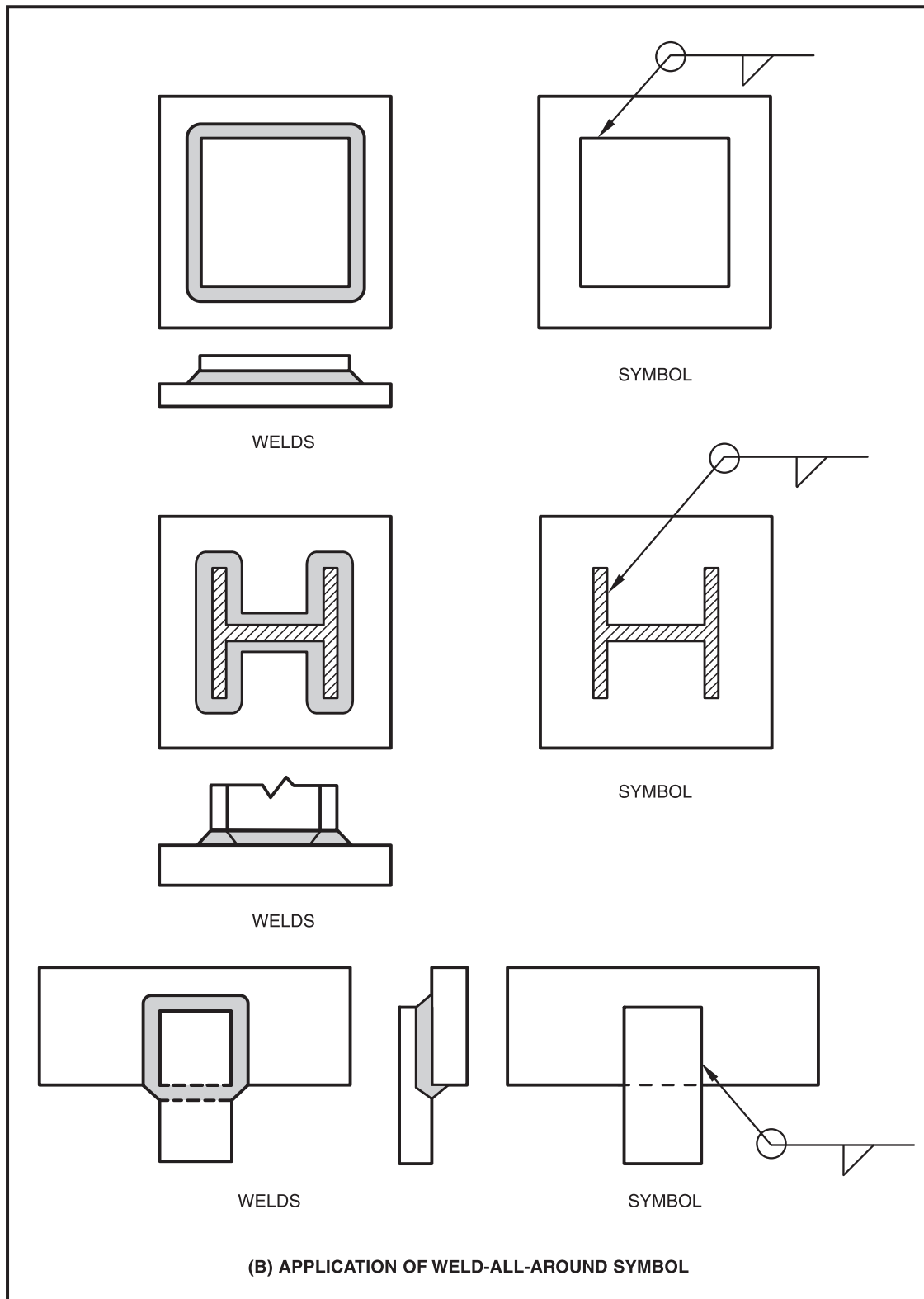


Figure 6.4 (Continued)—Application of the Symbol for the Specification of the Extent of Welding

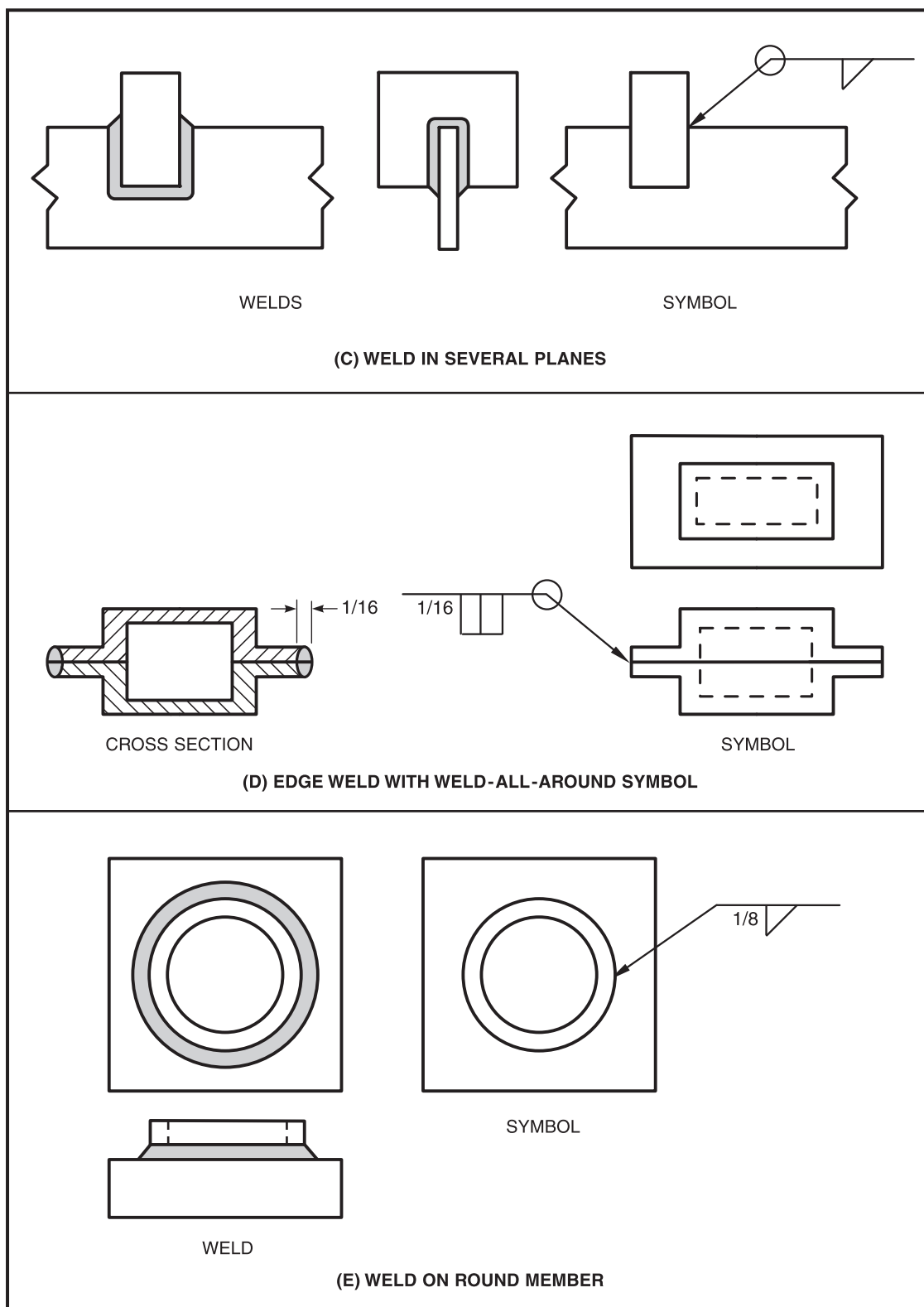


Figure 6.4 (Continued)—Application of the Symbol for the Specification of the Extent of Welding

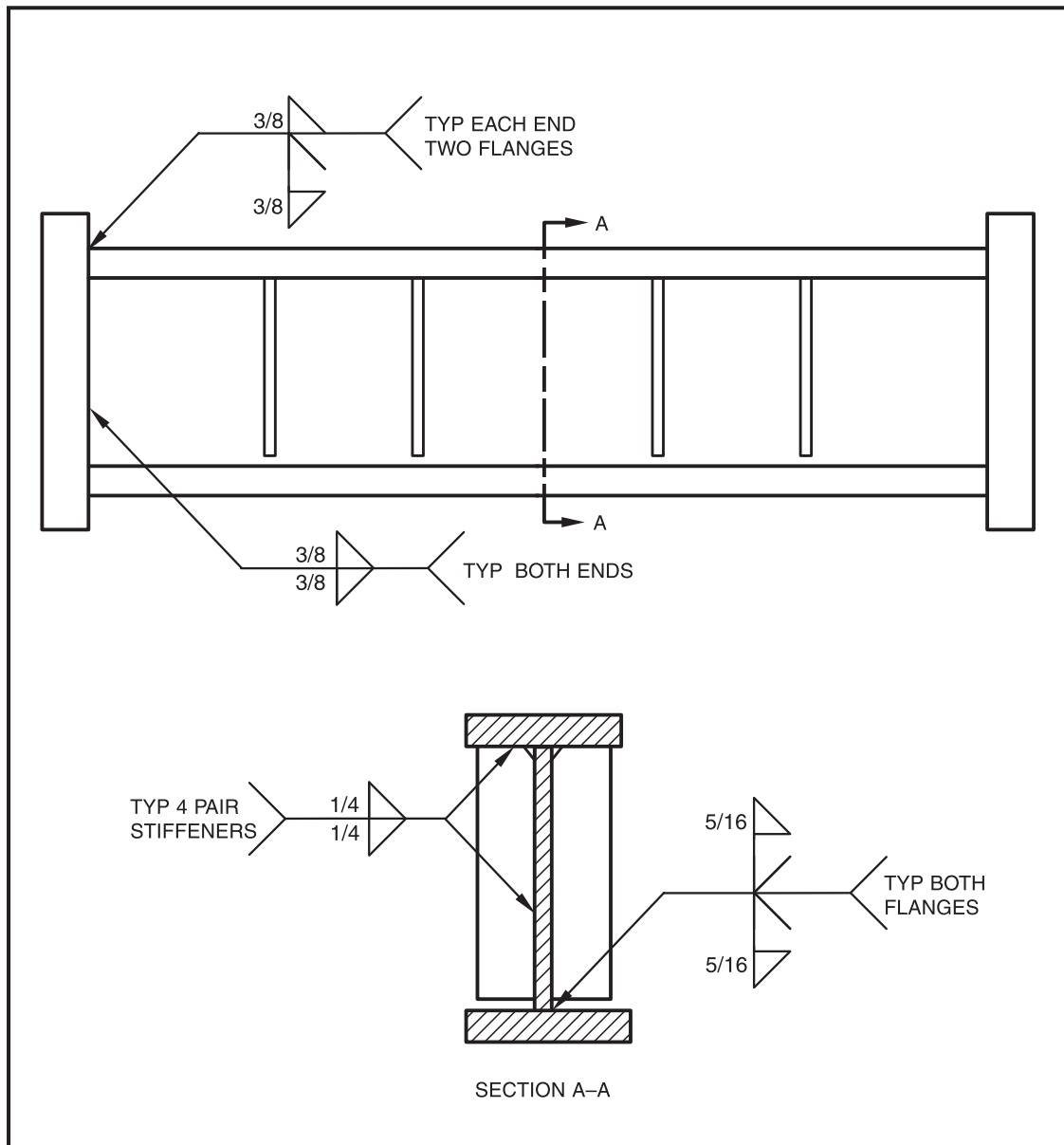
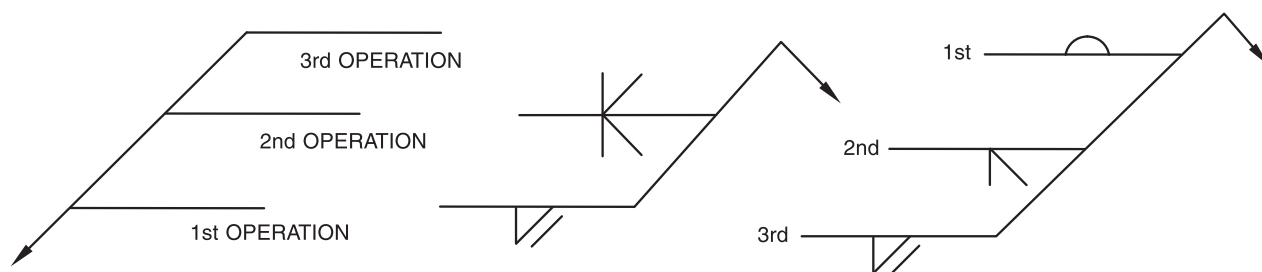


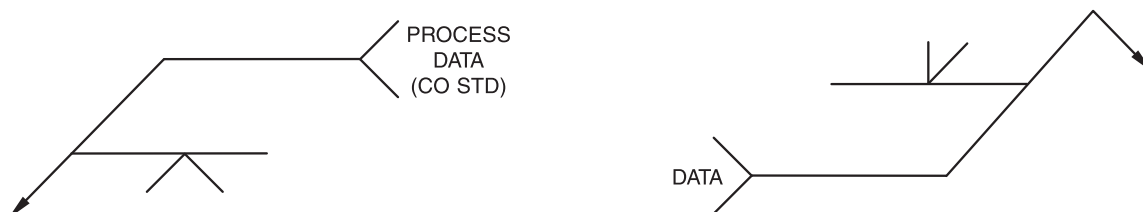
Figure 6.5—Application of the “TYPICAL” Welding Symbol

6.7 Multiple Reference Lines

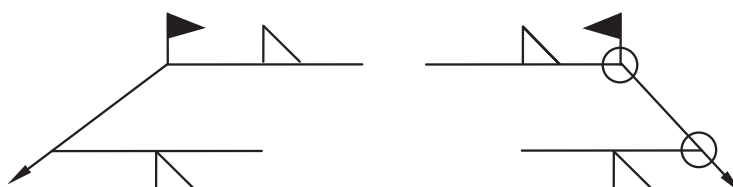
6.7.1 Sequence of Operations. Two or more reference lines may be used to indicate a sequence of operations. The first operation is specified on the reference line nearest the arrow. Subsequent operations are specified sequentially on additional reference lines.



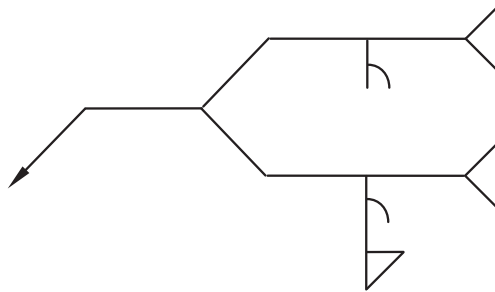
6.7.2 Supplementary Data. The tail of additional reference lines may be used to specify data supplementary to welding symbol information.



6.7.3 Symbols on Multiple Reference Lines. Symbols (including supplementary symbols) shall be placed on the reference line for each operation to which they are applicable.



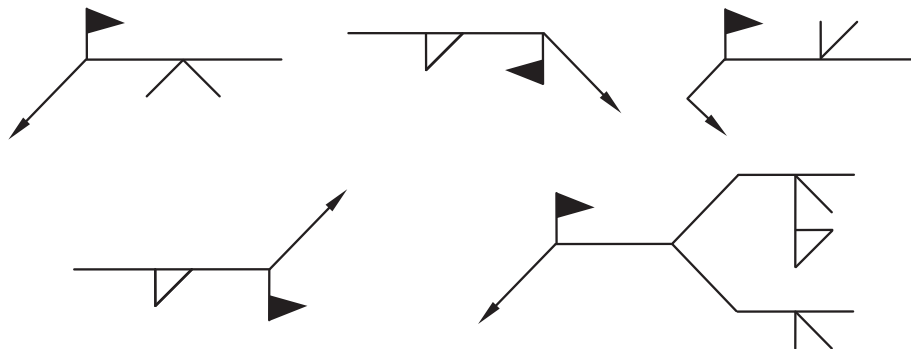
6.8 Welded Connections with Multiple Joint Types. Welds extending around joints with no abrupt changes in direction (e.g., pipe, round bar) where the joint transitions from one type to another (including combination welds) may be described with the use of multiple subreference lines. Individual weld symbols or combination weld symbols shall be placed on their own subreference lines connected to a single reference line.



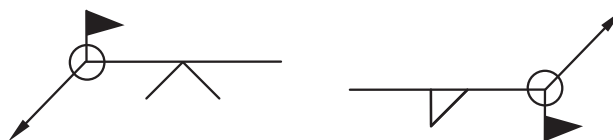
Source: Adapted from AWS D14.9:2013, *Specification for the Welding of Hydraulic Cylinders*, Figures 2(a) and 2(b), American Welding Society.

Unlike the rules for multiple reference lines outlined in 6.7.1, the sequence of welding with respect to the subreference lines is undetermined.

6.9 Field Weld Symbol. A flag is used to specify a field weld. The flag shall be placed at a right angle to, and on either side of, the reference line at the junction with the arrow (see Annex D6.9). The flag may point in either direction.



6.9.1 Field Weld and Weld-All-Around Symbols. When required, the field weld symbol and the weld-all-around symbol can be applied to the same location.



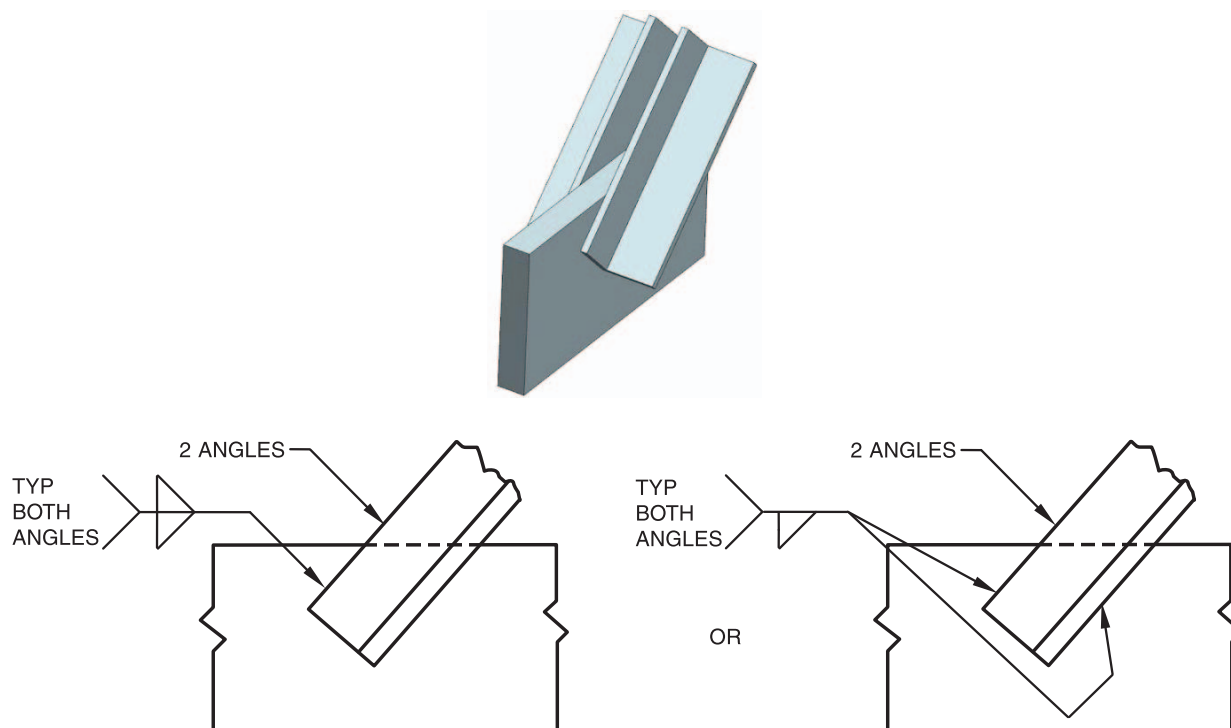
6.10 Extent of Welding Denoted by Symbols

6.10.1 Weld Continuity. Unless otherwise indicated, welding symbols shall denote continuous welds.

6.10.2 Changes in the Direction of Welding. Welding symbols apply only between abrupt changes in the direction of welding or to the extent of hatching or dimension lines (see Figure 6.6), except when the weld-all-around symbol is used [see Figure 6.4(B), (C), and (D)].

Additional welding symbols or multiple arrows shall be used to specify the welds required for any abrupt changes in direction. When it is desirable to use multiple arrows on a welding symbol, the arrows shall originate from a single reference line [see Figure 6.4(A)], or from the first reference line in the case of a multiple reference line symbol. See Annex D6.10.2 for applications involving square and rectangular tubing.

6.10.3 Hidden Members. When the welding of a hidden member is to be the same as a visible member, it may be specified. If the welding of a hidden member is to be different from a visible member, specific information for the welding of both shall be specified. If needed for clarification, auxiliary illustrations or views shall be provided.



6.10.4 Weld Location Specified. A weld having a length less than the available joint length and where the location is significant shall have the location specified on the drawing [see Figure 6.6(C)].

6.10.5 Weld Location Not Specified. A weld having a length less than the available joint length and where the location is not significant may be specified without indicating the location [see Figure 6.6(D)].

6.11 Weld-All-Around Symbol

6.11.1 Welds in Multiple Directions or Planes. A continuous weld, whether a single or combined type, extending around a series of connected joints, may be specified by the addition of the weld-all-around symbol at the junction of the arrow and reference line.



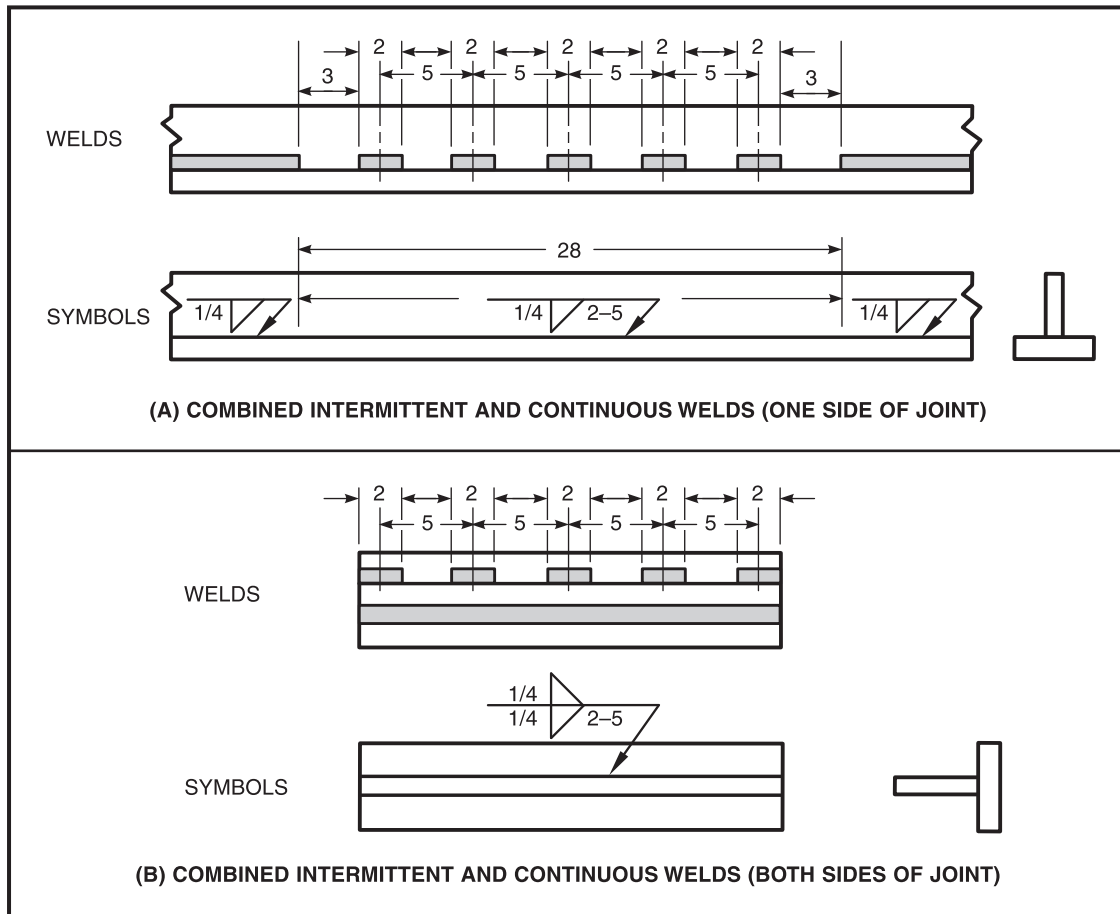


Figure 6.6—Application of the Location and Extent of Fillet Welds

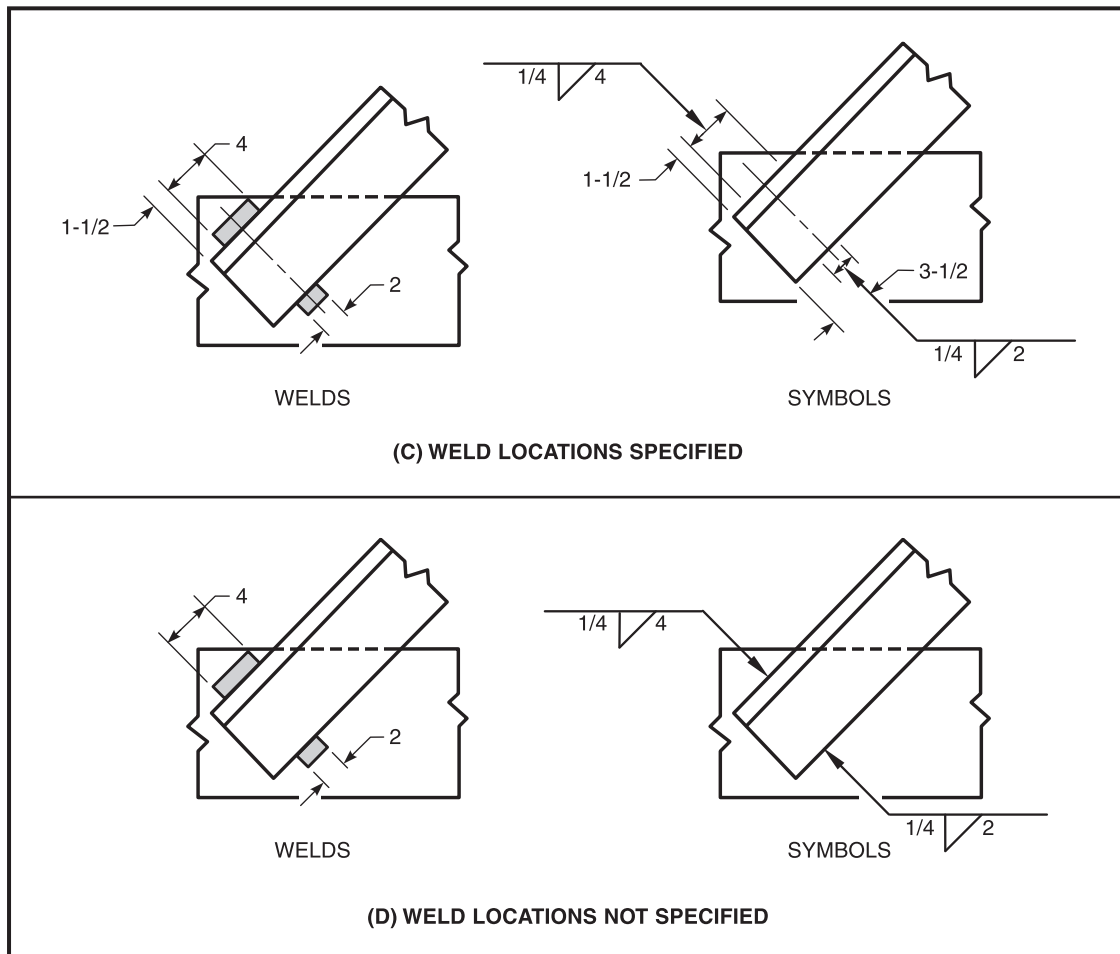
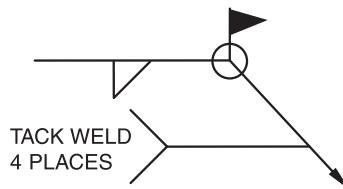


Figure 6.6 (Continued)—Application of the Location and Extent of Fillet Welds

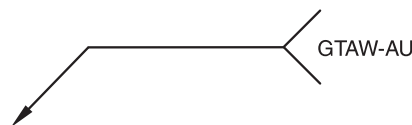
The weld joint configuration shall be consistent with the elements of the welding symbol for all locations where a single weld-all-around symbol applies. The series of joints may involve different operations, directions, and may lie in more than one plane [see Figure 6.4(B), (C), (D), and Annex D6.11.1].



6.11.2 Circumferential Welds. Welds extending around circumferential joints with no abrupt change in direction (e.g., pipe, round bar) are excluded from the requirement regarding changes in direction and do not require the weld-all-around symbol to specify a continuous weld [see Figure 6.4(E)].

6.12 Tail of the Welding Symbol

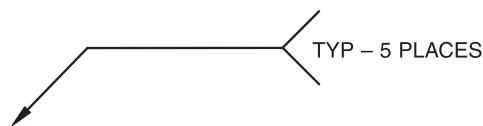
6.12.1 Welding and Allied Process Specification. The welding or allied process to be used may be specified by placing the appropriate letter designations from Table A2, Table A3, or Table A4 in the tail of the welding symbol. An auxiliary suffix from Table A5 may be used.



6.12.2 References. Specifications, codes, or any other applicable documents may be specified by placing the reference in the tail of the welding symbol. Information contained in the referenced document need not be repeated in the welding symbol.



6.12.3 Welding Symbols Designated "TYPICAL." Repetitions of identical welding symbols on a drawing may be avoided by designating a single welding symbol as "TYPICAL" (usually abbreviated "TYP") and pointing the arrow to the representative joint (see Figure 6.5). The user shall provide additional information to completely identify all applicable joints (see Annex D6.12.3).



6.12.4 Designation of Special Types of Welds. When the basic weld symbols are inadequate to indicate the desired weld, the weld shall be specified by a cross section, detail, or other data with a reference thereto in the tail of the welding symbol. This may be necessary for skewed joints (see 7.13 and 8.7).



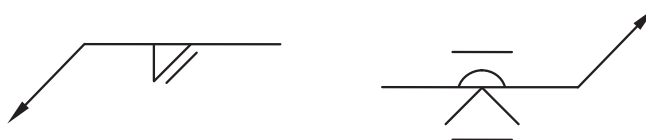
6.12.5 Omission of the Tail. When no references are required, the tail may be omitted from the welding symbol.



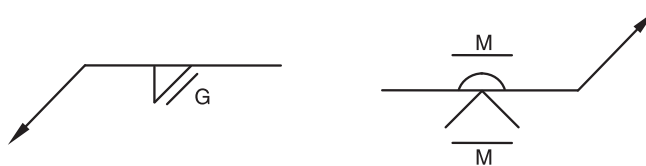
6.12.6 Drawing Notes. Drawing notes may be used to provide information pertaining to the welds. Such information need not be repeated in the welding symbols.

6.13 Contour Symbols

6.13.1 Contours Obtained by Any Method. Welds to be contoured flush, flat, convex, or concave by welding or any method of mechanical finishing shall be specified by adding the flush, flat, convex, or concave contour symbol, respectively, to the welding symbol.



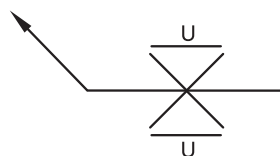
6.13.2 Contours Obtained by a Specific Mechanical Finishing Method. When a specific mechanical finishing method is required, the appropriate designator shall be added to the contour symbol as shown below. Finishing designators do not specify the quality of finish.



C = CHIPPING
G = GRINDING
H = HAMMERING

M = MACHINING
P = PLANISHING
R = ROLLING

6.13.3 Contours Obtained by an Unspecified Mechanical Finishing Method. When welds are required to be mechanically finished but the method of finishing is unspecified, the designator “U” shall be added to the appropriate contour symbol.



U = UNSPECIFIED

6.14 Melt-Through Symbol. The melt-through symbol shall be used only when complete joint penetration plus visible root reinforcement is required in welds made from one side (see Figure 6.7).

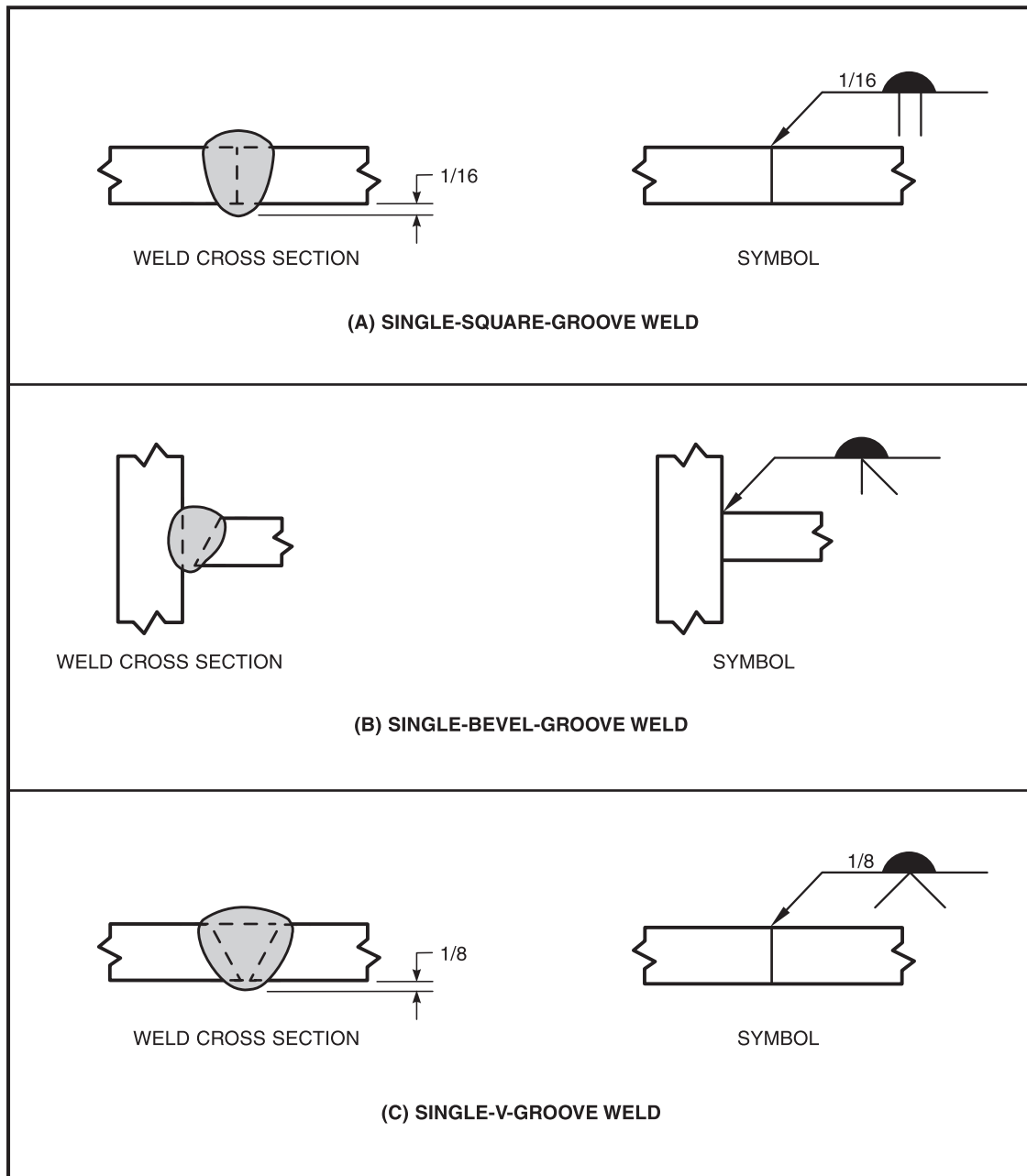


Figure 6.7—Application of the Melt-Through Symbol

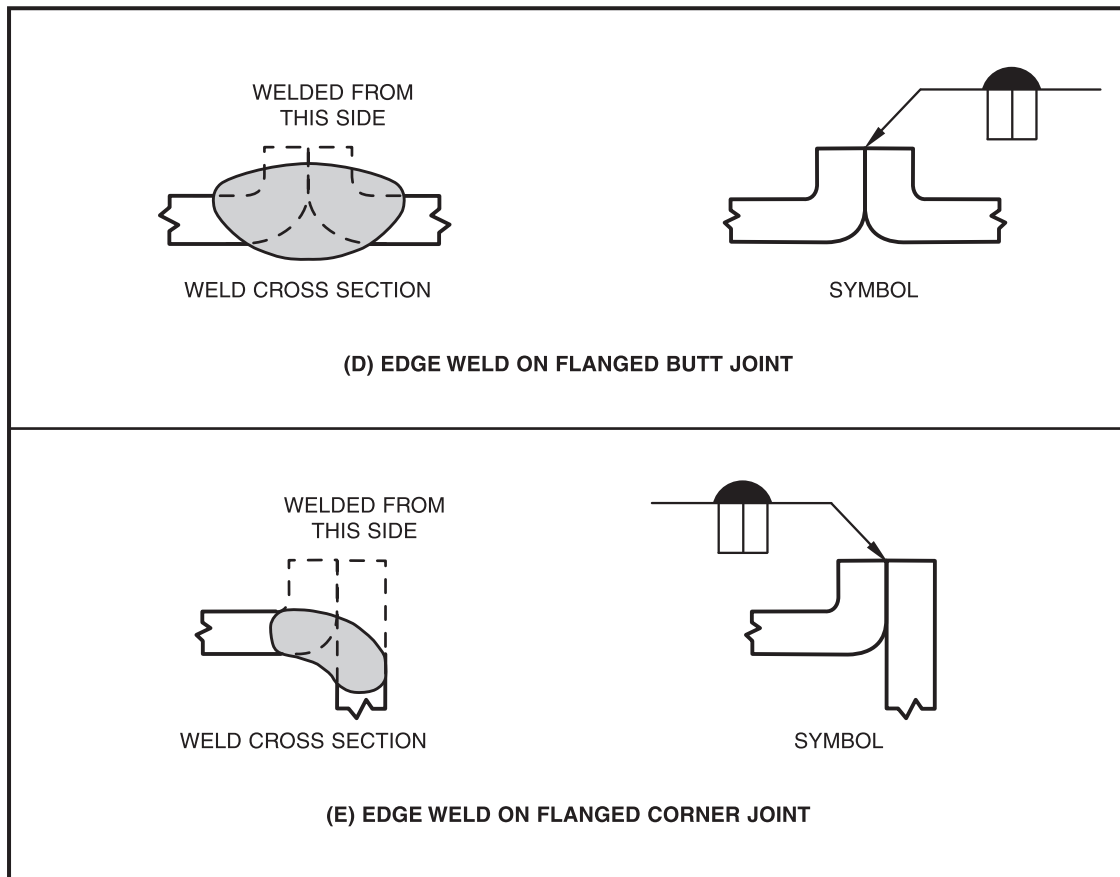


Figure 6.7 (Continued)—Application of the Melt-Through Symbol

6.14.1 Melt-Through Symbol Location. The melt-through symbol shall be placed on the side of the reference line opposite the weld symbol (see Figure 6.7).

6.14.2 Melt-Through Dimensions. The height of the root reinforcement may be specified by placing the required dimension to the left of the melt-through symbol [see Figure 6.7(A) and (C)]. The height of the root reinforcement may be left unspecified [see Figure 6.7(B)].

6.15 Melt-Through with Edge Welds

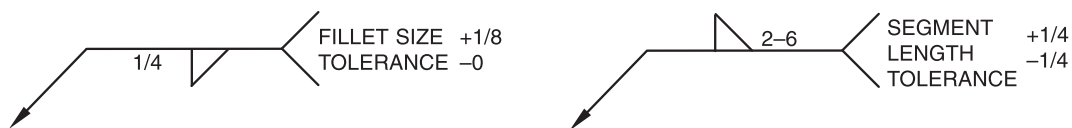
6.15.1 Melt-Through with Edge Welds on Flanged Butt Joints. Edge welds requiring complete joint penetration shall be specified by the edge weld symbol with the melt-through symbol placed on the opposite side of the reference line. The details of the flanges are considered part of the drawing and are not specified by the welding symbol [see Figure 6.7(D)].

6.15.2 Melt-Through with Edge Welds on Flanged Corner Joints. Edge welds requiring complete joint penetration shall be specified by the edge weld symbol with the melt-through symbol placed on the opposite side of the reference line. The details of the flange are considered part of the drawing and are not specified by the welding symbol [see Figure 6.7(E)].

6.16 Method of Drawing Symbols. Symbols may be drawn mechanically, electronically, or by freehand. Symbols intended to appear in publications or to be of high precision should be drawn with the dimensions and proportions given in Annex B or Annex C.

6.17 U.S. Customary and SI Units. The primary system of measurement for the drawings shall be used on welding symbols. Dual units shall not be used on welding symbols. If it is desired to show conversions from SI to U.S. Customary Units or vice versa, conversions may be included on the drawing, e.g., a table. For guidance on drafting standards, refer to the ASME Y14 standards. For guidance on the use of SI Units, refer to AWS A1.1, *Metric Practice Guide for the Welding Industry*.

6.18 Weld Dimension Tolerance. When a tolerance is applicable to a weld symbol dimension, it may be shown in the tail of the welding symbol or specified by a drawing note, table, code, or specification. In all cases, a reference shall be made to the dimension to which the tolerance applies.

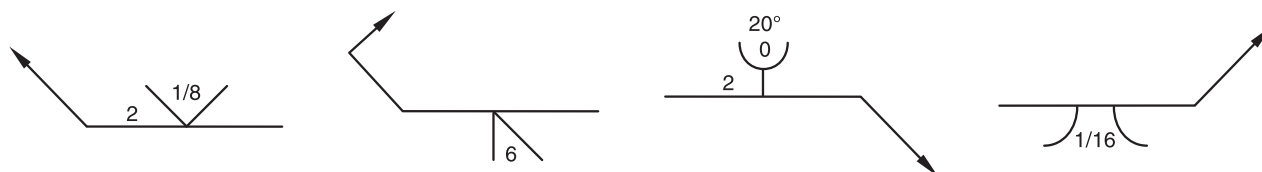


6.19 Changes in Joint Geometry During Welding. A welding symbol with a single reference line is intended to specify the joint geometry to be established prior to the start of welding. Changes in the joint geometry of groove welds resulting from the specified welding operations (e.g., backgouging and backing welds) are not to be included as a part of the welding symbol (see Annex D6.19).

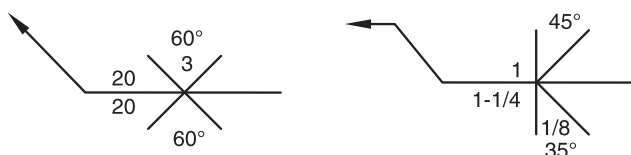
7. Groove Welds

7.1 General

7.1.1 Single-Groove Dimensions. Groove weld dimensions shall be specified on the same side of the reference line as the weld symbol [see Figure 7.1(A) and (F)].

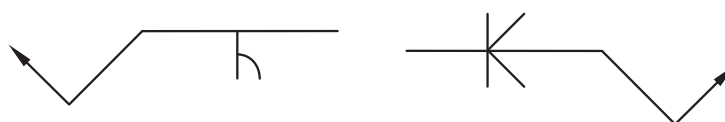


7.1.2 Double-Groove Dimensions. Each groove of a double-groove joint may be dimensioned; however, the root opening need appear only once (see Figure 7.2).

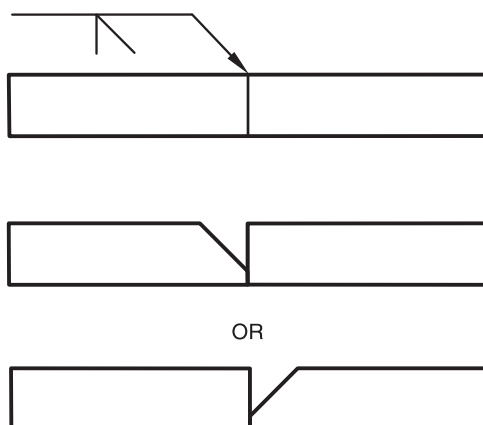


7.1.3 Broken Arrow and Straight Arrow

7.1.3.1 Broken Arrow. A broken arrow is used, when necessary, to specify which member is to have a bevel-, J-, or flare-bevel-groove edge shape for single- or double-bevel, J-, or flare-bevel-groove welds [see 6.4.1 and Figure 7.1(B)].



7.1.3.2 Straight Arrow for Single-Groove Welds. A straight arrow is used when either member may have the desired edge shape for single-bevel-, single-J-, or single-flare-bevel-groove welds.



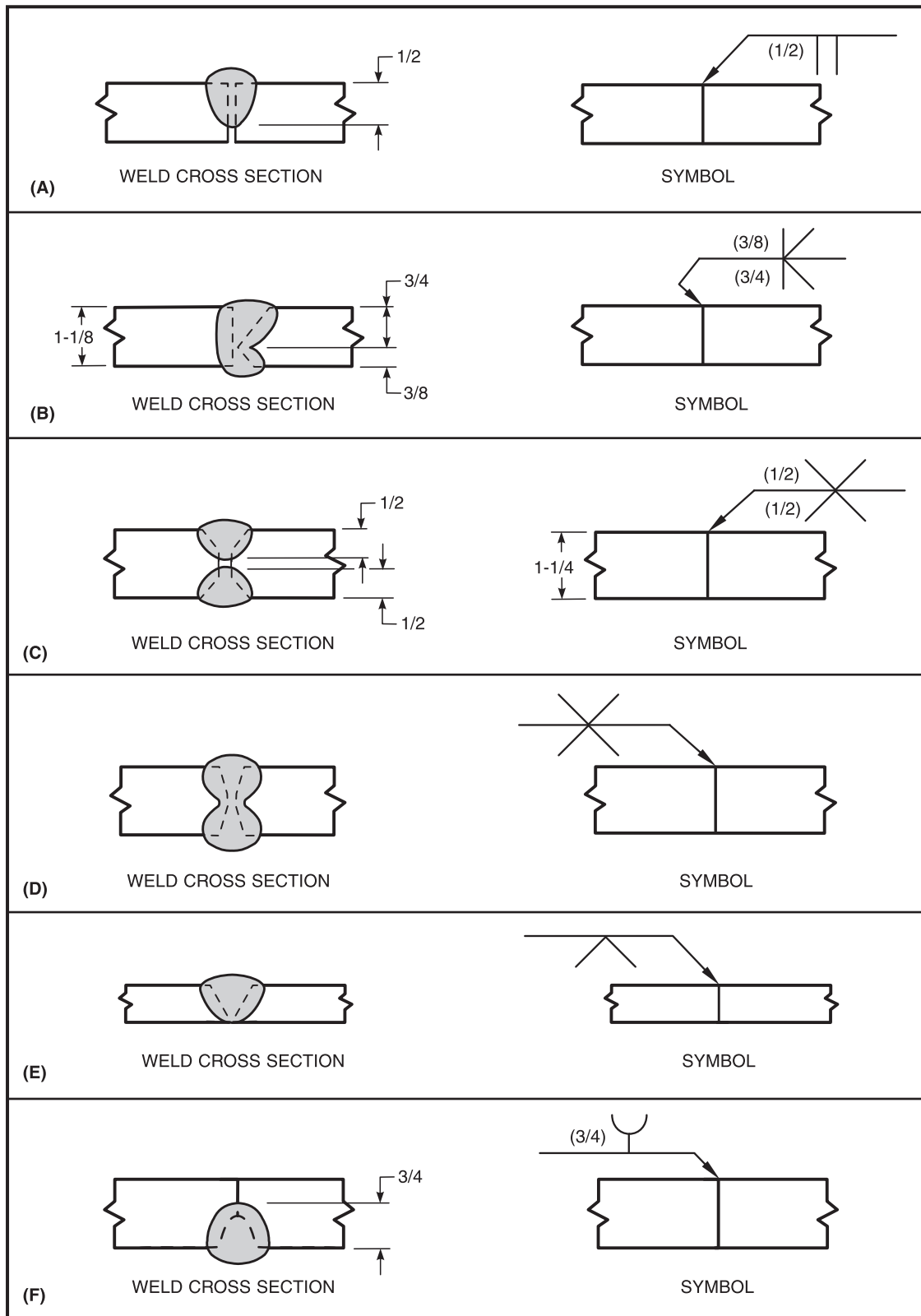


Figure 7.1—Application of Groove Weld Size, Groove Depth Not Specified

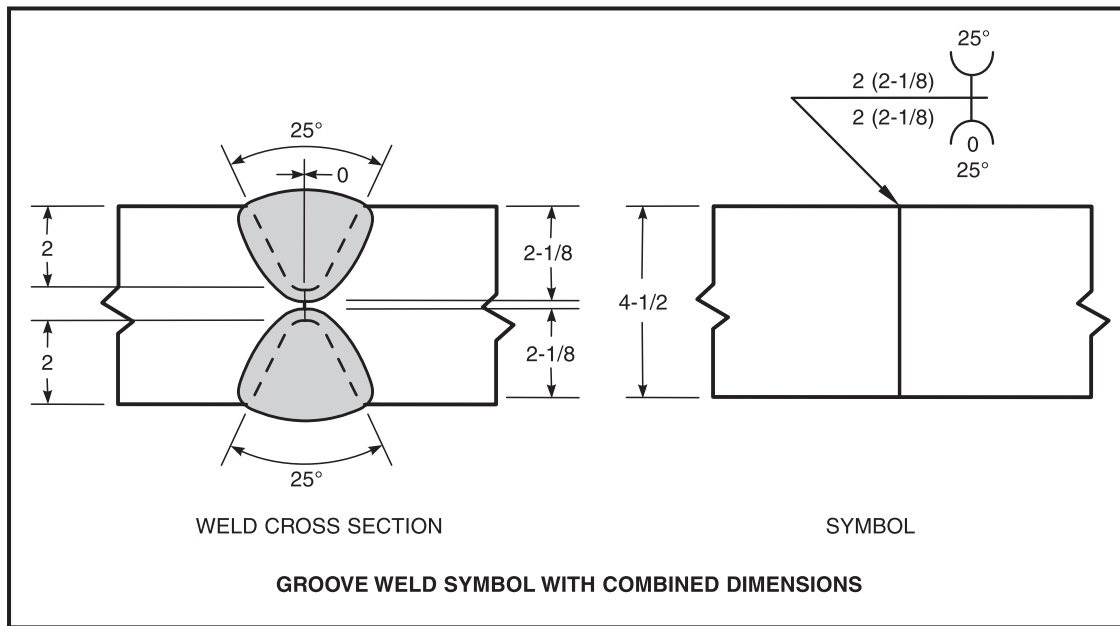
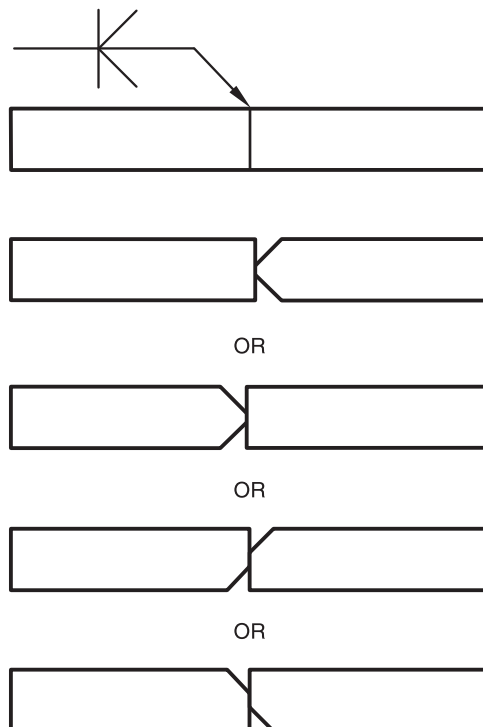


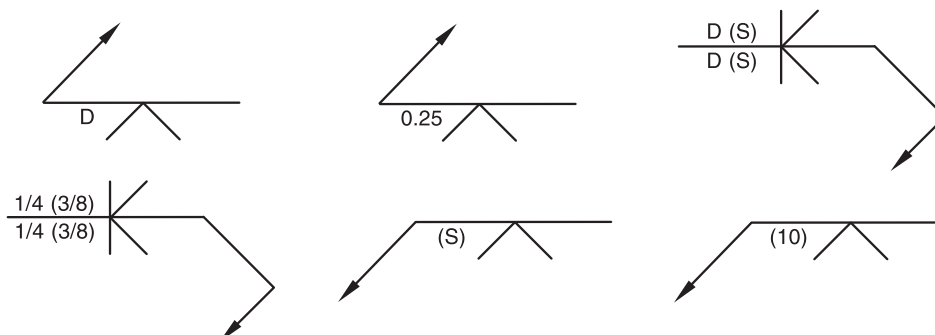
Figure 7.2—Application of Dimensions to the Groove Weld Symbol

7.1.3.3 Straight Arrow for Double-Groove Welds. A straight arrow is used when either or both members may have the desired edge shape for double-bevel-, double-J-, or double-flare-bevel groove welds. The edge shape may be in one member on the arrow side of the joint and in the second member on the other side of the joint.

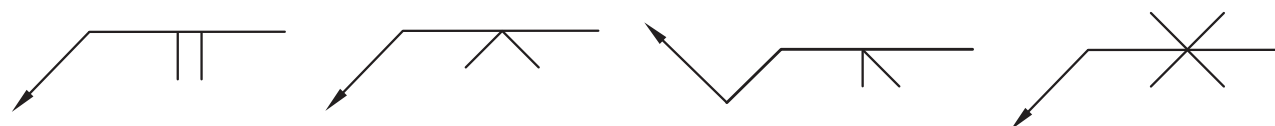


7.2 Groove Depth and Groove Weld Size

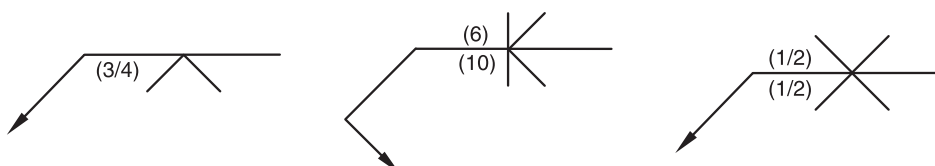
7.2.1 Location. When used, the groove depth, “D”, and the groove weld size, “(S)”, shall be placed to the left of the weld symbol [see Figure 7.1(A), (B), (C), and (F) and Figures 7.2 through 7.4].



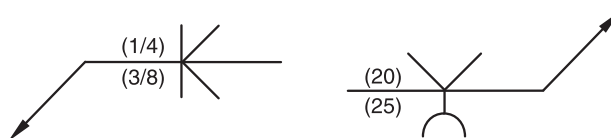
7.2.2 Complete Joint Penetration. Omitting the groove depth, “D”, and groove weld size, “(S)”, dimensions from the welding symbol requires a groove weld extending through the thickness of the joint [see Figures 7.1(D), 7.1(E), and 7.7, as well as Annex D7.2.2].



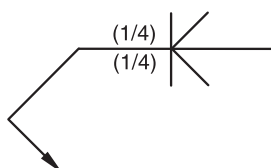
7.2.3 Partial Joint Penetration Welds, Groove Weld Size Specified, Groove Depth Not Specified. Groove weld size, “(S)”, extending only partly through the joint shall be specified in parentheses to the left of the weld symbol [see Figure 7.1(A), (C), and (F)].



7.2.4 Complete Joint Penetration Double-Groove Welds, Groove Weld Size Specified, Groove Depth Not Specified. The size of nonsymmetrical groove welds (arrow side versus other side) extending completely through the joint shall be specified in parentheses to the left of the weld symbol [see Figure 7.5(B) and (C)].



The size of symmetrical groove welds (arrow side versus other side) that extend completely through the joint may be specified in parentheses to the left of the weld symbol [see Figure 7.5(A)].



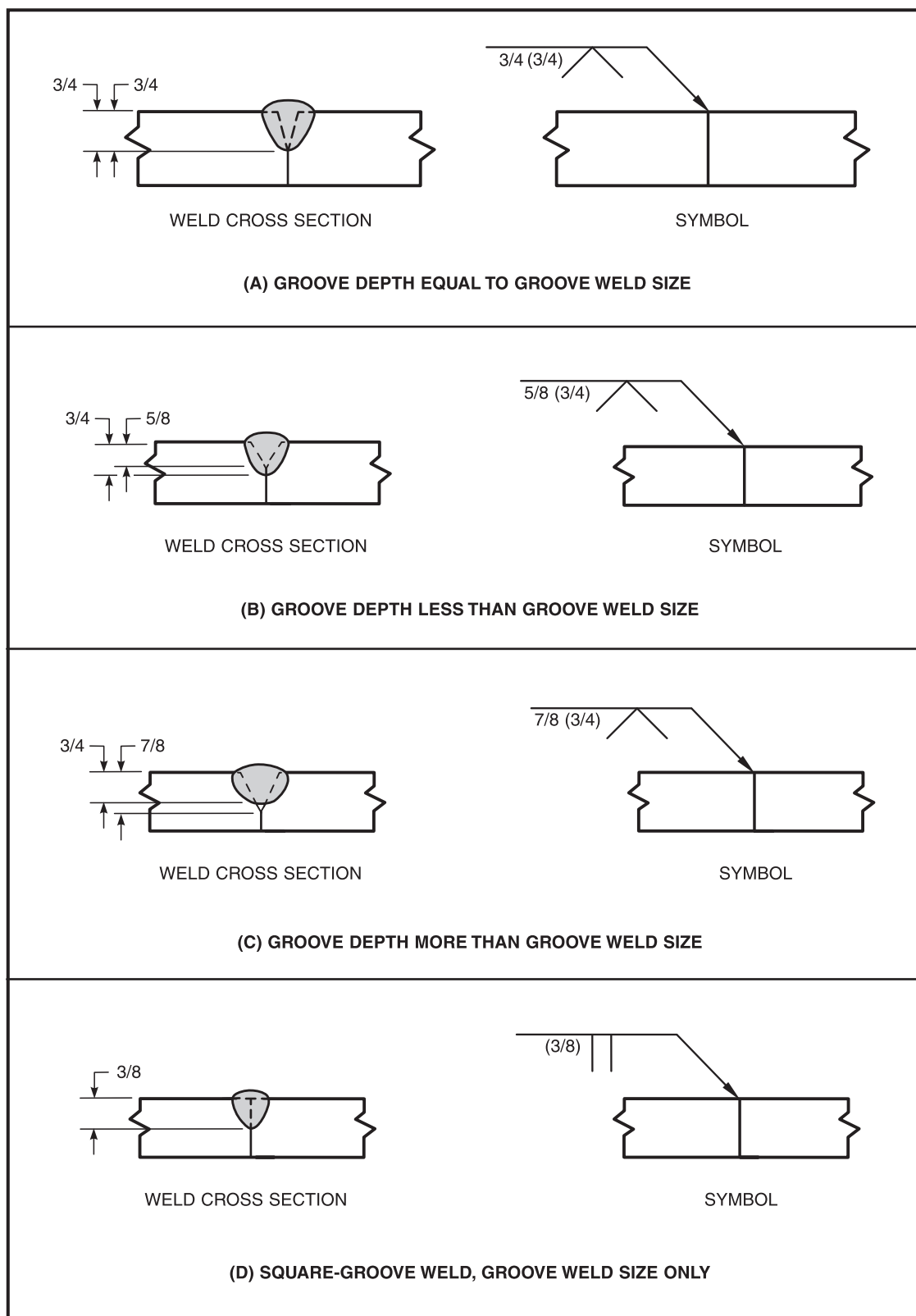


Figure 7.3—Application of Groove Weld Size Related to Groove Depth

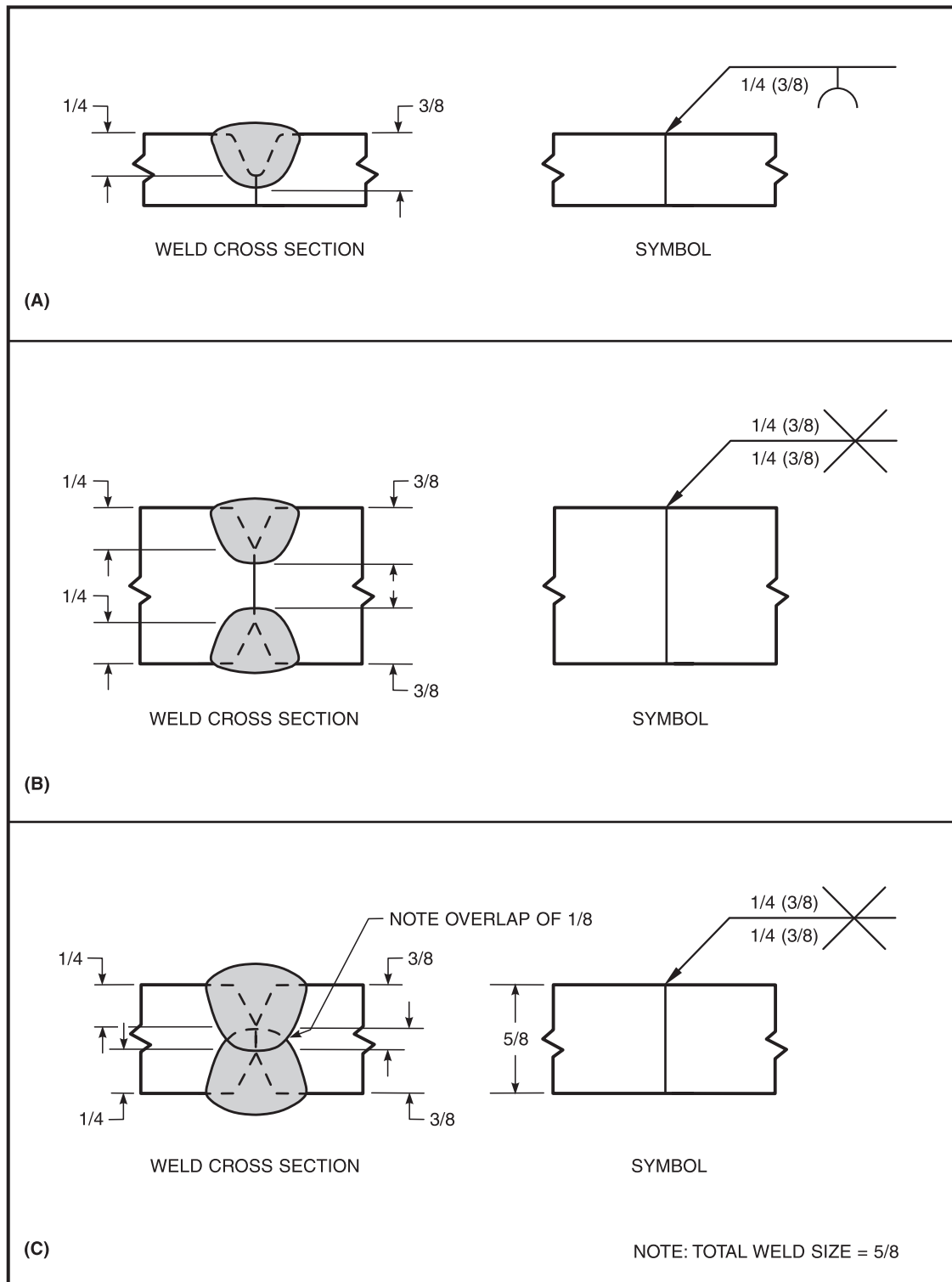


Figure 7.4—Specification of Groove Depth and Groove Weld Size

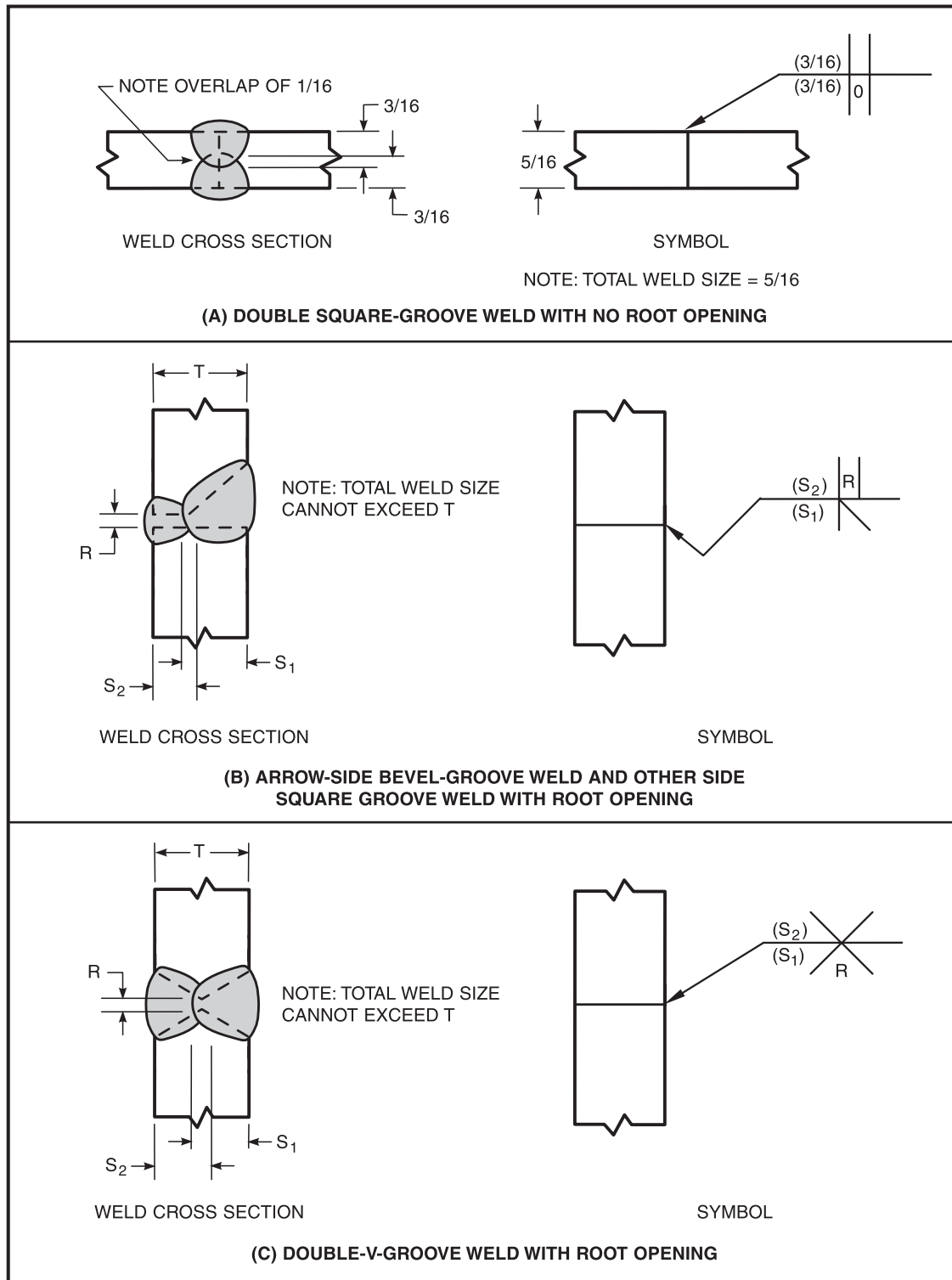
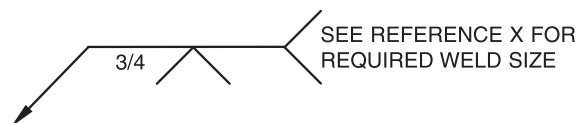
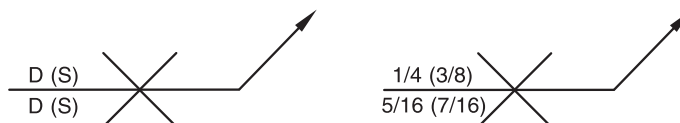


Figure 7.5—Application of Symbols for Groove Weld Size Only

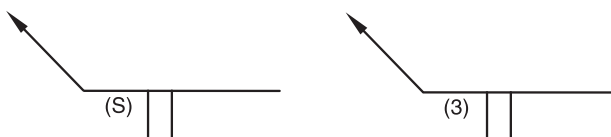
7.2.5 Groove Depth Specified, Groove Weld Size Specified Elsewhere. A dimension not in parentheses placed to the left of a groove weld symbol specifies the groove depth only.



7.2.6 Groove Depth and Groove Weld Size Specified. The groove depth, “D”, and groove weld size, “(S)”, are located to the left of the weld symbol as “D (S)” [see Figures 7.3(A), (B), and (C) and 7.6(B)].



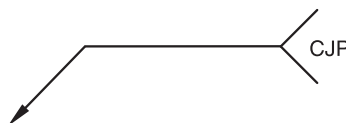
Square groove welds are an exception where the groove depth, D, is not applicable [see Figures 7.3(D) and 7.6(A)].



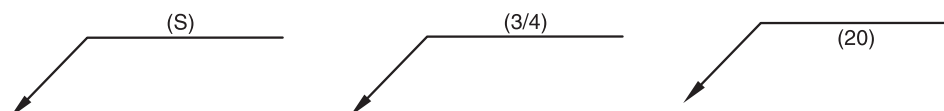
7.2.7 Groove Depth Specified, Groove Weld Size Not Specified. A welding symbol with a groove depth, “D”, specified, and the groove weld size, “(S)”, not included and not specified elsewhere, requires a groove weld size not less than the groove depth.



7.2.8 Joint Geometry Not Specified, Complete Joint Penetration Required. Optional joint geometry with complete joint penetration (CJP) required is specified by placing the letters “CJP” in the tail of the welding symbol and omitting the weld symbol (see Figure 7.7).



7.2.9 Joint Geometry Not Specified, Groove Weld Size Specified. For optional joint geometry, the groove weld size is specified by placing dimension “(S)” on the arrow side or the other side of the reference line as required, but omitting the weld symbol (see Figure 7.8).



7.2.10 Flare-Groove Welds. Flare-groove welds are a special case that do not conform to all the accepted conventions associated with other types of groove welds (see Annex D7.2.10).

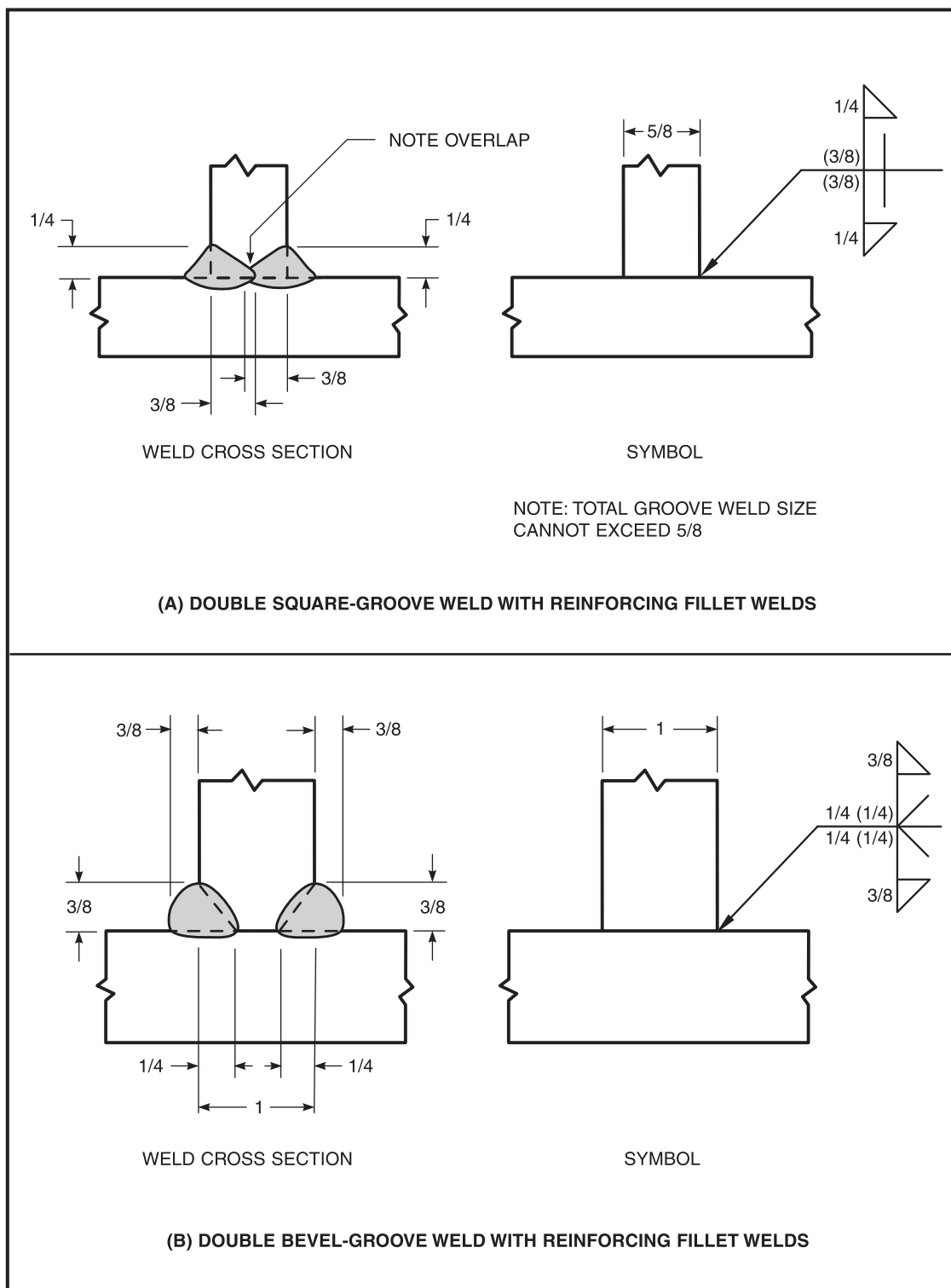


Figure 7.6—Application of Symbols for Combined Groove and Fillet Welds